

**WEST VALLEY NUCLEAR  
SERVICES INC.**

**WEST VALLEY DEMONSTRATION  
PLANT**

**SLUDGE MOBILIZATION**

**HLW TRANSFER PIPING**

***STRESS ANALYSIS OF 6-55-4/2-038 PIPES***

**CALCULATION NUMBER WV38-1**

**PREPARED BY**

**EBASCO SERVICES INCORPORATED  
2 WORLD TRADE CENTER  
NEW YORK, NY 10048**

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EBASCO SERVICES INCORPORATED  
CALCULATION COVER SHEET

SHEET 001 OF 007

CLIENT: West Valley Nuclear Services Company Inc.,

PROJECT: West Valley Demonstration Project

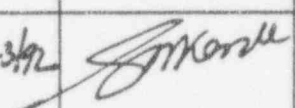
SUBJECT: SLUDGE MOBILIZATION - HLW TRANSFER PIPING, 6-55-4/2-038

CALCULATION NO.: WV38-1

CONTAINS ASSUMPTIONS WHICH REQUIRE CONFIRMATION YES ☐ NO ☒

ASSUMPTIONS CONFIRMED ON not applicable BY

PRELIMINARY ☐ FINAL ☒ SUPERSEDES CALC NO. not applicable

REV NO.	SH. NOS.	CALCULATIONS BY NAME	DATE	CHECKED BY NAME	DATE	REVIEWED/APPROVED NAME	DATE
0	ALL	C.M. Arshad	3/23/92	initials only	3/23/92		3/23/92

EBASCO SERVICES INCORPORATED  
CALCULATION CONTINUATION SHEET

SHEET 002 OF 007

CLIENT: West Valley Nuclear Services Company Inc.,  
PROJECT: West Valley Demonstration Project  
SUBJECT: SLUDGE MOBILIZATION - HLW TRANSFER PIPING, 6-55-4/2-038  
CALCULATION NO.: WV38-1

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APPENDICES

- APPENDIX A (PIPING ISOMETRICS)
- APPENDIX B (TABLE 3.1 AND 3.2.1 THRU 3.2.16)
- APPENDIX C (MISCELLANEOUS CALCULATIONS)
- APPENDIX D (COMPUTER OUTPUT)

EBASCO SERVICES INCORPORATED  
CALCULATION CONTINUATION SHEET

SHEET 003 OF 007

CLIENT: West Valley Nuclear Services Company Inc.,  
PROJECT: West Valley Demonstration Project  
SUBJECT: SLUDGE MOBILIZATION - HLW TRANSFER PIPING, 6-55-4/2-038  
CALCULATION NO.: WV38-1

1.0 PURPOSE:

This report presents stress analysis of the HLW Transfer Piping 6-55-4/2-038 as shown on the attached piping isometric drawing WV4-38 (Appendix A).

This report also provides support reactions corresponding to each of the loading conditions experienced by the piping system during the course of operation of the plant.

The report provides an assurance that the piping layout as shown on the aforementioned piping isometric drawing complies with the requirements of the ASME/ANSI B31.3 Chemical Plant and Petroleum Refinery Piping Code (Ref. 5.3).

2.0 DESCRIPTION OF ANALYSIS:

Pipe line routing is shown on the attached Piping Stress Analysis Isometric Drawing WV4-38

Other stress analysis related technical data is also shown on the attached isometric. This data is related to pipe physical and material properties, and pipe operating/design temperature/pressure. Piping stress analysis is performed using CAESAR II microcomputer program (Ref. 5.4). The loading conditions and analysis criteria are based on Ref. 5.1.

The loading conditions considered for analysis are as follows:

i) THERMAL EFFECTS:

a) Internal 2 inch process pipe @ 150 PSIG internal pressure and 220 F degree temperature and outer 4 inch jacket pipe @ atmospheric pressure and 55 F degree temperature.

b) Internal 2 inch process pipe @ 150 PSIG internal pressure 220 F degree temperature and outer 4 inch jacket pipe @ atmospheric pressure and 220 F degree temperature.

ii) SUSTAINED LOADS:

Internal pressure of 150 PSIG for both process and jacket pipes and weight of pipe and contents. Contents of the process pipe is a fluid of 1.4 specific gravity. The jacket pipe is empty.

EBASCO SERVICES INCORPORATED  
CALCULATION CONTINUATION SHEET

SHEET 004 OF 007

CLIENT: West Valley Nuclear Services Company Inc.,  
PROJECT: West Valley Demonstration Project  
SUBJECT: SLUDGE MOBILIZATION - HLW TRANSFER PIPING, 6-55-4/2-038  
CALCULATION NO.: WV38-1

2.0 DESCRIPTION OF ANALYSIS (continued)

iii) EFFECTS DUE TO EARTHQUAKE LOADINGS:

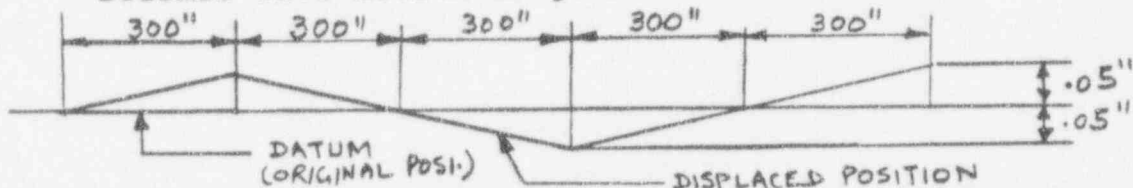
The effects due to earthquake loadings are as follows:

a) SEISMIC INERTIAL EFFECTS:

Seismic inertial effects are analyzed using the US NRC Reg. Guide 1.60 Figure 1, Horizontal Design Response Spectra - Scaled to 0.1 g Horizontal Ground Acceleration - 2 % Damping and Figure 2, Vertical Design Response Spectra - Scaled to 0.1 g Vertical Ground Acceleration - 2 % Damping. A dynamic analysis considering modes upto 33 Hz is performed.

b) SEISMIC WAVE MOTION EFFECTS:

Effects due to wave motion of the earthquake are applied at all horizontal supports as support movements. The seismic wave motion is generalized as follows:



Wave motion is considered to occur in two mutually perpendicular horizontal directions and vertical direction separately and the three such spatial effects are combined by the square root of sum of squares (SRSS) method.

c) RELATIVE MOTION BETWEEN PIT 8Q-1 AND PIT 8Q-2:

Pits 8Q-1 and 8Q-2 are expected to move 0.333" in the two horizontal directions and 0.250" in the vertical direction separately and relative to the trench and the motion of the pits are out of phase. The node 1000/1 is located at PIT 8Q-2 whereas node 1150/150 is located in PIT 8Q-1.

EBASCO SERVICES INCORPORATED  
CALCULATION CONTINUATION SHEET

SHEET 005 of 007

CLIENT: West Valley Nuclear Services Company Inc.,  
PROJECT: West Valley Demonstration Project  
SUBJECT: SLUDGE MOBILIZATION - HLW TRANSFER PIPING, 6-55-4/2-038  
CALCULATION NO.: WV38-1

2.0 DESCRIPTION OF ANALYSIS: (continued)

The horizontal relative motions are applied at the pipe interfaces as axial and lateral movements. The three relative motion effects are analyzed separately and combined by the square root of sum squares (SRSS) method. The results from (a), (b) and (c) above are combined absolutely to arrive at the combined seismic effects.

iv) ANALYTICAL MODEL:

It is noted that the thermal expansion effects described in (i) (a) cause the internal process pipe to touch the outer jacket pipe at node point 110. To simulate this effect, fictitious restraints at this node point are modeled with gaps and these restraints are connected to the outer pipe. The gaps are calculated and shown in APPENDIX C. For this calculations the gaps at these locations are the clearances between the process pipe and jacket pipe.

Single miter bends are used to maximize the clearances at change in directions at locations 1080 and 1140. At other locations the clearances are adequate to accommodate the thermal expansion.

The axial forces caused by this effect are reviewed and the resulting axial stress is low.

3.0 STRESS ANALYSIS RESULTS:

3.1 SUMMARY OF PIPE STRESSES AND COMPLIANCE:

Table 3.1 provides a summary of Pipe Stresses and the assurance that the piping layout and supporting schemes as shown on the attached piping isometrics (Appendix A) meet the requirements of the B31.3 Code.

EBASCO SERVICES INCORPORATED  
CALCULATION CONTINUATION SHEET

SHEET 006 OF 007

CLIENT: West Valley Nuclear Services Company Inc.,  
PROJECT: West Valley Demonstration Project  
SUBJECT: SLUDGE MOBILIZATION - HLW TRANSFER PIPING, 6-55-4/2-038  
CALCULATION NO.: WV38-1

3.2 SUMMARY OF PIPE-SUPPORT REACTIONS:

The following Tables provide summary of pipe-support reactions for various loading conditions.

TABLE 3.2.1 corresponds to Thermal Expansion Effects - Inside Pipe @ 220 F and Outside Pipe @ 55 F.

TABLE 3.2.2 corresponds to Thermal Expansion Effects - Inside Pipe @ 220 F and Outside Pipe @ 220 F.

Table 3.2.3 corresponds to Live and Dead Weight Effects.

Table 3.2.4 corresponds to a combination of Table 3.2.1 and Table 3.2.3 (Thermal Expansion Case 1 + Dead and Live Weights).

Table 3.2.5 corresponds to a combination of Table 3.2.2 and Table 3.2.3 (Thermal Expansion Case 2 + Dead and Live Weights).

Table 3.2.6 corresponds to Effects due to Seismic Inertia.

Table 3.2.7 corresponds to Effects due to Seismic Inertia+ Dead and Live Weights.

Table 3.2.8 corresponds to Effects due to Seismic Wave Motion Displacements in the X Direction at Restraint Locations

Table 3.2.9 corresponds to Effects due to Seismic Wave Motion Displacements in the Y Direction at Restraint Locations

Table 3.2.10 corresponds to Effects due to Seismic Wave Motion Displacements in the Z Direction at Restraint Locations

Table 3.2.11 corresponds to Effects due to Relative Seismic Displacements in the X Direction at Restraint Locations

Table 3.2.12 corresponds to Effects due to Relative Seismic Displacements in the Y Direction at Restraint Locations

Table 3.2.13 corresponds to Effects due to Relative Seismic Displacements in the Z Direction at Restraint Locations



EBASCO SERVICES INCORPORATED  
CALCULATION CONTINUATION SHEET

SHEET 007 of 007

CLIENT: West Valley Nuclear Services Company Inc.,  
PROJECT: West Valley Demonstration Project  
SUBJECT: SLUDGE MOBILIZATION - HLW TRANSFER PIPING, 6-55-4/2-038  
CALCULATION NO.: WV38-1

3.2 SUMMARY OF PIPE-SUPPORT REACTIONS (continued)

Table 3.2.14 corresponds to the Effects due to Thermal Expansion (maximum of the two cases analyzed), and Live and Dead Weight at Restraint Locations

Table 3.2.15 corresponds to Effects due to Seismic Inertia, Seismic Wave Motion and Seismic Relative Displacements at Restraint Locations

Table 3.2.16 corresponds to Maximum Loads at Restraint Locations (Absolute sum of values from Tables 3.2.14 and 3.2.15)

4.0 CONCLUSION:

The piping system as shown on isometrics WV38-1 and analyzed per Ref. 5.1 meets the requirements of ANSI/ASME B31.3 Code.

5.0 REFERENCES:

5.1 Criteria:

- a) Letter from M Schiffhauer, West Valley Nuclear Services Co., Inc., to F J E Storey, Ebasco Services Inc., dated January 15, 1992. SOW No. 99
- b) Telefax from D Nuta/P Harrison, Ebasco Services Inc., to M Schiffhauer, date February 19, 1992
- c) Ebasco Interoffice Correspondence from W Chao to F J E Storey, dated March 3, 1992.
- 5.2 West Valley Nuclear Services Inc., Drawings for Sludge Mobilization System, HLW Transfer Piping, Drawing No. 904D-060, Sheets 1 through 5.
- 5.3 American Society of Mechanical Engineers, ASME Code for Pressure Piping, Chemical Plant and Petroleum Refinery Piping, B31.3, 1987 Edition.
- 5.4 CAESAR II, Version 3.1, COADE Engineering Software, Houston, Texas, November 1990.

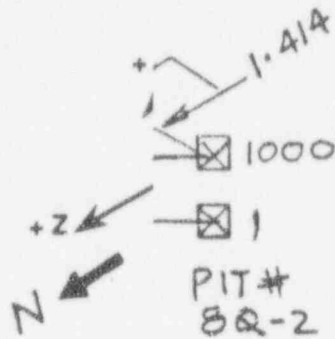
APPENDIX A  
(Piping Isometrics)

TOTAL NUMBER OF PAGES 1

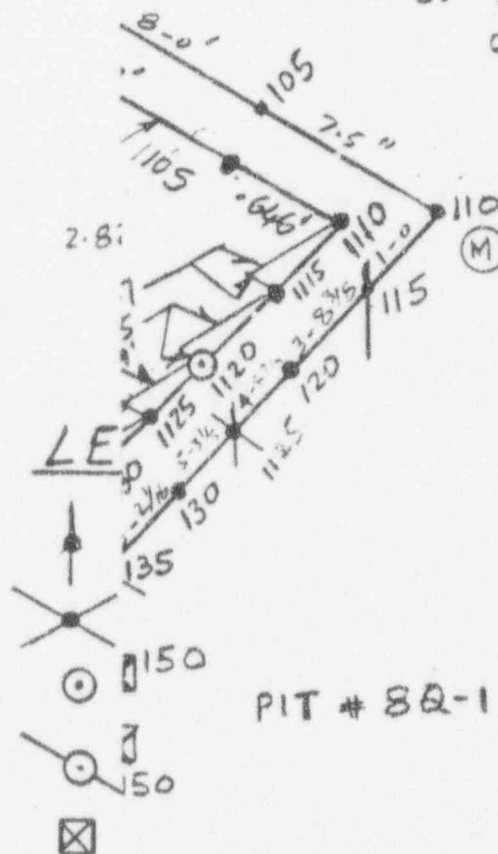
PREPARED BY: C.M. Arslan 3/21/92

CHECKED BY: Muirose R. Sanayuan 3/22/92



ISOMET  
WV4-3CALC. NO.  
WV38-1NOTES:

- 1-ALL 2" (INNER PIPE) ELBOW ARE LONG RADIUS
- 2-ALL 4" (OUTER PIPE) ELBOW ARE SHORT RADIUS. EXCEPT AT 1080 AND 1100 WHERE THEY ARE MITERS.
3. NO INSULATION ON PIPES.



CMA	3/16	REDRAWN AND REANALYZED PER NEW CRITERIA
DRAWN BY	CK'D BY	DESCRIPTION

EBASCO SERVICES INCORPORATED  
NEW YORK, N.Y.

6-55-4 -038	4.50	T VALLEY NUCLEAR SERVICES
6-55-2 -038	2.5	T VALLEY DEMONSTRATION PIPING
		TRANSFER PIPING SLUDGE MOBILIZATION
LINE NO.	PIPE O.D.	DATE: 2-29-92
		DATE: 3-18-92
		ISOMETRIC NO.
		WV4-38

APPENDIX B

(TABLES 3.1 AND 3.2.1 THRU 3.2.16)

TOTAL NUMBER OF PAGES 19

PREPARED BY: C.M. Ashad 3/21/92

CHECKED BY: Prinevas Me Sanyavaram 3/23/92

TABLE 3.1  
SUMMARY OF MAXIMUM STRESSES

LOADING CONDITION: LIVE/DEAD WEIGHT AND PRESSURE.

MAXIMUM STRESS AT NODE 60 = 2052 psi.  
Allowable Stress = 16700 psi. ( $S_h$ ) <sup>1</sup>

LOADING COMBINATION : SEISMIC INERTIA + SEISMIC WAVE MOTION +  
RELATIVE SEISMIC DISPLACEMENTS + LIVE/DEAD WEIGHT + PRESSURE

MAXIMUM STRESS AT NODE 1110 = 12984 psi  
Allowable Stress = 22211 psi ( $1.33 S_h$ ) <sup>2</sup>

LOADING CASE: THERMAL EXPANSION CASE 1 (OUTER PIPE @ 55° F AND INNER  
PIPE @ 220° F)

MAXIMUM STRESS AT NODE 110 = 10335 psi  
Allowable Stress = 25050 psi ( $S_A$ ) <sup>3</sup>

LOADING CASE: THERMAL EXPANSION CASE 2 (OUTER PIPE @ 220° F AND INNER  
PIPE @ 220° F)

MAXIMUM STRESS AT NODE 1110 = 13236 psi  
Allowable Stress = 25050 psi ( $S_A$ ) <sup>3</sup>

LEGEND:

- 1 - Based on Code Paragraph No. 302.3.5.c
- 2 - Based on Code Paragraph No. 302.3.6.a
- 3 - Based on Code Paragraph No. 302.3.5.d

$S_h$  - Material Allowable Stress @ Design Temperature for  
Material ASTM A 312-TP 316L

$S_c$  - Material Allowable Stress @ Room Temperature for  
Material ASTM A 312-TP 316L

$$S_A = (1.25S_c + 0.25S_h)$$

1 CAESAR II RESTRAINT REPORT  
CASE 4 (EXP) D4(EXP)=D1-D3

FILE:WV38-1 WVNS 6-55-4/2-038  
DATE:MAR 20,1992 THERMAL EXPANSION (55F/220F)  
TABLE 3.2.1

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1000	0.	0.	-2.	0.	-11.	0.	Rigid ANC
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	-1.	0.	1.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-3.	0.	0.	0.	Flex Z
1100	-4.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	-1.	0.	Rigid ANC
1150	6.	0.	3.	0.	-57.	0.	Rigid ANC
1	6.	0.	-10.	0.	0.	0.	Flex Y
15	0.	0.	0.	0.	0.	0.	Flex Z
15	0.	0.	-9.	0.	0.	0.	Flex +Y
35	0.	0.	0.	0.	0.	0.	Flex Y
55	0.	0.	0.	0.	0.	0.	Flex X
55	-6.	0.	6.	0.	0.	0.	Flex X
60	-8.	0.	-8.	0.	0.	0.	Flex Y
60	0.	0.	0.	0.	0.	0.	Flex X
60	-19.	0.	19.	0.	0.	0.	Flex +Y
85	0.	0.	0.	0.	0.	0.	Flex Y
100	0.	0.	0.	0.	0.	0.	Flex X
100	-86.	0.	0.	0.	0.	0.	Flex Z
100	0.	0.	-41.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
110	0.	0.	0.	0.	0.	0.	Flex +Y
115	0.	0.	0.	0.	0.	0.	Flex Y
125	0.	0.	0.	0.	0.	0.	Flex X
125	56.	0.	-56.	0.	0.	0.	Flex Y
135	0.	0.	0.	0.	0.	0.	Flex X
135	-36.	0.	36.	0.	0.	0.	Flex X
150	94.	0.	63.	0.	97.	0.	Rigid ANC

1 CAESAR II RESTRAINT REPORT  
CASE 5 (EXP) D5(EXP)=D2-D3

FILE:WV38-1 WVNS 6-55-4/2-038  
DATE:MAR 20,1992 THERMAL EXPANSION (220F/220F)  
TABLE 3.2.2

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1000	53.	0.	-160.	0.	-648.	0.	Rigid ANC
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	-145.	0.	-145.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	-260.	0.	260.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-206.	0.	0.	0.	Flex Z
1100	-45.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	0.	0.	Flex Y
1150	397.	0.	251.	0.	-265.	0.	Rigid ANC
1	5.	0.	-14.	0.	-65.	0.	Rigid ANC
15	0.	0.	0.	0.	0.	0.	Flex Y
15	0.	0.	-2.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	0.	0.	0.	0.	0.	Flex Y
55	-1.	0.	1.	0.	0.	0.	Flex X
60	-13.	0.	-13.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	-24.	0.	24.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	-7.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	-19.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	3.	0.	-3.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
135	-5.	0.	5.	0.	0.	0.	Flex X
150	42.	0.	22.	0.	-38.	0.	Rigid ANC

1 CAESAR II RESTRAINT REPORT  
CASE 3 (SUS) W+P1

FILE:WV38-1  
DATE:MAR 19,1992  
TABLE 3.2.3

WVNS 6-55-4/2-038  
WV38WT

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1000	0.	-105.	0.	92.	0.	198.	Rigid ANC
1030	0.	-154.	0.	0.	0.	0.	Flex Y
1050	0.	-119.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	-172.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1070	0.	-81.	0.	0.	0.	0.	Flex Y
1090	0.	-124.	0.	0.	0.	0.	Flex Y
1100	0.	-212.	0.	0.	0.	0.	Flex Z
1100	0.	0.	0.	0.	0.	0.	Flex X
1100	0.	0.	0.	0.	0.	0.	Flex Y
1120	0.	-220.	0.	0.	0.	0.	Flex Y
1130	0.	-129.	0.	0.	0.	82.	Rigid ANC
1150	0.	-81.	0.	20.	0.	37.	Rigid ANC
1	0.	-14.	0.	0.	0.	0.	Flex Y
15	0.	-35.	0.	0.	0.	0.	Flex Z
15	0.	0.	0.	0.	0.	0.	Flex +Y
35	0.	-57.	0.	0.	0.	0.	Flex Y
55	0.	-25.	0.	0.	0.	0.	Flex X
55	0.	0.	0.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	0.	-67.	0.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex +Y
85	0.	-63.	0.	0.	0.	0.	Flex Y
100	0.	-65.	0.	0.	0.	0.	Flex X
100	0.	0.	0.	0.	0.	0.	Flex Z
100	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
110	0.	0.	0.	0.	0.	0.	Flex +Y
115	0.	-47.	0.	0.	0.	0.	Flex Y
125	0.	-53.	0.	0.	0.	0.	Flex X
125	0.	0.	0.	0.	0.	0.	Flex Y
135	0.	-35.	0.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	21.	Rigid ANC
150	0.	-19.	0.	4.	0.		

1 CAESAR II RESTRAINT REPORT  
CASE 1 (OPE) W+T1+P1

FILE:WV38-1

WVNS 6-55-4/2-038

DATE:MAR 19,1992 THERMAL (55F/220F) + WEIGHT

TABLE 3.2.4

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1000	0.	-105.	-2.	92.	-11.	198.	Rigid ANC
1030	0.	-154.	0.	0.	0.	0.	Flex Y
1050	0.	-119.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	-172.	0.	0.	0.	0.	Flex Y
1060	-1.	0.	1.	0.	0.	0.	Flex X
1070	0.	-81.	0.	0.	0.	0.	Flex Y
1090	0.	-124.	0.	0.	0.	0.	Flex Y
1100	0.	-212.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-3.	0.	0.	0.	Flex Z
1100	-4.	0.	0.	0.	0.	0.	Flex X
1120	0.	-220.	0.	0.	0.	0.	Flex Y
1130	0.	-129.	0.	0.	0.	0.	Flex Y
1150	6.	-81.	3.	0.	-1.	82.	Rigid ANC
1	6.	-14.	-10.	20.	-57.	37.	Rigid ANC
15	0.	-35.	0.	0.	0.	0.	Flex Y
15	0.	0.	-9.	0.	0.	0.	Flex Z
35	0.	-57.	0.	0.	0.	0.	Flex +Y
55	0.	-25.	0.	0.	0.	0.	Flex Y
55	-6.	0.	6.	0.	0.	0.	Flex X
60	-8.	0.	-8.	0.	0.	0.	Flex X
60	0.	-67.	0.	0.	0.	0.	Flex Y
60	-19.	0.	19.	0.	0.	0.	Flex X
85	0.	-63.	0.	0.	0.	0.	Flex +Y
100	0.	-65.	0.	0.	0.	0.	Flex Y
100	-86.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	-41.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	-47.	0.	0.	0.	0.	Flex +Y
125	0.	-53.	0.	0.	0.	0.	Flex Y
125	56.	0.	-56.	0.	0.	0.	Flex X
135	0.	-35.	0.	0.	0.	0.	Flex Y
135	-36.	0.	36.	0.	0.	0.	Flex X
150	94.	-19.	63.	4.	97.	21.	Rigid ANC



1 CAESAR II RESTRAINT REPORT  
CASE 2 (OPE) W+T2+P1

FILE:WV38-1 WVNS 6-55-4/2-038  
DATE:MAR 19,1992 THERMAL (220F/220F) + WEIGHT  
TABLE 3.2.5

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1000	53.	-105.	-160.	92.	-648.	198.	Rigid ANC
1030	0.	-154.	0.	0.	0.	0.	Flex Y
1050	0.	-119.	0.	0.	0.	0.	Flex Y
1060	-145.	0.	-145.	0.	0.	0.	Flex X
1060	0.	-172.	0.	0.	0.	0.	Flex Y
1060	-260.	0.	260.	0.	0.	0.	Flex X
1070	0.	-81.	0.	0.	0.	0.	Flex Y
1090	0.	-124.	0.	0.	0.	0.	Flex Y
1100	0.	-212.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-206.	0.	0.	0.	Flex Z
1100	-45.	0.	0.	0.	0.	0.	Flex X
1120	0.	-220.	0.	0.	0.	0.	Flex Y
1130	0.	-129.	0.	0.	0.	0.	Flex Y
1150	397.	-81.	251.	0.	-265.	82.	Rigid ANC
1	5.	-14.	-14.	20.	-65.	37.	Rigid ANC
15	0.	-35.	0.	0.	0.	0.	Flex Y
15	0.	0.	-2.	0.	0.	0.	Flex Z
35	0.	-57.	0.	0.	0.	0.	Flex +Y
55	0.	-25.	0.	0.	0.	0.	Flex Y
55	-1.	0.	1.	0.	0.	0.	Flex X
60	-13.	0.	-13.	0.	0.	0.	Flex X
60	0.	-67.	0.	0.	0.	0.	Flex Y
60	-24.	0.	24.	0.	0.	0.	Flex X
85	0.	-63.	0.	0.	0.	0.	Flex +Y
100	0.	-65.	0.	0.	0.	0.	Flex Y
100	-7.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	-19.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	-47.	0.	0.	0.	0.	Flex +Y
125	0.	-53.	0.	0.	0.	0.	Flex Y
125	3.	0.	-3.	0.	0.	0.	Flex X
135	0.	-35.	0.	0.	0.	0.	Flex Y
135	-5.	0.	5.	0.	0.	0.	Flex X
150	42.	-19.	22.	4.	-38.	21.	Rigid ANC



CAESAR II SUPPORT REACTIONS  
(OCC) Shock Case # 1

FILE:WV38-1

WVNS 6-55-4/2-038

DATE:MAR 20,1992

SEISMIC INERTIA ANALYSIS

TABLE 3.2.6

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			
TOTALS....FX	FY	FZ	MX	MY	MZ		
MODAL MAX.FX/Mode	FY/Mode	FZ/Mode	MX/Mode	MY/Mode	MZ/Mode		
1000	9	4	24	5	57	14	Rigid ANC
	5	4	17	4	42	13	
	4 Z(1)	5 Y(1)	4 Z(1)	5 Y(1)	4 Z(1)	5 Y(1)	
1030	0	5	0	0	0	0	Flex Y
		3					
		5 Y(1)					
1050	0	9	0	0	0	0	Flex Y
		4					
		12 Y(1)					
1060	10	0	10	0	0	0	Flex X
	5		5				
	11 Z(1)		11 Z(1)				
1060	0	6	0	0	0	0	Flex Y
		5					
		2 Y(1)					
1060	11	0	11	0	0	0	Flex X
	7		7				
	4 Z(1)		4 Z(1)				
1070	0	2	0	0	0	0	Flex Y
		1					
		6 Y(1)					
1090	0	8	0	0	0	0	Flex Y
		6					
		6 Y(1)					
1100	0	7	0	0	0	0	Flex Y
		7					
		6 Y(1)					
1100	0	0	24	0	0	0	Flex Z
			18				
		1 Z(1)					
1100	104	0	0	0	0	0	Flex X
	77						
	1 Z(1)						
1120	0	19	0	0	0	0	Flex Y
		14					
		6 Y(1)					
1130	0	16	0	0	0	0	Flex Y
		11					
		13 Y(1)					

CAESAR II SUPPORT REACTIONS  
(OCC) Shock Case # 1

FILE:WV38-1  
DATE:MAR 20,1992  
TABLE 3.2.6

WVNS 6-55-4/2-038  
SEISMIC INERTIA ANALYSIS

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			
	FX	FY	FZ	MX	MY	MZ	
TOTALS....	FX	FY	FZ	MX	MY	MZ	
MODAL MAX.FX/Mode	FY/Mode	FZ/Mode	MX/Mode	MY/Mode	MZ/Mode		
1150	30	3	102	5	290	5	Rigid ANC
	20	2	76	4	218	4	
	1 Z(1)	13 Y(1)	1 Z(1)	6 Y(1)	1 Z(1)	13 Y(1)	
1	4	0	2	1	11	3	Rigid ANC
	2		1		8	3	
	19 X(1)	5	19 X(1)	12	4 Z(1)	5 Y(1)	
15	0	6	0	0	0	0	Flex Y
		6					
		5 Y(1)					
15	0	0	14	0	0	0	Flex Z
			11				
			4 Z(1)				
35	0	6	0	0	0	0	Flex +Y
		3					
		12 Y(1)					
55	0	8	0	0	0	0	Flex Y
		3					
		12 Y(1)					
55	6	0	6	0	0	0	Flex X
	3		3				
	4 Z(1)		4 Z(1)				
60	8	0	8	0	0	0	Flex X
	5		5				
	11 Z(1)		11 Z(1)				
60	0	8	0	0	0	0	Flex Y
		8					
		2 Y(1)					
60	7	0	7	0	0	0	Flex X
	3		3				
	3 Z(1)		3 Z(1)				
85	0	6	0	0	0	0	Flex +Y
		3					
		8 Y(1)					
100	0	2	0	0	0	0	Flex Y
		1					
		8 Y(1)					
100	19	0	0	0	0	0	Flex X
	11						
	1 Z(1)						

CAESAR II SUPPORT REACTIONS  
(OCC) Shock Case # 1

FILE:WV38-1

WVNS 6-55-4/2-038

DATE:MAR 20,1992

SEISMIC INERTIA ANALYSIS

TABLE 3.2.6

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			
TOTALS....FX	FY	FZ	MX	MY	MZ		
MODAL MAX.FX/Mode	FY/Mode	FZ/Mode	MX/Mode	MY/Mode	MZ/Mode		
100	0	0	5	0	0	0	Flex Z
			2				
		1 Z(1)					
110	0	0	0	0	0	0	Flex X w/gap
110	0	0	0	0	0	0	Flex Z w/gap
115	0	6	0	0	0	0	Flex +Y
		5					
	6 Y(1)						
125	0	11	0	0	0	0	Flex Y
		9					
	11 Y(1)						
125	11	0	11	0	0	0	Flex X
	8		8				
	1 Z(1)		1 Z(1)				
135	0	11	0	0	0	0	Flex Y
		9					
	13 Y(1)						
135	6	0	6	0	0	0	Flex X
	4		4				
	1 Z(1)		1 Z(1)				
150	12	1	16	2	41	0	Rigid ANC
	9		10	1	29		
	20 Z(1)	13	1 Z(1)	13 Y(1)	1 Z(1)	21	

CAESAR II SUPPORT REACTIONS  
(OCC)Combination # 1

FILE:WV38-1  
DATE:MAR 19,1992  
TABLE 3.2.7

WVNS 6-55-4/2-038  
WV38SW

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			
	FX	FY	FZ	MX	MY	MZ	
1000	9	110	24	97	57	212	Rigid ANC
1030	0	159	0	0	0	0	Flex Y
1050	0	128	0	0	0	0	Flex Y
1060	10	0	10	0	0	0	Flex X
1060	0	178	0	0	0	0	Flex Y
1060	11	0	11	0	0	0	Flex X
1070	0	83	0	0	0	0	Flex Y
1090	0	132	0	0	0	0	Flex Y
1100	0	219	0	0	0	0	Flex Y
1100	0	0	24	0	0	0	Flex Z
1100	104	0	0	0	0	0	Flex X
1120	0	239	0	0	0	0	Flex Y
1130	0	145	0	0	0	0	Flex Y
1150	30	84	102	5	290	88	Rigid ANC
1	4	14	2	20	11	40	Rigid ANC
15	0	42	0	0	0	0	Flex Y
15	0	0	14	0	0	0	Flex Z
35	0	63	0	0	0	0	Flex +Y
55	0	33	0	0	0	0	Flex Y
55	6	0	6	0	0	0	Flex X
60	8	0	8	0	0	0	Flex X
60	0	75	0	0	0	0	Flex Y
60	7	0	7	0	0	0	Flex X
85	0	69	0	0	0	0	Flex +Y
100	0	67	0	0	0	0	Flex Y
100	19	0	0	0	0	0	Flex X
100	0	0	5	0	0	0	Flex Z
110	0	0	0	0	0	0	Flex X w/gap
110	0	0	0	0	0	0	Flex Z w/gap
110	0	0	0	0	0	0	Flex +Y
115	0	53	0	0	0	0	Flex Y
125	0	64	0	0	0	0	Flex X
125	11	0	11	0	0	0	Flex Y
135	0	46	0	0	0	0	Flex X
135	6	0	6	0	0	0	Flex Y
150	12	19	16	5	41	21	Rigid ANC

1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38WX WVNS 6-55-4/2-038  
DATE:MAR 19,1992 X - SEISMIC WAVE MOTION  
TABLE 3.2.8

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	-7.	0.	-7.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	-7.	0.	7.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Z
1100	4.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	0.	0.	Flex Y
1	0.	0.	0.	0.	-5.	0.	Rigid ANC
15	0.	0.	0.	0.	0.	0.	Flex Y
15	0.	0.	0.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	0.	0.	0.	0.	0.	Flex Y
55	0.	0.	0.	0.	0.	0.	Flex X
60	-1.	0.	-1.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	-1.	0.	1.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	0.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	0.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	0.	0.	0.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
135	0.	0.	0.	0.	0.	0.	Flex X
150	1.	0.	0.	0.	-3.	0.	Rigid ANC
1000	-1.	0.	-5.	0.	-50.	0.	Displ. Reaction
10600	-14.	0.	0.	0.	0.	0.	Displ. Reaction
11000	4.	0.	0.	0.	0.	0.	Displ. Reaction
1150	11.	0.	5.	0.	-25.	0.	Displ. Reaction

1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38WY WVNS 6-55-4/2-038  
DATE:MAR 19,1992 Y-SEISMIC WAVE MOTION  
TABLE 3.2.9

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	5.	0.	0.	0.	0.	Flex Y
1050	0.	5.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	-9.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1070	0.	2.	0.	0.	0.	0.	Flex Y
1090	0.	1.	0.	0.	0.	0.	Flex Y
1100	0.	1.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Z
1100	0.	0.	0.	0.	0.	0.	Flex X
1120	0.	3.	0.	0.	0.	0.	Flex Y
1130	0.	-10.	0.	0.	0.	0.	Flex Y
1	0.	-1.	0.	2.	0.	4.	Rigid ANC
15	0.	1.	0.	0.	0.	0.	Flex Y
15	0.	0.	0.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	1.	0.	0.	0.	0.	Flex Y
55	0.	0.	0.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex X
60	0.	-1.	0.	0.	0.	0.	Flex Y
60	0.	0.	0.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	0.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	0.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	0.	0.	0.	0.	0.	0.	Flex X
135	0.	-1.	0.	0.	0.	0.	Flex Y
135	0.	0.	0.	0.	0.	0.	Flex X
150	0.	1.	0.	2.	0.	-4.	Rigid ANC
1000	0.	-4.	0.	16.	0.	37.	Displ. Reaction
10300	0.	5.	0.	0.	0.	0.	Displ. Reaction
10500	0.	5.	0.	0.	0.	0.	Displ. Reaction
10600	0.	-9.	0.	0.	0.	0.	Displ. Reaction
10700	0.	2.	0.	0.	0.	0.	Displ. Reaction
10900	0.	1.	0.	0.	0.	0.	Displ. Reaction
11000	0.	1.	0.	0.	0.	0.	Displ. Reaction
11200	0.	3.	0.	0.	0.	0.	Displ. Reaction
11300	0.	-10.	0.	0.	0.	0.	Displ. Reaction
1150	0.	8.	0.	22.	0.	-39.	Displ. Reaction

1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38WZ

WVNS 6-55-4/2-038

DATE:MAR 19,1992

Z-SEISMIC WAVE MOTION

TABLE 3.2.10

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-1.	0.	0.	0.	Flex Z
1100	0.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	0.	0.	Flex Y
1	0.	0.	0.	0.	-3.	0.	Rigid ANC
15	0.	0.	0.	0.	0.	0.	Flex Y
15	0.	0.	0.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	0.	0.	0.	0.	0.	Flex Y
55	0.	0.	0.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	0.	0.	0.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	0.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	0.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	0.	0.	0.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
135	0.	0.	0.	0.	0.	0.	Flex X
150	0.	0.	0.	0.	2.	0.	Rigid ANC
1000	-3.	0.	-1.	0.	-29.	0.	Displ. Reaction
10600	0.	0.	-1.	0.	0.	0.	Displ. Reaction
11000	0.	0.	-1.	0.	0.	0.	Displ. Reaction
1150	3.	0.	2.	0.	16.	0.	Displ. Reaction



1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38RX WVNS 6-55-4/2-038  
DATE:MAR 19,1992 X - RESLATIVE SEISMIC DISPL.  
TABLE 3.2.11

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	31.	0.	31.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	85.	0.	-85.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-57.	0.	0.	0.	Flex Z
1100	-163.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	0.	0.	Flex Y
1	-2.	0.	6.	0.	21.	0.	Rigid ANC
15	0.	0.	0.	0.	0.	0.	Flex Y
15	0.	0.	1.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	0.	0.	0.	0.	0.	Flex Y
55	1.	0.	-1.	0.	0.	0.	Flex X
60	2.	0.	2.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	7.	0.	-7.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	-16.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	-6.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	1.	0.	-1.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
135	-1.	0.	1.	0.	0.	0.	Flex X
150	8.	0.	3.	0.	-19.	0.	Rigid ANC
1000	-23.	0.	72.	0.	209.	0.	Displ. Reaction
1150	71.	0.	39.	0.	-158.	0.	Displ. Reaction



1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38RY WVNS 6-55-4/2-038  
DATE:MAR 19,1992 Y - RELATIVE SEISMIC DISPL.  
TABLE 3.2.12

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	220.	0.	0.	0.	0.	Flex Y
1050	0.	-175.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	83.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1070	0.	-40.	0.	0.	0.	0.	Flex Y
1090	0.	24.	0.	0.	0.	0.	Flex Y
1100	0.	-19.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Z
1100	0.	0.	0.	0.	0.	0.	Flex X
1120	0.	116.	0.	0.	0.	0.	Flex Y
1130	0.	-353.	0.	0.	0.	0.	Flex Y
1	0.	-21.	0.	40.	0.	60.	Rigid ANC
15	0.	20.	0.	0.	0.	0.	Flex Y
15	0.	0.	0.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	1.	0.	0.	0.	0.	Flex Y
55	0.	0.	0.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex X
60	0.	1.	0.	0.	0.	0.	Flex Y
60	0.	0.	0.	0.	0.	0.	Flex X
85	0.	-3.	0.	0.	0.	0.	Flex +Y
100	0.	4.	0.	0.	0.	0.	Flex Y
100	0.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	0.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	0.	0.	0.	0.	0.	0.	Flex X
135	0.	-33.	0.	0.	0.	0.	Flex Y
135	0.	0.	0.	0.	0.	0.	Flex X
150	0.	31.	0.	45.	0.	-94.	Rigid ANC
1000	0.	-104.	0.	322.	0.	638.	Displ. Reaction
1150	0.	249.	0.	479.	0.	-909.	Displ. Reaction

1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38RZ WVNS 6-55-4/2-038  
DATE:MAR 19,1992 Z - RELATIVE SEISMIC DISPL.  
TABLE 3.2.13

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	195.	0.	195.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	-6.	0.	6.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-406.	0.	0.	0.	Flex Z
1100	-538.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	0.	0.	Flex Y
1	-2.	0.	-6.	0.	-61.	0.	Rigid ANC
15	0.	0.	0.	0.	0.	0.	Flex Y
15	0.	0.	-2.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	0.	0.	0.	0.	0.	Flex Y
55	-1.	0.	1.	0.	0.	0.	Flex X
60	19.	0.	19.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	0.	0.	0.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	-53.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	-38.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	2.	0.	-2.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
135	-3.	0.	3.	0.	0.	0.	Flex X
150	39.	0.	25.	0.	-7.	0.	Rigid ANC
1000	-27.	0.	-68.	0.	-613.	0.	Displ. Reaction
1150	376.	0.	274.	0.	13.	0.	Displ. Reaction

MAXIMUM OF THERMAL + WEIGHT LOADS ON SUPPORTS (LINE No. 6-55-4/2-038)

NODE No.	FX (lbs)	FY (lbs)	FZ (lbs)	MX (ft-lbs)	MY (ft-lbs)	MZ (ft-lbs)
1000	53.00	-105.00	-160.00	92.00	-648.00	198.00
1030	0.00	-154.00	0.00	0.00	0.00	0.00
1050	0.00	-119.00	0.00	0.00	0.00	0.00
1060	-145.00	0.00	-145.00	0.00	0.00	0.00
1060	0.00	-172.00	0.00	0.00	0.00	0.00
1060	-260.00	0.00	260.00	0.00	0.00	0.00
1070	0.00	-81.00	0.00	0.00	0.00	0.00
1090	0.00	-124.00	0.00	0.00	0.00	0.00
1100	0.00	-212.00	0.00	0.00	0.00	0.00
1100	0.00	0.00	-206.00	0.00	0.00	0.00
1100	-45.00	0.00	0.00	0.00	0.00	0.00
1120	0.00	-220.00	0.00	0.00	0.00	0.00
1130	0.00	-129.00	0.00	0.00	0.00	0.00
1150	397.00	-81.00	251.00	0.00	-265.00	82.00
1	6.00	-14.00	-14.00	20.00	-65.00	37.00
15	0.00	-35.00	0.00	0.00	0.00	0.00
15	0.00	0.00	-9.00	0.00	0.00	0.00
35	0.00	-57.00	0.00	0.00	0.00	0.00
55	0.00	-25.00	0.00	0.00	0.00	0.00
55	-6.00	0.00	6.00	0.00	0.00	0.00
60	-13.00	0.00	-13.00	0.00	0.00	0.00
60	0.00	-67.00	0.00	0.00	0.00	0.00
60	-24.00	0.00	24.00	0.00	0.00	0.00
85	0.00	-63.00	0.00	0.00	0.00	0.00
100	0.00	-65.00	0.00	0.00	0.00	0.00
100	-86.00	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	-41.00	0.00	0.00	0.00
110	0.00	0.00	0.00	0.00	0.00	0.00
110	0.00	0.00	0.00	0.00	0.00	0.00
115	0.00	-47.00	0.00	0.00	0.00	0.00
125	0.00	-53.00	0.00	0.00	0.00	0.00
125	56.00	0.00	-56.00	0.00	0.00	0.00
135	0.00	-35.00	0.00	0.00	0.00	0.00
135	-36.00	0.00	36.00	0.00	0.00	0.00
150	94.00	-19.00	63.00	4.00	97.00	21.00

TABLE No. 3.2.14

SEISMIC LOADS ON SUPPORTS (LINE No. 6-55-4/2-038)

NODE No.	FX (lbs)	FY (lbs)	FZ (lbs)	MX (ft-lbs)	MY (ft-lbs)	MZ (ft-lbs)
1000	47.63	113.00	128.13	343.00	762.45	689.00
1030	0.00	230.00	0.00	0.00	0.00	0.00
1050	0.00	189.00	0.00	0.00	0.00	0.00
1060	214.45	0.00	214.45	0.00	0.00	0.00
1060	0.00	98.00	0.00	0.00	0.00	0.00
1060	103.21	0.00	103.21	0.00	0.00	0.00
1070	0.00	44.00	0.00	0.00	0.00	0.00
1090	0.00	33.00	0.00	0.00	0.00	0.00
1100	0.00	27.00	0.00	0.00	0.00	0.00
1100	0.00	0.00	434.98	0.00	0.00	0.00
1100	670.15	0.00	0.00	0.00	0.00	0.00
1120	0.00	138.00	0.00	0.00	0.00	0.00
1130	0.00	379.20	0.00	0.00	0.00	0.00
1150	424.05	260.00	384.15	506.00	478.22	954.00
1	6.83	22.00	10.49	42.00	81.34	67.00
15	0.00	28.00	0.00	0.00	0.00	0.00
15	0.00	0.00	16.24	0.00	0.00	0.00
35	0.00	6.00	0.00	0.00	0.00	0.00
55	0.00	10.00	0.00	0.00	0.00	0.00
55	7.41	0.00	7.41	0.00	0.00	0.00
60	28.10	0.00	28.10	0.00	0.00	0.00
60	0.00	10.00	0.00	0.00	0.00	0.00
60	15.00	0.00	15.00	0.00	0.00	0.00
85	0.00	9.00	0.00	0.00	0.00	0.00
100	0.00	6.00	0.00	0.00	0.00	0.00
100	74.36	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	43.47	0.00	0.00	0.00
110	0.00	0.00	0.00	0.00	0.00	0.00
110	0.00	0.00	0.00	0.00	0.00	0.00
115	0.00	6.00	0.00	0.00	0.00	0.00
125	0.00	11.00	0.00	0.00	0.00	0.00
125	13.24	0.00	13.24	0.00	0.00	0.00
135	0.00	45.00	0.00	0.00	0.00	0.00
135	9.16	0.00	9.16	0.00	0.00	0.00
150	52.81	32.00	41.18	48.00	64.85	98.00
10300	0.00	5.00	0.00	0.00	0.00	0.00
10500	0.00	5.00	0.00	0.00	0.00	0.00
10600	14.00	9.00	1.00	0.00	0.00	0.00
10700	0.00	2.00	0.00	0.00	0.00	0.00
10900	0.00	1.00	0.00	0.00	0.00	0.00
11000	4.00	1.00	1.00	0.00	0.00	0.00
11200	0.00	3.00	0.00	0.00	0.00	0.00
11300	0.00	10.00	0.00	0.00	0.00	0.00

TABLE No. 3.2.15

MAXIMUM LOADS ON SUPPORTS (LINE No. 6-55-4/2-038)

NODE No.	FX (lbs)	FY (lbs)	FZ (lbs)	MX (ft-lbs)	MY (ft-lbs)	MZ (ft-lbs)
1000	100.63	218.00	288.13	435.00	1410.45	887.00
1030	0.00	384.00	0.00	0.00	0.00	0.00
1050	0.00	308.00	0.00	0.00	0.00	0.00
1060	359.45	0.00	359.45	0.00	0.00	0.00
1060	0.00	270.00	0.00	0.00	0.00	0.00
1060	363.21	0.00	363.21	0.00	0.00	0.00
1070	0.00	125.00	0.00	0.00	0.00	0.00
1090	0.00	157.00	0.00	0.00	0.00	0.00
1100	0.00	239.00	0.00	0.00	0.00	0.00
1100	0.00	0.00	640.98	0.00	0.00	0.00
1100	715.15	0.00	0.00	0.00	0.00	0.00
1120	0.00	358.00	0.00	0.00	0.00	0.00
1130	0.00	508.00	0.00	0.00	0.00	0.00
1150	821.05	341.00	635.15	506.00	743.22	1036.00
1	12.83	36.00	24.49	62.00	146.34	104.00
15	0.00	63.00	0.00	0.00	0.00	0.00
15	0.00	0.00	25.24	0.00	0.00	0.00
35	0.00	63.00	0.00	0.00	0.00	0.00
55	0.00	35.00	0.00	0.00	0.00	0.00
55	13.41	0.00	13.41	0.00	0.00	0.00
60	41.10	0.00	41.10	0.00	0.00	0.00
60	0.00	77.00	0.00	0.00	0.00	0.00
60	39.00	0.00	39.00	0.00	0.00	0.00
85	0.00	72.00	0.00	0.00	0.00	0.00
100	0.00	71.00	0.00	0.00	0.00	0.00
100	160.36	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	84.47	0.00	0.00	0.00
110	0.00	0.00	0.00	0.00	0.00	0.00
110	0.00	0.00	0.00	0.00	0.00	0.00
115	0.00	53.00	0.00	0.00	0.00	0.00
125	0.00	64.00	0.00	0.00	0.00	0.00
125	69.24	0.00	69.24	0.00	0.00	0.00
135	0.00	80.00	0.00	0.00	0.00	0.00
135	45.16	0.00	45.16	0.00	0.00	0.00
150	146.81	51.00	104.18	52.00	161.85	119.00
10300	0.00	5.00	0.00	0.00	0.00	0.00
10500	0.00	5.00	0.00	0.00	0.00	0.00
10600	14.00	9.00	1.00	0.00	0.00	0.00
10700	0.00	2.00	0.00	0.00	0.00	0.00
10900	0.00	1.00	0.00	0.00	0.00	0.00
11000	4.00	1.00	1.00	0.00	0.00	0.00
11200	0.00	3.00	0.00	0.00	0.00	0.00
11300	0.00	10.00	0.00	0.00	0.00	0.00

TABLE No. 3.2.16

APPENDIX C

(Miscellaneous Calculations)

TOTAL NUMBER OF PAGES 12

PREPARED BY: C.M. A. S. C. 3/21/92

CHECKED BY: *Travis R. Langston* 3/23/92



EBASCO SERVICES INCORPORATED

BY CMA DATE 3-21-92 SHEET 1 OF 2  
 CHKD. BY SM DATE 3-23-92 OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_  
 CLIENT WEST VALLEY NUCLEAR SERVICES  
 PROJECT WEST VALLEY DEMONSTRATION PLANT  
 SUBJECT HLW TRANSFER PIPING - 6-55-4/2-038 CALC. WV 38-1

VERIFICATION OF STRESS CRITERIA

1. WEIGHT + PRESSURE

MAX. STRESS AT NODE 60 = 2,052 PSI  
 ALLOWABLE (SL) = 16,700 PSI  
 2,052 < 16,700

OK

2. THERMAL EXPANSION

a. INNER PIPE AT 220°F AND OUTER PIPE AT 55°F  
 MAX. AXIAL STRESS AT NODE 105 = 106 PSI  
 MAX. STRESS AT NODE 110 = 10,335 PSI  
 ALLOWABLE (SA) = 25,050 PSI

10,335 < 25,050

OK

b. INNER PIPE AT 220°F AND OUTER PIPE AT 220°F

MAX. STRESS AT NODE 1110 = 13,236 PSI  
 ALLOWABLE (SA) = 25,050 PSI

13,236 < 25,050

OK

3. WEIGHT + PRESSURE + SEISMIC EFFECTS

SEISMIC EFFECT = INERTIA + WAVE MOTION + RELATIVE DISPL.

MAX. AT NODE 1110 =  $1408 + \sqrt{472^2 + 18^2 + 135^2} + \sqrt{2228^2 + 670^2 + 9493^2}$   
 = 1408 + 491 + 9774 = 11,673

MAX. AT NODE 1110 = WEIGHT + PRESS. + SEISMIC EFFECT  
 = 1311 + 11,673 = 12,984 PSI  
 ALLOWABLE (1.33 SL) = 22,111 PSI

12,984 < 22,111

OK

# EBASCO SERVICES INCORPORATED

BY CMA DATE 2-29-92

SHEET 2 OF 2  
DEPT. NO.

CHKD. BY IM DATE 3-23-92

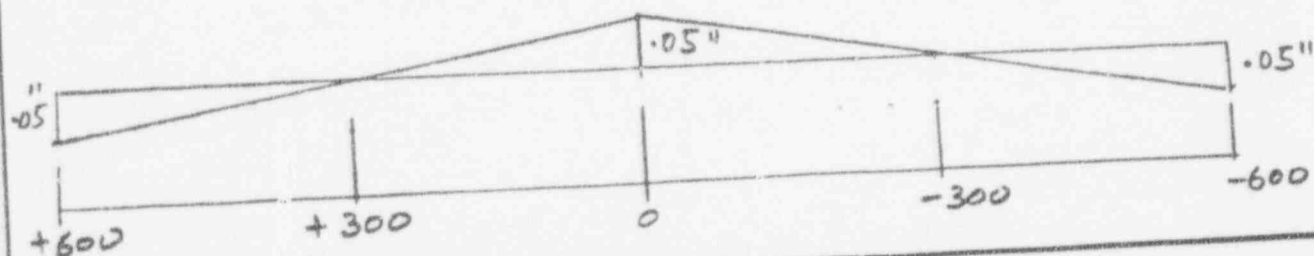
OFS NO.

CLIENT WEST VALLEY NUCLEAR SERVICES

PROJECT WEST VALLEY DEMONSTRATION PROJECT

SUBJECT SEISM

NODE POINT	FUNCTION OF SUPPORT	NODAL CO-ORDINATE			SEISMIC WAVE MOTION DISPLACEMENT		
		X IN	Y IN	Z IN	$\Delta X$ IN	$\Delta Y$ IN	$\Delta Z$ IN
1	ANCHOR	0	0	0	.050	.050	.050
1000	ANCHOR	0	0	0	.05	.050	.050
1030	Y	-105.2	0	78.2	.031	.033	.033
1050	Y	-98.8	0	136	.027	.034	.034
1060	X, Y, Z	-20.2	0	215.2	.014	.047	.047
1070	Y	45.3	0	280.7	.003	.042	.042
1090	Y	100.2	0	314.5	-.002	.033	.033
1100	X, Y, Z	220.2	0	314.5	-.002	.013	.013
1120	Y	363.8	0	354.4	-.009	-.011	-.011
1130	Y	448.2	0	438.9	-.023	-.025	-.025
1150	ANCHOR	525	0	494	-.032	-.038	-.038
150	ANCHOR	0	0				





EBASCO SERVICES INCORPORATED

BY SLB DATE 2-12-92

SHEET 1 OF 10

CHKD. BY KKT DATE 3/20/92

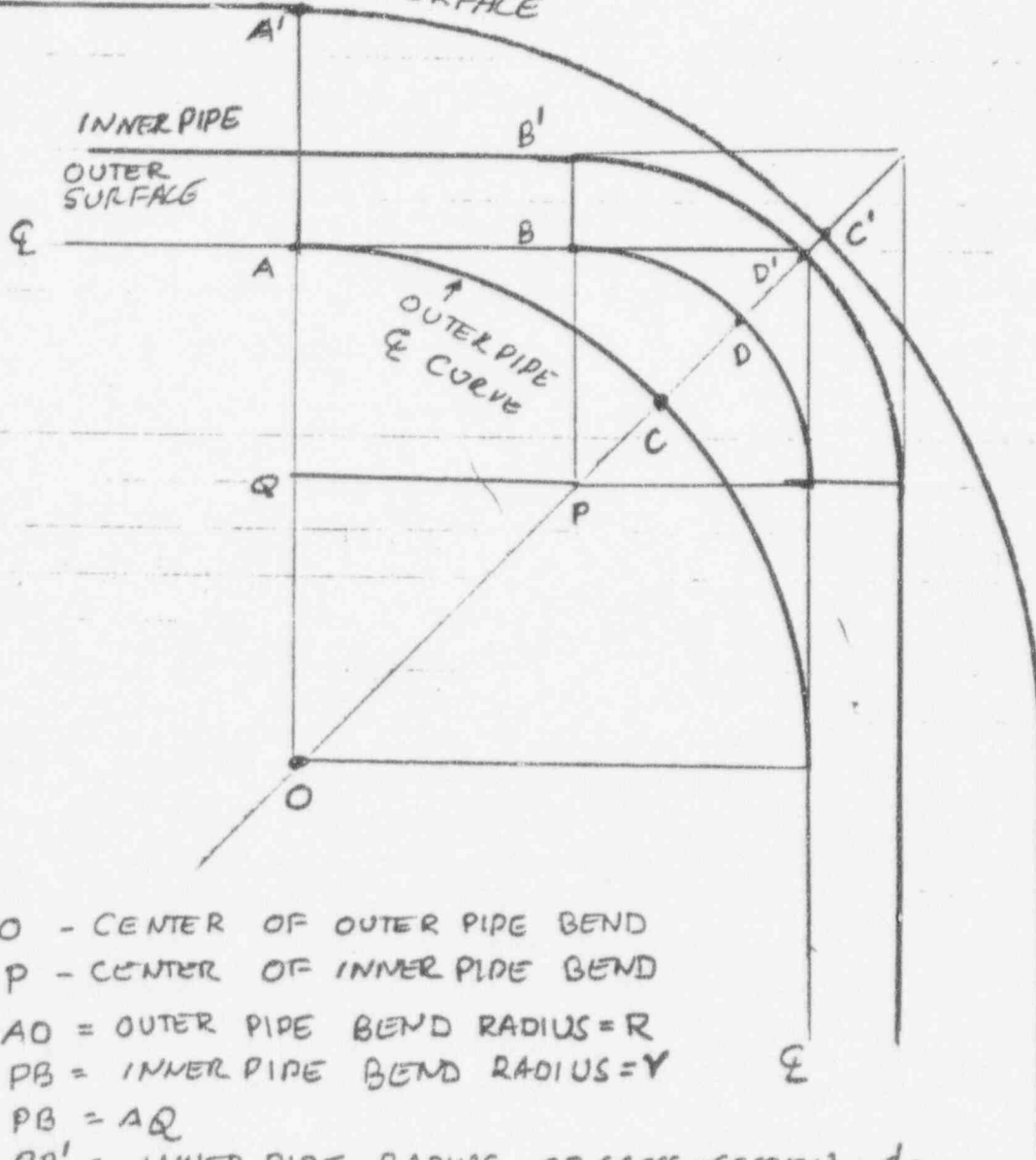
OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT WVNS

PROJECT \_\_\_\_\_

SUBJECT SLUDGE PIPE - GAPS AT BENDS

OUTER PIPE 'INNER SURFACE



O - CENTER OF OUTER PIPE BEND

P - CENTER OF INNER PIPE BEND

AO = OUTER PIPE BEND RADIUS = R

PB = INNER PIPE BEND RADIUS = Y

PB = AQ

PB' = INNER PIPE RADIUS OF CROSS-SECTION =  $\frac{d_o}{2}$

OA' = OUTER PIPE INNER RADIUS OF CROSS-SECTION =  $\frac{D_o - 2T}{2}$

$d_o$  = INNER PIPE OD

$D_o$  = OUTER PIPE OD T = OUTER PIPE WALL THK.

OR = PQ = R - Y

OP =  $1.414(R - Y)$

OC' =  $R + \frac{D_o - 2T}{2}$

PD' =  $Y + \frac{d_o}{2}$

OD' =  $Y + \frac{d_o}{2} + 1.414(R - Y)$

GAP = OC' - OD'

EBASCO SERVICES INCORPORATED

BY SM DATE 2-12-92  
CHKD. BY KKT DATE 3/20/92

SHEET 2 OF 10  
DEPT. \_\_\_\_\_  
NO. \_\_\_\_\_

OFS NO. \_\_\_\_\_

CLIENT WVNS

PROJECT \_\_\_\_\_

SUBJECT SLUDGE PIPING - GAPS AT BENDS

CASE 1  $90^\circ$

6" LONG RADIUS 3" LONG RADIUS  
 $R = 9"$   $\gamma = 4.5"$   $D_o = 6.625"$   $T = 0.432"$   
 $d_o = 3.5"$

$$OC' = R + \frac{D_o - 2T}{2} = 9 + \frac{6.625 - 2 \times 0.432}{2} = 9 + 2.8805 = 11.8805"$$

$$OD' = \gamma + \frac{d_o}{2} + 1.414(R - \gamma) = 4.5 + \frac{3.5}{2} + 1.414(9 - 4.5) \\ = 4.5 + 1.75 + 6.363 = 12.613"$$

GAP =  $-0.7325"$  INTERFERENCE - NO GOOD

CASE 2  $90^\circ$

6" LR 3" LR  $D_o = 6.625"$   $T = 0.280"$   
 $R = 9"$   $\gamma = 4.5"$   $d_o = 3.5"$

$$OC' = R + \frac{D_o - 2T}{2} = 9 + \frac{6.625 - 2 \times 0.280}{2} = 9 + 3.0325 = 12.0325"$$

$$OD' = \gamma + \frac{d_o}{2} + 1.414(R - \gamma) = 4.5 + \frac{3.5}{2} + 1.414(9 - 4.5) \\ = 4.5 + 1.75 + 6.363 = 12.613"$$

GAP =  $-0.5805"$  INTERFERENCE - NO GOOD

CASE 3  $90^\circ$

6" SR 3" LR  $D_o = 6.625"$   $T = 0.432"$   
 $R = 6"$   $\gamma = 4.5"$   $d_o = 3.5"$

$$OC' = R + \frac{D_o - 2T}{2} = 6 + \frac{6.625 - 2 \times 0.432}{2} = 6 + 2.8805 = 8.8805"$$

$$OD' = \gamma + \frac{d_o}{2} + 1.414(R - \gamma) = 4.5 + \frac{3.5}{2} + 1.414(6 - 4.5) \\ = 4.5 + 1.75 + 2.121 = 8.371"$$

GAP =  $0.5095"$  OK

EBASCO SERVICES INCORPORATED

BY LM DATE 2-12-97

SHEET 3 OF 10

CHKD. BY KLT DATE 3/20/92

OFS NO. \_\_\_\_\_

DEPT. NO. \_\_\_\_\_

CLIENT WVMS

PROJECT \_\_\_\_\_

SUBJECT SLUDGE PIPING GAPS AT BENDS

CASE 4 6" SR 3" LR

$D_o = 6.625"$   $T = 0.280"$

$R = 6"$   $r = 4.5"$

$d_o = 3.5"$

$$OC' = R + \frac{D_o - 2T}{2} = 6 + \frac{6.625 - 2 \times 0.28}{2} = 6 + 3.0325 = 9.0325"$$

$$OD' = r + \frac{d_o}{2} + 1.414(R - r) = 4.5 + \frac{3.5}{2} + 1.414(6 - 4.5) \\ = 4.5 + 1.75 + 2.121 = 8.371"$$

GAP = 0.6612" OK

CASE 5 4" LR 2" LR

$D_o = 4.5"$   $T = 0.337"$

$R = 6"$   $r = 3"$

$d_o = 2.375"$

$$OC' = R + \frac{D_o - 2T}{2} = 6 + \frac{4.5 - 2 \times 0.337}{2} = 6 + 1.93 = 7.93"$$

$$OD' = r + \frac{d_o}{2} + 1.414(R - r) = 3 + \frac{2.375}{2} + 1.414(6 - 3) \\ = 3 + 1.1875 + 4.242 = 8.4295"$$

GAP = -0.5165" INTERFERENCE NO GOOD

CASE 6 4" LR 2" LR

$D_o = 4.5"$   $T = 0.237"$

$R = 6"$   $r = 3"$

$d_o = 2.375"$

$$OC' = R + \frac{D_o - 2T}{2} = 6 + \frac{4.5 - 2 \times 0.237}{2} = 6 + 2.013 = 8.013"$$

$$OD' = r + \frac{d_o}{2} + 1.414(R - r) = 3 + \frac{2.375}{2} + 1.414(6 - 3) = 8.4295"$$

GAP = -0.4165" NO GOOD INTERFERENCE

EBASCO SERVICES INCORPORATED

BY BOS DATE 2-12-92

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CLIENT WVNS

PROJECT \_\_\_\_\_

SUBJECT SLURGE PIPING

CASE 7 4" SR 2" LR

$$D_o = 4.5" \quad T = 0.337"$$

$$R = 4" \quad \gamma = 3"$$

$$d_o = 2.375"$$

$$OC' = R + \frac{D_o - 2T}{2} = 4 + \frac{4.5 - 2 \times 0.337}{2} = 4 + 1.913 = 5.913"$$

$$OD' = \gamma + \frac{d_o}{2} + 1.414(R - \gamma) = 3 + \frac{2.375}{2} + 1.414(4 - 3) = 3 + 1.1875 + 1.414 = 5.6015"$$

$$GAP = 0.3115" \quad \underline{OK}$$

CASE 8 4" SR 2" LR

$$D_o = 4.5" \quad T = 0.237"$$

$$d_o = 2.375"$$

$$OC' = R + \frac{D_o - 2T}{2} = 4 + \frac{4.5 - 2 \times 0.237}{2} = 4 + 2.013 = 6.013"$$

$$OD' = \gamma + \frac{d_o}{2} + 1.414(R - \gamma) = 4 + \frac{2.375}{2} + 1.414(4 - 3) = 5.6015"$$

$$GAP = 0.4115" \quad \underline{OK}$$

CASE 9 6" LR 2" LR

$$D_o = 6.625" \quad T = 0.28"$$

$$d_o = 2.375"$$

$$R = 9" \quad \gamma = 3"$$

$$OC' = R + \frac{D_o - 2T}{2} = 9 + \frac{6.625 - 2 \times 0.28}{2} = 9 + 3.0325 = 12.0325"$$

$$OD' = \gamma + \frac{d_o}{2} + 1.414(R - \gamma) = 3 + \frac{2.375}{2} + 1.414(9 - 3) = 3 + 1.1875 + 8.484 = 12.6715"$$

$$GAP = -0.639" \quad \underline{NO GOOD INTERFERENCE}$$

CASE 10 6" SR 2" LR

$$D_o = 6.625" \quad T = 0.28"$$

$$d_o = 2.375"$$

$$R = 6" \quad \gamma = 3"$$

$$OC' = R + \frac{D_o - 2T}{2} = 9.0325"$$

$$OD' = \gamma + \frac{d_o}{2} + 1.414(R - \gamma) = 3 + 1.1875 + 4.242 = 8.4295"$$

$$GAP = 0.603" \quad \underline{OK}$$

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BY SNS DATE 2-12-92

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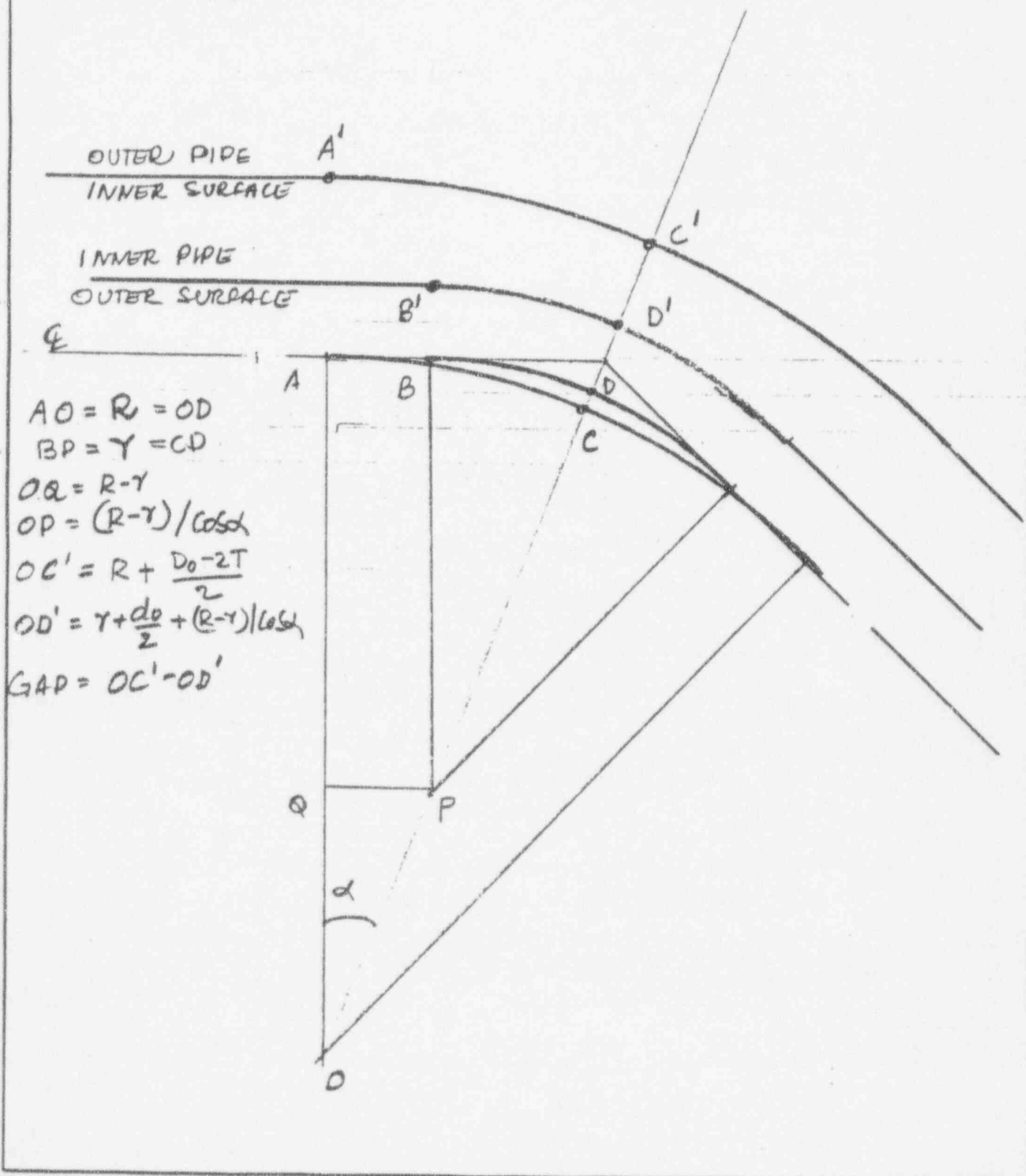
OFS NO. \_\_\_\_\_ DEPT. NO. \_\_\_\_\_

CLIENT WVNS

PROJECT \_\_\_\_\_

SUBJECT SLUDGE PIPING - GAP AT ELBOWS / BENDS

45° ELBOW



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PROJECT \_\_\_\_\_

SUBJECT SLUDGE PLANT - GAP AT BENDS

CASE 1 45° ELBOW

6" LR 3" LR

R = 9" r = 4.5"

D<sub>0</sub> = 6.625" T = 0.432"  
d<sub>0</sub> = 3.5"

$$OC' = R + \frac{D_0 - 2T}{2} = 9 + \frac{6.625 - 2 \times 0.432}{2} = 11.8805"$$

$$OD' = r + \frac{d_0}{2} + \frac{(R-r)}{\cos \alpha} = 4.5 + \frac{3.5}{2} + \frac{9-4.5}{\cos 22.5} = 4.5 + 1.75 + 4.871 = 11.121"$$

GAP = 0.7595" OK

CASE 2 45° ELBOW

6" LR 3" LR

R = 9" r = 4.5"

D<sub>0</sub> = 6.625" T = 0.28"  
d<sub>0</sub> = 3.5"

$$OC' = R + \frac{D_0 - 2T}{2} = 9 + \frac{6.625 - 2 \times 0.28}{2} = 12.0325"$$

$$OD' = r + \frac{d_0}{2} + \frac{(R-r)}{\cos \alpha} = 4.5 + \frac{3.5}{2} + \frac{9-4.5}{\cos 22.5} = 11.121"$$

GAP = 0.9115" OK

CASE 3 45° ELBOW

6" SR 3" LR

R = 6" r = 4.5"

D<sub>0</sub> = 6.625" T = 0.432"  
d<sub>0</sub> = 3.5"

$$OC' = R + \frac{D_0 - 2T}{2} = 6 + \frac{6.625 - 2 \times 0.432}{2} = 8.8805"$$

$$OD' = r + \frac{d_0}{2} + \frac{(R-r)}{\cos \alpha} = 4.5 + \frac{3.5}{2} + \frac{6-4.5}{\cos 22.5} = 4.5 + 1.75 + 1.6236 = 7.8736"$$

GAP = 1.0069" OK

CASE 4 45° Elbow

D<sub>0</sub> = 6.625" T = 0.28" d<sub>0</sub> = 3.5"  
R = 6" r = 4.5"

$$OC' = R + \frac{D_0 - 2T}{2} = 6 + \frac{6.625 - 2 \times 0.28}{2} = 6 + 3.0325 = 9.0325"$$

$$OD' = r + \frac{d_0}{2} + \frac{(R-r)}{\cos \alpha} = 7.8736"$$

GAP = 1.1589" OK



EBASCO SERVICES INCORPORATED

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CLIENT WVNS

PROJECT \_\_\_\_\_

SUBJECT SLUDGE PIPING - GAP AT BENDS

CASE 5

450

4" LR, 2" LR R=6", r=3" D<sub>0</sub>=4.5" T=0.337"

$$OC' = R + \frac{D_0 - 2T}{2} = 6 + \frac{4.5 - 2 \times 0.337}{2} = 7.913"$$

$$OD' = r + \frac{d_0}{2} + \frac{(R-r)}{\cos \alpha} = 3 + 1.1875 + \frac{3}{\cos 22.5} = 7.4345"$$

GAP = 0.4785" OK

CASE 6

450

4" LR, 2" LR R=6" r=3" D<sub>0</sub>=4.5" T=0.237"

$$OC' = R + \frac{D_0 - 2T}{2} = 6 + \frac{4.5 - 2 \times 0.237}{2} = 8.013"$$

$$OD' = r + \frac{d_0}{2} + \frac{(R-r)}{\cos \alpha} = 7.4345"$$

GAP = 0.5785" OK



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CLIENT WVNS

PROJECT \_\_\_\_\_

SUBJECT SLUDGE PIPING - GAP AT BENDS

STANDARD GAP - PIPE TO PIPE STRAIGHT PORTIONS

6x3

OD 6.625" T = 0.432"

OD 3.5"

$$\begin{aligned} \text{GAP} &= \frac{6.625 - 2 \times 0.432}{2} - \frac{3.5}{2} \\ &= 1.1305" \end{aligned}$$

6x3

OD = 6.625" T = 0.28"

OD = 3.5"

$$\begin{aligned} \text{GAP} &= \frac{6.625 - 2 \times 0.28}{2} - \frac{3.5}{2} \\ &= 1.2025" \end{aligned}$$

4x2

OD = 4.5 T = 0.337"

OD = 2.375

$$\begin{aligned} \text{GAP} &= \frac{4.5 - 2 \times 0.337}{2} - \frac{2.375}{2} \\ &= 0.7255" \end{aligned}$$

4x2

OD = 4.5 T = 0.237

OD = 2.375

$$\begin{aligned} \text{GAP} &= \frac{4.5 - 2 \times 0.237}{2} - \frac{2.375}{2} \\ &= 0.8255" \end{aligned}$$

6x2

OD = 6.625" T = 0.28"

OD = 2.375

$$\begin{aligned} \text{GAP} &= \frac{6.625 - 2 \times 0.28}{2} - \frac{2.375}{2} \\ &= 1.845" \end{aligned}$$

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CLIENT WVNS

PROJECT \_\_\_\_\_

SUBJECT SLUDGE PIPING - GAPS AT BENDS

SUMMARY

OUTER	INNER	L TYPE	GAP
6 Sch 80	3	90° LR/LR	INTERFERENCE
6 Sch 40	3	90° LR/LR	INTERFERENCE
6 Sch 80	3	90° SR/LR	0.5095"
6 Sch 40	3	90° SR/LR	0.6612
4 Sch 80	2	90° LR/LR	INTERFERENCE
4 Sch 40	2	90° LR/LR	INTERFERENCE
4 Sch 80	2	90° SR/LR	0.3115"
4 Sch 40	2	90° SR/LR	0.4115"
6 Sch 40	2	90° LR/LR	INTERFERENCE
6 Sch 40	2	90° SR/LR	0.603
6 Sch 80	3	45° LR/LR	0.7595"
6 Sch 40	3	45° LR/LR	0.9115"
6 Sch 80	3	45° SR/LR	1.0069"
6 Sch 40	3	45° SR/LR	1.1589"
4 Sch 80	2	45° LR/LR	0.4785"
4 Sch 40	2	45° LR/LR	0.5785"
6 Sch 80	3	STRAIGHT	1.1305"
6 Sch 40	3	STRAIGHT	1.2825"
4 Sch 80	2	STRAIGHT	0.7255"
4 Sch 40	2	STRAIGHT	0.8255"
6 Sch 40	2	STRAIGHT	1.845"

LEGEND : LR LONG RADIUS ELBOW  
SR SHORT RADIUS ELBOW

EBASCO SERVICES INCORPORATED

BY KKT DATE 3/20/92

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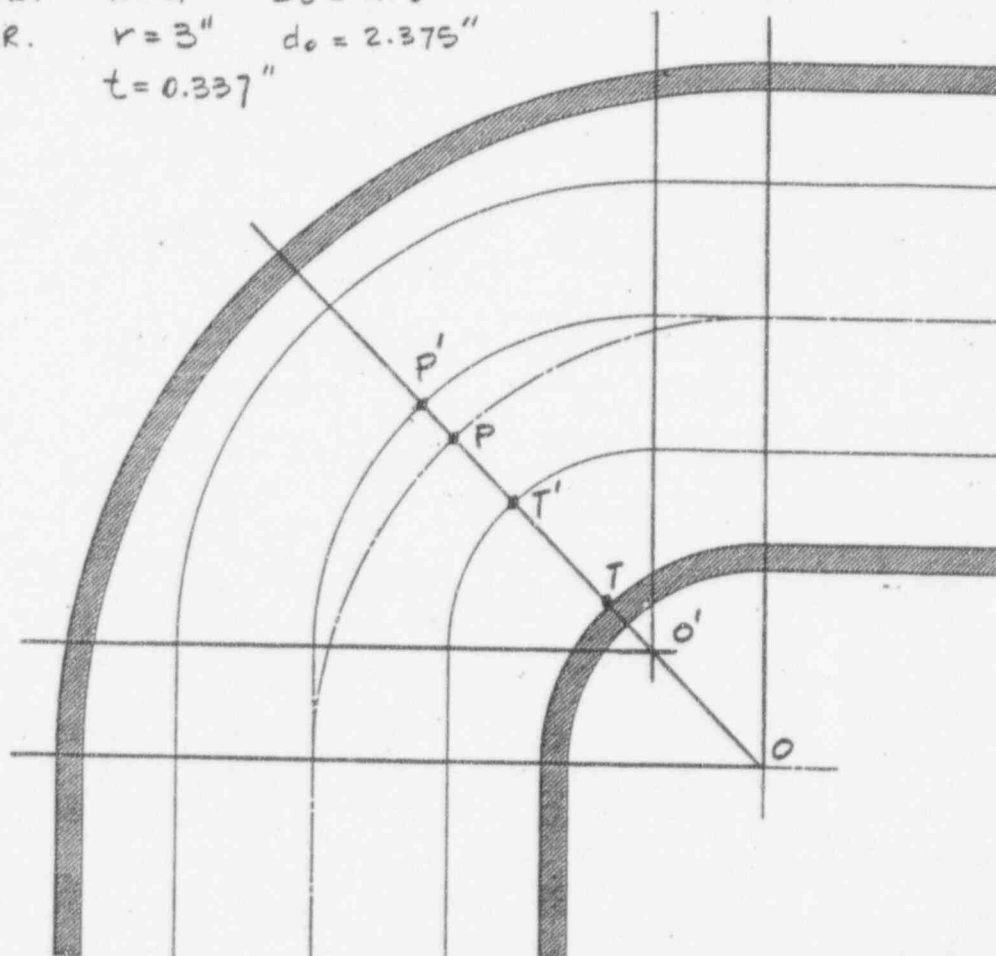
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CLIENT WVNS

PROJECT WEST VALLEY DEMONSTRATION PLANT.

SUBJECT HLW TRANSFER PIPING - SLUDGE MOBILIZATION - GAP CALCULATION

4" S.R.  $R=4"$   $D_o=4.5"$   
 2" L.R.  $r=3"$   $d_o=2.375"$   
 $t=0.337"$



$$TT' = OT' - OT = O'T' + OO' - OT$$

$$O'T' = r - \frac{d_o}{2} ; OO' = 1.414(R-r) ; OT = R - \frac{D_o}{2} - t$$

$$\therefore TT' = \left(r - \frac{d_o}{2}\right) + (1.414(R-r)) - \left(R - \frac{D_o}{2} - t\right)$$

$$TT' = \left(3 - \frac{2.375}{2}\right) + 1.414(4-3) - \left(4 - \frac{4.5}{2} - .337\right)$$

$$\therefore TT' = 1.814"$$

APPENDIX D

(COMPUTER ANALYSIS OUTPUT)

TOTAL NUMBER OF PAGES *154*

PREPARED BY: *C.M. Arshad 3/21/92*

CHECKED BY: *Prinivasee Sanjaraman 3/23/92*

## **INPUT DATA**

Job Description:

WEST VALLEY NUCLEAR SERVICES COMPANY INC; }  
WEST VALLEY DEMONSTRATION PROJECT  
SLUDGE MOBILIZATION SYSTEM  
HLW TRANSFER PIPING 6-55-4/2-038  
FILE WV38-1 MAIN RUN FILE

PIPE DATA

From 1000 To 1010 DX= -1.414 ft. DZ= 1.413 ft.

PIPE

Dia= 4.500 in. Wall= .237 in. Insul= .000 in.

GENERAL

T1= 55 F T2= 220 F P1= 150 lb./sq.in. P2= 0.0 lb./sq.in.

Mat= (6)AUSTENITIC STAINLESS E= 28,300,000 lb./sq.in. v = .292

Density= .2893 lb./cu.in.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 44.999

RESTRAINTS

Node 1000 ANC

ALLOWABLE STRESSES

B31.3 (1987) Sc= 16,700 lb./sq.in. Sh1= 16,700 lb./sq.in.

Sh2= 16,700 lb./sq.in. F1= 1.00 F2= 1.00

From 1010 To 1015 DX= -1.250 ft.

From 1015 To 1020 DX= -1.250 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000

From 1020 To 1025 DX= -1.761 ft. DZ= 1.761 ft.

From 1025 To 1030 DX= -3.085 ft. DZ= 3.085 ft.

RESTRAINTS

Node 1030 Y K= 250,000 lb./in.

From 1030 To 1035 DX= -1.591 ft. DZ= 1.591 ft.

From 1035 To 1040 DX= -.707 ft. DZ= .707 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

From 1040 To 1050 DX= 2.828 ft. DZ= 2.828 ft.

RESTRAINTS

Node 1050 Y K= 250,000 lb./in.

From 1050 To 1055 DX= 2.828 ft. DZ= 2.828 ft.

From 1055 To 1060 DX= 3.712 ft. DZ= 3.712 ft.

RESTRAINTS

Node 1060 X K= 250,000 lb./in. Dir Vec= .7071 .0000 .7071

Node 1060 Y K= 250,000 lb./in.

Node 1060 X K= 250,000 lb./in. Dir Vec= .7071 .0000 -.7071

From 1060 To 1065 DX= 2.651 ft. DZ= 2.651 ft.

From 1065 To 1070 DX= 2.810 ft. DZ= 2.810 ft.

RESTRAINTS

Node 1070 Y K= 250,000 lb./in.

From 1070 To 1080 DX= 2.828 ft. DZ= 2.828 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Miters= 1



PIPE DATA

From 1080 To 1085 DX= 1.000 ft.

From 1085 To 1090 DX= .749 ft.

RESTRAINTS

Node 1090 Y K= 250,000 lb./in.

From 1090 To 1095 DX= 1.999 ft.

From 1095 To 1100 DX= 7.999 ft.

RESTRAINTS

Node 1100 Y K= 250,000 lb./in.

Node 1100 Z K= 250,000 lb./in.

Node 1100 X K= 250,000 lb./in.

From 1100 To 1105 DX= 7.999 ft.

From 1105 To 1110 DX= .646 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Miters= 1

From 1110 To 1115 DX= .707 ft. DZ= .707 ft.

From 1115 To 1120 DX= 2.615 ft. DZ= 2.615 ft.

RESTRAINTS

Node 1120 Y K= 250,000 lb./in.

From 1120 To 1125 DX= 3.349 ft. DZ= 3.349 ft.

From 1125 To 1130 DX= 3.721 ft. DZ= 3.721 ft.

RESTRAINTS

Node 1130 Y K= 250,000 lb./in.

From 1130 To 1135 DX= 2.243 ft. DZ= 2.243 ft.

From 1135 To 1140 DX= 3.182 ft. DZ= 3.182 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

From 1140 To 1150 DX= .883 ft. DZ= -.883 ft.

RESTRAINTS

Node 1150 ANC

From 1 To 10 DX= -1.414 ft. DZ= 1.413 ft.

PIPE

Dia= 2.375 in. Wall= .154 in. Insul= .000 in.

GENERAL

T1= 220 F T2= 220 F Fluid= .0505 lb./cu.in.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 44.999

RESTRAINTS

Node 1 ANC Cnode 1000

PIPE DATA

From 10 To 15 DX= -1.250 ft.

RESTRAINTS

Node 15 Y Cnode 1015 K= 3,000 lb./in.  
Node 15 Z Cnode 1015 K= 3,000 lb./in.

From 15 To 20 DX= -1.250 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

From 20 To 25 DX= -1.761 ft. DZ= 1.761 ft.

From 25 To 30 DX= -3.085 ft. DZ= 3.085 ft.

From 30 To 35 DX= -1.591 ft. DZ= 1.591 ft.

RESTRAINTS

Node 35 +Y Cnode 1035 K= 9,000 lb./in.

From 35 To 40 DX= -.707 ft. DZ= .707 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000

From 40 To 50 DX= 2.828 ft. DZ= 2.828 ft.

From 50 To 55 DX= 2.828 ft. DZ= 2.828 ft.

RESTRAINTS

Node 55 Y Cnode 1055 K= 3,000 lb./in.  
Node 55 X Cnode 1055 K= 3,000 lb./in. Dir Vec= -.7071 .0000 .7071

From 55 To 60 DX= 3.712 ft. DZ= 3.712 ft.

RESTRAINTS

Node 60 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
.7071  
Node 60 Y Cnode 1060 K= 603,000 lb./in.  
Node 60 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
-.7071

From 60 To 65 DX= 2.651 ft. DZ= 2.651 ft.

From 65 To 70 DX= 2.810 ft. DZ= 2.810 ft.

From 70 To 80 DX= 2.828 ft. DZ= 2.828 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

From 80 To 85 DX= 1.000 ft.

RESTRAINTS

Node 85 +Y Cnode 1085 K= 9,000 lb./in.

From 85 To 90 DX= .749 ft.

From 90 To 95 DX= 1.999 ft.

## PIPE DATA

-----  
From 95 To 100 DX= 7.999 ft.

## RESTRAINTS

Node 100	Y	Cnode 1100	K= 603,000 lb./in.
Node 100	X	Cnode 1100	K= 603,000 lb./in.
Node 100	Z	Cnode 1100	K= 603,000 lb./in.

-----  
From 100 To 105 DX= 7.999 ft.-----  
From 105 To 110 DX= .646 ft.

## BEND at "TO" end

Radius= 3.000 in. (LONG)    Bend Angle= 45.000

## RESTRAINTS

Node 110	X	Cnode 1110	K= 1,000,000 lb./in.	Gap= .825 in.
Dir Vec= .7070    .0000    .7070				
Node 110	Z	Cnode 1110	K= 1,000,000 lb./in.	Gap= .825 in.
Dir Vec= .7070    .0000    -.7070				

-----  
From 110 To 115 DX= .707 ft.    DZ= .707 ft.

## RESTRAINTS

Node 115 +Y    Cnode 1115    K= 9,000

-----  
From 115 To 120 DX= 2.615 ft.    DZ= 2.615 ft.

## ALLOWABLE STRESSES

B31.3 (1987)

-----  
From 120 To 125 DX= 3.349 ft.    DZ= 3.349 ft.

## RESTRAINTS

Node 125	Y	Cnode 1125	K= 3,000 lb./in.
Node 125	X	Cnode 1125	K= 3,000 lb./in.    Dir Vec= .7071    .0000
-.7071			

-----  
From 125 To 130 DX= 3.721 ft.    DZ= 3.721 ft.-----  
From 130 To 135 DX= 2.243 ft.    DZ= 2.243 ft.

## RESTRAINTS

Node 135	Y	Cnode 1135	K= 3,000 lb./in.
Node 135	X	Cnode 1135	K= 3,000 lb./in.    Dir Vec= .7071    .0000
-.7071			

-----  
From 135 To 140 DX= 3.182 ft.    DZ= 3.182 ft.

## BEND at "TO" end

Radius= 3.000 in. (LONG)    Bend Angle= 90.000

-----  
From 140 To 150 DX= .883 ft.    DZ= -.883 ft.

## RESTRAINTS

Node 150 ANC    Cnode 1150

**THERMAL (55F/220F) + WEIGHT ANALYSIS**  
**ANALYSIS OUTPUT**

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.0000	.0000	.0000	.0000	.0000	.0000
10	-.0328	-.0067	.0154	.0120	-.0639	.0355
15	-.0521	-.0167	-.0028	.0171	-.0861	.0480
20	-.0760	-.0315	-.0280	.0228	-.1061	.0511
25	-.1433	-.0530	-.0384	.0155	-.1099	.0224
30	-.2539	-.0381	-.0450	-.0227	-.0588	-.0549
35	-.2916	-.0093	-.0291	-.0152	-.0030	-.0676
40	-.2961	-.0001	-.0138	-.0044	.0753	-.0693
50	-.1867	-.0264	-.0338	-.0330	.1396	-.0461
55	-.0646	-.0123	-.0605	-.0633	.0913	-.0216
60	-.0001	-.0008	.0000	-.0222	-.1037	-.0704
65	-.0516	-.0484	.1409	-.0082	-.2235	-.0898
70	-.1429	-.0623	.3269	-.0739	-.2262	-.0299
80	-.1964	-.0067	.4791	-.1107	-.0639	-.0010
85	-.1813	-.0076	.4871	-.1067	-.0214	-.0117
90	-.1686	-.0104	.4877	-.1033	.0136	-.0221
95	-.1349	-.0211	.4628	-.0943	.1049	-.0231
100	-.0002	-.0010	-.0001	-.0582	.4394	.0003
105	.1344	-.0310	-.6583	-.0221	.1435	.0040
110	.1466	-.0302	-.6709	-.0178	-.0267	.0015
115	.1467	-.0282	-.6497	-.0115	-.1279	-.0039
120	.0434	-.0297	-.4585	-.0080	-.3591	-.0032
125	-.1316	-.0186	-.1708	-.0026	-.2176	-.0034
130	-.1166	-.0274	-.0606	-.0065	.0359	.0064
135	-.0611	-.0146	-.0407	-.0124	.0180	.0159
140	-.0098	-.0006	.0140	-.0021	.0184	.0077
150	.0000	.0000	.0000	.0000	.0000	.0000
1000	.0000	.0000	.0000	.0000	.0000	.0000
1010	.0032	-.0024	-.0015	.0002	.0067	.0112
1015	.0049	-.0050	.0001	-.0020	.0082	.0113
1020	.0075	-.0077	.0025	-.0064	.0102	.0055
1025	.0137	-.0060	.0034	-.0099	.0103	.0014
1030	.0243	-.0006	.0040	-.0047	.0061	.0052
1035	.0282	-.0029	.0027	-.0002	.0016	.0091
1040	.0282	-.0034	.0013	-.0007	-.0097	.0081
1050	.0177	-.0005	.0036	.0033	-.0137	.0020
1055	.0060	-.0040	.0061	.0029	-.0083	.0000
1060	.0000	-.0007	.0000	-.0019	.0099	.0015
1065	.0047	-.0009	-.0134	-.0011	.0210	-.0015
1070	.0134	-.0003	-.0312	-.0025	.0219	-.0026
1080	.0188	-.0006	-.0465	-.0063	.0030	-.0002
1085	.0175	-.0006	-.0467	-.0077	-.0002	.0004
1090	.0163	-.0005	-.0465	-.0089	-.0031	.0000
1095	.0130	-.0009	-.0435	-.0123	-.0109	-.0010
1100	.0000	-.0008	.0000	-.0260	-.0405	-.0100
1105	-.0130	-.0285	.0631	-.0396	-.0173	-.0083
1110	-.0142	-.0282	.0644	-.0431	.0109	-.0003
1115	-.0133	-.0230	.0617	-.0437	.0182	.0019
1120	-.0014	-.0009	.0413	-.0280	.0361	-.0063
1125	.0155	-.0011	.0135	-.0098	.0200	-.0148
1130	.0130	-.0005	.0040	-.0060	-.0050	-.0079

CAESAR II DISPLACEMENT REPORT FILE:WV38-1 WVNS 6-55-4/2-038  
CASE 1 (OPE) W+T1+P1 DATE:MAR 19,1992 THERMAL (55F/220F) + WEIGHT

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1135	.0068	-.0028	.0029	-.0025	-.0034	-.0050
1140	.0007	-.0001	-.0010	-.0009	-.0018	.0017
1150	.0000	.0000	.0000	.0000	.0000	.0000

CAESAR II RESTRAINT REPORT  
CASE 1 (OPE) W+T1+P1

FILE:WV38-1

DATE:MAR 19,1992

WVNS 6-55-4/2-038

THERMAL (55F/220F) + WEIGHT

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1000	0.	-105.	-2.	92.	-11.	198.	Rigid ANC
1030	0.	-154.	0.	0.	0.	0.	Flex Y
1050	0.	-119.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	-172.	0.	0.	0.	0.	Flex Y
1060	-1.	0.	1.	0.	0.	0.	Flex X
1070	0.	-81.	0.	0.	0.	0.	Flex Y
1090	0.	-124.	0.	0.	0.	0.	Flex Y
1100	0.	-212.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-3.	0.	0.	0.	Flex Z
1100	-4.	0.	0.	0.	0.	0.	Flex X
1120	0.	-220.	0.	0.	0.	0.	Flex Y
1130	0.	-129.	0.	0.	0.	0.	Flex Y
1150	6.	-81.	3.	0.	-1.	82.	Rigid ANC
1	6.	-14.	-10.	20.	-57.	37.	Rigid ANC
15	0.	-35.	0.	0.	0.	0.	Flex Y
15	0.	0.	-9.	0.	0.	0.	Flex Z
35	0.	-57.	0.	0.	0.	0.	Flex +Y
55	0.	-25.	0.	0.	0.	0.	Flex Y
55	-6.	0.	6.	0.	0.	0.	Flex X
60	-8.	0.	-8.	0.	0.	0.	Flex X
60	0.	-67.	0.	0.	0.	0.	Flex Y
60	-19.	0.	19.	0.	0.	0.	Flex X
85	0.	-63.	0.	0.	0.	0.	Flex +Y
100	0.	-65.	0.	0.	0.	0.	Flex Y
100	-86.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	-41.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	-47.	0.	0.	0.	0.	Flex +Y
125	0.	-53.	0.	0.	0.	0.	Flex Y
125	56.	0.	-56.	0.	0.	0.	Flex X
135	0.	-35.	0.	0.	0.	0.	Flex Y
135	-36.	0.	36.	0.	0.	0.	Flex X
150	94.	-19.	63.	4.	97.	21.	Rigid ANC



CAESAR II STRESS SUMMARY  
CASE 1 (OPE) W+T1+P1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL (55F/220F) + WEIGHT

\*\*\*\* NO CODE STRESS CHECK PROCESSED

PIPING CODE: B31.3 (1987)

HIGHEST STRESSES: (lb./sq.in.)

OPE STRESS:	10707.	@NODE 110	ALLOWABLE:	0.
BENDING STRESS:	10342.	@NODE 110		
TORSIONAL STRESS:	130.	@NODE 140		
AXIAL STRESS:	636.	@NODE 1105		
3D MAXIMUM SHEAR:	10914.	@NODE 110		

STRESS OPTIMIZATION PARAMETERS:

OPE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES  
IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST  
OPE STRESS IN THE SYSTEM.

AVG. OPE STRESS 1881.

-----/BETWEEN/---/BELOW/

OPE STRESS 90-100%	.96	99.04
OPE STRESS 80-90 %	.00	99.04
OPE STRESS 70-80 %	.00	99.04
OPE STRESS 60-70 %	.00	99.04
OPE STRESS 50-60 %	4.81	94.23
OPE STRESS 25-50 %	13.46	80.77
OPE STRESS 0-25 %	80.77	

PIPE ELEMENTS ANALYZED: 52

SAMPLED POINTS: 104

CAESAR II FORCE/STRESS REPORT FILE:WV38-1 WVNS 6-55-4/2-038  
CASE 1 (OPE) W+T1+P1 DATE:MAR 19,1992 THERMAL (55F/220F) + WEIGHT

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			(lb./sq.in.)			
	FX	FY	FZ	MX	MY	MZ	SIFI	SIPO	RESULT	ALLOW.
1000	6	91	-8	-72	-45	-160	1.00	1.00	1284	0
1010	-6	-66	8	-40	40	33	1.94	1.61	993	0
1010	6	66	-8	40	-40	-33	1.00	1.00	853	0
1015	-6	-55	8	-40	32	-30	1.00	1.00	828	0
1015	6	20	-16	40	-32	30	1.00	1.00	828	0
1020	-6	-4	16	-41	9	-47	1.94	1.61	993	0
1020	6	4	-16	41	-9	47	1.00	1.00	845	0
1025	-6	20	16	-28	-7	-34	1.00	1.00	774	0
1025	6	-20	-16	28	7	34	1.00	1.00	774	0
1030	-6	68	16	110	-40	104	1.00	1.00	1194	0
1030	6	84	-16	-110	40	-104	1.00	1.00	1194	0
1035	-6	-60	16	-5	-57	-10	1.00	1.00	826	0
1035	6	2	-16	5	57	10	1.00	1.00	826	0
1040	-6	11	16	0	-56	-11	1.94	1.61	1019	0
1040	6	-11	-16	0	56	11	1.00	1.00	820	0
1050	-6	50	16	76	0	-87	1.00	1.00	1037	0
1050	6	69	-16	-76	0	87	1.00	1.00	1037	0
1055	-6	-24	16	-56	65	45	1.00	1.00	969	0
1055	0	0	-10	56	-65	-45	1.00	1.00	969	0
1060	0	58	10	51	106	-62	1.00	1.00	1103	0
1060	-25	47	-1	-51	-106	62	1.00	1.00	1107	0
1065	25	-5	1	-19	40	7	1.00	1.00	777	0
1065	-25	5	-1	19	-40	-7	1.00	1.00	777	0
1070	25	37	1	25	-29	-37	1.00	1.00	810	0
1070	-25	42	-1	-25	29	37	1.00	1.00	810	0
1080	25	3	1	-32	-99	20	2.71	2.71	1642	0
1080	-25	-3	-1	32	99	-20	1.00	1.00	1007	0
1085	25	12	1	-32	-98	14	1.00	1.00	1001	0
1085	-25	-75	-1	32	98	-14	1.00	1.00	1001	0
1090	25	83	1	-32	-97	-45	1.00	1.00	1029	0
1090	-25	40	-1	32	97	45	1.00	1.00	1029	0
1095	25	-18	1	-32	-95	14	1.00	1.00	991	0
1095	-25	18	-1	32	95	-14	1.00	1.00	991	0
1100	25	69	1	-32	-87	-188	1.00	1.00	1394	0

CAESAR II FORCE/STRESS REPORT  
CASE 1 (OPE) W+T1+P1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL (55F/220F) + WEIGHT

DATA POINT	----Forces(lb.)-----			---Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			RESULT	ALLOW.
1100	-108	77	-39	32	87	188	1.00	1.00	1420	0
1105	108	10	39	-32	231	80	1.00	1.00	1560	0
1105	-108	-10	-39	32	-231	-80	1.00	1.00	1560	0
1110	108	19	39	-30	247	69	2.71	2.71	3237	0
1110	-108	-19	-39	30	-247	-69	1.00	1.00	1600	0
1115	108	28	39	-16	209	55	1.00	1.00	1444	0
1115	-108	-75	-39	16	-209	-55	1.00	1.00	1444	0
1120	108	116	39	233	30	-194	1.00	1.00	1776	0
1120	-108	103	-39	-233	-30	194	1.00	1.00	1776	0
1125	108	-51	39	-25	-198	64	1.00	1.00	1421	0
1125	-52	-1	-95	25	198	-64	1.00	1.00	1421	0
1130	52	59	95	86	-36	-47	1.00	1.00	1027	0
1130	-52	69	-95	-86	36	47	1.00	1.00	1027	0
1135	52	-34	95	-30	61	69	1.00	1.00	996	0
1135	-88	0	-59	30	-61	-69	1.00	1.00	996	0
1140	88	53	59	34	20	-30	1.94	1.61	834	0
1140	-88	-53	-59	-34	-20	30	1.00	1.00	796	0
1150	88	61	59	3	98	-61	1.00	1.00	1043	0
1	-5	14	9	-19	56	-36	1.00	1.00	1963	0
10	5	-2	-9	8	-49	24	1.72	1.44	2461	0
10	-5	2	9	-8	49	-24	1.00	1.00	1666	0
15	5	4	-9	8	-38	26	1.00	1.00	1474	0
15	-5	30	18	-8	38	-26	1.00	1.00	1474	0
20	5	-23	-18	6	-14	-9	1.72	1.44	1040	0
20	-5	23	18	-6	14	9	1.00	1.00	846	0
25	5	-9	-18	-20	7	-36	1.00	1.00	1371	0
25	-5	9	18	20	-7	36	1.00	1.00	1371	0
30	5	15	-18	-10	46	-26	1.00	1.00	1620	0
30	-5	-15	18	10	-46	26	1.00	1.00	1620	0
35	5	28	-18	24	66	8	1.00	1.00	1988	0
35	-5	28	18	-24	-66	-8	1.00	1.00	1988	0
40	5	-22	-18	2	71	-5	1.72	1.44	3101	0
40	-5	22	18	-2	-71	5	1.00	1.00	1994	0
50	5	0	-18	-27	6	24	1.00	1.00	1258	0

CAESAR II FORCE/STRESS REPORT FILE:WV38-1 WVNS 6-55-4/2-038  
CASE 1 (OPE) W+T1+P1 DATE:MAR 19,1992 THERMAL (55F/220F) + WEIGHT

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			(lb./sq.in.)			
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	RESULT	ALLOW.
50	-5	0	18	27	-6	-24	1.00	1.00	1258	0
55	5	22	-18	4	-62	-6	1.00	1.00	1799	0
55	0	2	12	-4	62	6	1.00	1.00	1799	0
60	0	27	-12	51	-107	-53	1.00	1.00	3254	0
60	27	38	1	-51	107	53	1.00	1.00	3243	0
65	-27	-17	-1	-23	-38	21	1.00	1.00	1513	0
65	27	17	1	23	38	-21	1.00	1.00	1513	0
70	-27	5	-1	-40	35	37	1.00	1.00	1850	0
70	27	-5	1	40	-35	-37	1.00	1.00	1850	0
80	-27	29	-1	7	108	-13	1.72	1.44	4485	0
80	27	-29	1	-7	-108	13	1.00	1.00	2797	0
85	-27	34	-1	7	107	-41	1.00	1.00	2915	0
85	27	28	1	-7	-107	41	1.00	1.00	2915	0
90	-27	-24	-1	7	106	-21	1.00	1.00	2765	0
90	27	24	1	-7	-106	21	1.00	1.00	2765	0
95	-27	-13	-1	7	102	15	1.00	1.00	2669	0
95	27	13	1	-7	-102	-15	1.00	1.00	2669	0
100	-27	33	-1	7	88	-63	1.00	1.00	2785	0
100	113	31	43	-7	-88	63	1.00	1.00	2705	0
105	-113	14	-43	7	-257	4	1.00	1.00	5874	0
105	113	-14	43	-7	257	-4	1.00	1.00	5874	0
110	-113	18	-43	9	-280	-7	1.72	1.44	10706	0
110	113	-18	43	-9	280	7	1.00	1.00	6366	0
115	-113	23	-43	22	-235	-20	1.00	1.00	5444	0
115	113	23	43	-22	235	20	1.00	1.00	5444	0
120	-113	-1	-43	-9	-50	11	1.00	1.00	1489	0
120	113	1	43	9	50	-11	1.00	1.00	1489	0
125	-113	25	-43	29	186	-27	1.00	1.00	4455	0
125	57	27	99	-29	-186	27	1.00	1.00	4455	0
130	-57	3	-99	-14	33	16	1.00	1.00	1225	0
130	57	-3	99	14	-33	-16	1.00	1.00	1225	0
135	-57	21	-99	12	-59	-10	1.00	1.00	1680	0
135	94	13	62	-12	59	10	1.00	1.00	1680	0
140	-94	12	-62	7	13	-9	1.72	1.44	1016	0

CAESAR II FORCE/STRESS REPORT  
CASE 1 (OPE) W+T1+P1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL (55F/220F) + WEIGHT

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			RESULT	ALLOW.
140	94	-12	62	-7	-13	9	1.00	1.00	840	0
150	-94	18	-62	-3	-97	-20	1.00	1.00	2583	0

**THERMAL (220F/220F) + WEIGHT ANALYSIS**

**ANALYSIS OUTPUT**

CAESAR II DISPLACEMENT REPORT FILE:WV38-1  
CASE 2 (OPE) W+T2+P1

WVNS 6-55-4/2-038  
DATE:MAR 19,1992 THERMAL (220F/220F) + WEIGHT

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.0000	.0000	.0000	.0000	.0000	.0000
10	-.0335	-.0067	.0146	.0120	-.0673	.0355
15	-.0528	-.0167	-.0042	.0171	-.0880	.0480
20	-.0767	-.0315	-.0295	.0228	-.1047	.0511
25	-.1432	-.0530	-.0391	.0155	-.1070	.0224
30	-.2524	-.0381	-.0444	-.0227	-.0588	-.0549
35	-.2908	-.0093	-.0292	-.0152	-.0075	-.0676
40	-.2966	-.0001	-.0145	-.0044	.0644	-.0693
50	-.1944	-.0264	-.0273	-.0330	.1274	-.0461
55	-.0756	-.0123	-.0508	-.0633	.0956	-.0216
60	-.0017	-.0008	.0005	-.0222	-.0936	-.0704
65	-.0511	-.0484	.1393	-.0082	-.2245	-.0898
70	-.1440	-.0623	.3268	-.0739	-.2284	-.0299
80	-.1964	-.0067	.4777	-.1107	-.0534	-.0010
85	-.1813	-.0076	.4835	-.1067	-.0083	-.0117
90	-.1686	-.0104	.4819	-.1033	.0282	-.0221
95	-.1350	-.0211	.4507	-.0943	.1193	-.0231
100	-.0002	-.0010	-.0009	-.0582	.3961	.0003
105	.1346	-.0310	-.6517	-.0221	.2692	.0040
110	.1497	-.0302	-.6870	-.0178	.1815	.0015
115	.1808	-.0282	-.6967	-.0115	.1264	-.0039
120	.2405	-.0297	-.6683	-.0080	-.0575	-.0032
125	.2030	-.0186	-.5181	-.0026	-.1909	-.0034
130	.0962	-.0274	-.2859	-.0065	-.2282	.0064
135	.0307	-.0146	-.1449	-.0124	-.2052	.0159
140	-.0136	-.0006	.0103	-.0021	-.0265	.0077
150	.0000	.0000	.0000	.0000	.0000	.0000
1000	.0000	.0000	.0000	.0000	.0000	.0000
1010	-.0341	-.0024	.0143	.0002	-.0741	.0112
1015	-.0517	-.0050	-.0037	-.0020	-.0884	.0113
1020	-.0784	-.0077	-.0290	-.0064	-.1036	.0055
1025	-.1409	-.0060	-.0372	-.0099	-.1028	.0014
1030	-.2489	-.0006	-.0413	-.0047	-.0617	.0052
1035	-.2898	-.0029	-.0286	-.0002	-.0201	.0091
1040	-.2912	-.0034	-.0138	-.0007	.0845	.0081
1050	-.1918	-.0005	-.0298	.0033	.1260	.0020
1055	-.0752	-.0040	-.0510	.0029	.0911	.0000
1060	-.0016	-.0007	.0005	-.0019	-.0890	.0015
1065	-.0473	-.0009	.1353	-.0011	-.2163	-.0015
1070	-.1376	-.0003	.3202	-.0025	-.2292	-.0026
1080	-.1943	-.0006	.4780	-.0063	-.0208	-.0002
1085	-.1810	-.0006	.4786	-.0077	.0136	.0004
1090	-.1683	-.0005	.4739	-.0089	.0453	.0000
1095	-.1347	-.0009	.4579	-.0123	.1252	-.0010
1100	-.0002	-.0008	-.0008	-.0260	.3811	-.0100
1105	.1343	-.0285	-.6486	-.0396	.2930	-.0083
1110	.1535	-.0282	-.6879	-.0431	.1466	-.0003
1115	.1776	-.0230	-.6933	-.0437	.1059	.0019
1120	.2336	-.0009	-.6613	-.0280	-.0531	-.0063
1125	.2020	-.0011	-.5172	-.0098	-.1829	-.0148
1130	.0973	-.0005	-.2875	-.0060	-.2278	-.0079



CAESAR II DISPLACEMENT REPORT  
CASE 2 (OPE) W+T2+P1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL (220F/220F) + WEIGHT

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1135	.0321	-.0028	-.1468	-.0025	-.2033	-.0050
1140	-.0093	-.0001	.0085	-.0009	-.0115	.0017
1150	.0000	.0000	.0000	.0000	.0000	.0000

CAESAR II RESTRAINT REPORT  
CASE 2 (OPE) W+T2+P1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL (220F/220F) + WEIGHT

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1000	53.	-105.	-160.	92.	-648.	198.	Rigid ANC
1030	0.	-154.	0.	0.	0.	0.	Flex Y
1050	0.	-119.	0.	0.	0.	0.	Flex Y
1060	-145.	0.	-145.	0.	0.	0.	Flex X
1060	0.	-172.	0.	0.	0.	0.	Flex Y
1060	-260.	0.	260.	0.	0.	0.	Flex X
1070	0.	-81.	0.	0.	0.	0.	Flex Y
1090	0.	-124.	0.	0.	0.	0.	Flex Y
1100	0.	-212.	0.	0.	0.	0.	Flex Z
1100	0.	0.	-206.	0.	0.	0.	Flex X
1100	-45.	0.	0.	0.	0.	0.	Flex Y
1120	0.	-220.	0.	0.	0.	0.	Flex Y
1130	0.	-129.	0.	0.	0.	0.	Flex Y
1150	397.	-81.	251.	0.	-265.	82.	Rigid ANC
1	5.	-14.	-14.	20.	-65.	37.	Rigid ANC
15	0.	-35.	0.	0.	0.	0.	Flex Y
15	0.	0.	-2.	0.	0.	0.	Flex Z
35	0.	-57.	0.	0.	0.	0.	Flex +Y
55	0.	-25.	0.	0.	0.	0.	Flex Y
55	-1.	0.	1.	0.	0.	0.	Flex X
60	-13.	0.	-13.	0.	0.	0.	Flex X
60	0.	-67.	0.	0.	0.	0.	Flex Y
60	-24.	0.	24.	0.	0.	0.	Flex X
85	0.	-63.	0.	0.	0.	0.	Flex +Y
100	0.	-65.	0.	0.	0.	0.	Flex Y
100	-7.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	-19.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
110	0.	0.	0.	0.	0.	0.	Flex +Y
115	0.	-47.	0.	0.	0.	0.	Flex Y
125	0.	-53.	0.	0.	0.	0.	Flex X
125	3.	0.	-3.	0.	0.	0.	Flex Y
135	0.	-35.	0.	0.	0.	0.	Flex X
135	-5.	0.	5.	0.	0.	0.	Flex X
150	42.	-19.	22.	4.	-38.	21.	Rigid ANC

CAESAR II STRESS SUMMARY  
CASE 2 (OPE) W+T2+P1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL (220F/220F) + WEIGHT

\*\*\*\* NO CODE STRESS CHECK PROCESSED

PIPING CODE: B31.3 (1987)

HIGHEST STRESSES: (lb./sq.in.)

OPE STRESS:	13727.	@NODE 1110	ALLOWABLE:	0.
BENDING STRESS:	13255.	@NODE 1110		
TORSIONAL STRESS:	130.	@NODE 140		
AXIAL STRESS:	586.	@NODE 1010		
3D MAXIMUM SHEAR:	13987.	@NODE 1110		

STRESS OPTIMIZATION PARAMETERS:

OPE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES  
IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST  
OPE STRESS IN THE SYSTEM.

AVG. OPE STRESS 2749.

-----/BETWEEN/---/BELOW/

OPE STRESS 90-100%	.96	99.04
OPE STRESS 80-90 %	.96	98.08
OPE STRESS 70-80 %	.00	98.08
OPE STRESS 60-70 %	.00	98.08
OPE STRESS 50-60 %	.00	98.08
OPE STRESS 25-50 %	22.12	75.96
OPE STRESS 0-25 %	75.96	

PIPE ELEMENTS ANALYZED: 52

SAMPLED POINTS: 104

CAESAR II FORCE/STRESS REPORT  
CASE 2 (OPE) W+T2+P1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL (220F/220F) + WEIGHT

DATA POINT	----Forces(lb.)----			---Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			RESULT	ALLOW.
1000	-48	91	146	-72	583	-160	1.00	1.00	2833	0
1010	48	-66	-146	-40	-415	33	1.94	1.61	3598	0
1010	-48	66	146	40	415	-33	1.00	1.00	2149	0
1015	48	-55	-146	-40	-263	-30	1.00	1.00	1586	0
1015	-48	20	144	40	263	30	1.00	1.00	1586	0
1020	48	-4	-144	-41	-68	-47	1.94	1.61	1183	0
1020	-48	4	144	41	68	47	1.00	1.00	906	0
1025	48	20	-144	-28	86	-34	1.00	1.00	919	0
1025	-48	-20	144	28	-86	34	1.00	1.00	919	0
1030	48	68	-144	110	381	104	1.00	1.00	2091	0
1030	-48	84	144	-110	-381	-104	1.00	1.00	2091	0
1035	48	-60	-144	-5	533	-10	1.00	1.00	2552	0
1035	-48	2	144	5	-533	10	1.00	1.00	2552	0
1040	48	11	-144	0	533	-11	1.94	1.61	4436	0
1040	-48	-11	144	0	-533	11	1.00	1.00	2571	0
1050	48	50	-144	76	56	-87	1.00	1.00	1061	0
1050	-48	69	144	-76	-56	87	1.00	1.00	1061	0
1055	48	-24	-144	-56	-489	45	1.00	1.00	2428	0
1055	-49	0	145	56	489	-45	1.00	1.00	2428	0
1060	49	58	-145	51	-1212	-62	1.00	1.00	5115	0
1060	318	47	39	-51	1212	62	1.00	1.00	5057	0
1065	-318	-5	-39	-19	-472	7	1.00	1.00	2287	0
1065	318	5	39	19	472	-7	1.00	1.00	2287	0
1070	-318	37	-39	25	311	-37	1.00	1.00	1697	0
1070	318	42	39	-25	-311	37	1.00	1.00	1697	0
1080	-318	3	-39	-32	1092	20	2.71	2.71	11553	0
1080	318	-3	39	32	-1092	-20	1.00	1.00	4583	0
1085	-318	12	-39	-32	1061	14	1.00	1.00	4465	0
1085	318	-75	39	32	-1061	-14	1.00	1.00	4465	0
1090	-318	83	-39	-32	1031	-45	1.00	1.00	4357	0
1090	318	40	39	32	-1031	45	1.00	1.00	4357	0
1095	-318	-18	-39	-32	952	14	1.00	1.00	4058	0
1095	318	18	39	32	-952	-14	1.00	1.00	4058	0
1100	-318	69	-39	-32	634	-188	1.00	1.00	2975	0

CAESAR II FORCE/STRESS REPORT  
CASE 2 (OPE) W+T2+P1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL (220F/220F) + WEIGHT

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			RESULT	ALLOW.
1100	356	77	227	32	-634	188	1.00	1.00	2964	0
1105	-356	10	-227	-32	-1181	80	1.00	1.00	4911	0
1105	356	-10	227	32	1181	-80	1.00	1.00	4911	0
1110	-356	19	-227	-30	-1308	69	2.71	2.71	13727	0
1110	356	-19	227	30	1308	-69	1.00	1.00	5366	0
1115	-356	28	-227	-16	-1236	55	1.00	1.00	5091	0
1115	356	-75	227	16	1236	-55	1.00	1.00	5091	0
1120	-356	116	-227	233	-897	-194	1.00	1.00	4008	0
1120	356	103	227	-233	897	194	1.00	1.00	4008	0
1125	-356	-51	-227	-25	-463	64	1.00	1.00	2219	0
1125	359	-1	224	25	463	-64	1.00	1.00	2219	0
1130	-359	59	-224	86	39	-47	1.00	1.00	868	0
1130	359	69	224	-86	-39	47	1.00	1.00	868	0
1135	-359	-34	-224	-30	342	69	1.00	1.00	1782	0
1135	354	0	229	30	-342	-69	1.00	1.00	1782	0
1140	-354	53	-229	34	536	-30	1.94	1.61	4452	0
1140	354	-53	229	-34	-536	30	1.00	1.00	2582	0
1150	-354	61	-229	3	226	-61	1.00	1.00	1450	0
1	-4	14	14	-19	64	-36	1.00	1.00	2103	0
10	4	-2	-14	8	-49	24	1.72	1.44	2443	0
10	-4	2	14	-8	49	-24	1.00	1.00	1656	0
15	4	4	-14	8	-32	26	1.00	1.00	1378	0
15	-4	30	16	-8	32	-26	1.00	1.00	1378	0
20	4	-23	-16	6	-11	-9	1.72	1.44	959	0
20	-4	23	16	-6	11	9	1.00	1.00	807	0
25	4	-9	-16	-20	7	-36	1.00	1.00	1375	0
25	-4	9	16	20	-7	36	1.00	1.00	1375	0
30	4	15	-16	-10	42	-26	1.00	1.00	1560	0
30	-4	-15	16	10	-42	26	1.00	1.00	1560	0
35	4	28	-16	24	61	8	1.00	1.00	1881	0
35	-4	28	16	-24	-61	-8	1.00	1.00	1881	0
40	4	-22	-16	2	65	-5	1.72	1.44	2891	0
40	-4	22	16	-2	-65	5	1.00	1.00	1872	0
50	4	0	-16	-27	11	24	1.00	1.00	1280	0

CAESAR II FORCE/STRESS REPORT  
CASE 2 (OPE) W+12+P1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL (220F/220F) + WEIGHT

DATA POINT	----Forces(lb.)-----			--Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	RESULT	ALLOW.
50	-4	0	16	27	-11	-24	1.00	1.00	1280	0
55	4	22	-16	4	-47	-5	1.00	1.00	1487	0
55	-3	2	15	-4	47	6	1.00	1.00	1487	0
60	3	27	-15	51	-117	-53	1.00	1.00	3429	0
60	33	38	5	-51	117	53	1.00	1.00	3412	0
65	-33	-17	-5	-23	-42	21	1.00	1.00	1571	0
65	33	17	5	23	42	-21	1.00	1.00	1571	0
70	-33	5	-5	-40	37	37	1.00	1.00	1873	0
70	33	-5	5	40	-37	-37	1.00	1.00	1873	0
80	-33	29	-5	7	117	-13	1.72	1.44	4789	0
80	33	-29	5	-7	-117	13	1.00	1.00	2971	0
85	-33	34	-5	7	112	-41	1.00	1.00	3019	0
85	33	28	5	-7	-112	41	1.00	1.00	3019	0
90	-33	-24	-5	7	109	-21	1.00	1.00	2824	0
90	33	24	5	-7	-109	21	1.00	1.00	2824	0
95	-33	-13	-5	7	99	15	1.00	1.00	2591	0
95	33	13	5	-7	-99	-15	1.00	1.00	2591	0
100	-33	33	-5	7	58	-63	1.00	1.00	2307	0
100	40	31	23	-7	-58	63	1.00	1.00	2301	0
105	-40	14	-23	7	-131	4	1.00	1.00	3250	0
105	40	-14	23	-7	131	-4	1.00	1.00	3250	0
110	-40	18	-23	9	-145	-7	1.72	1.44	5810	0
110	40	-18	23	-9	145	7	1.00	1.00	3552	0
115	-40	23	-23	22	-135	-20	1.00	1.00	3393	0
115	40	23	23	-22	135	20	1.00	1.00	3393	0
120	-40	-1	-23	-9	-91	11	1.00	1.00	2422	0
120	40	1	23	9	91	-11	1.00	1.00	2422	0
125	-40	25	-23	29	-36	-27	1.00	1.00	1599	0
125	37	27	26	-29	36	27	1.00	1.00	1599	0
130	-37	3	-26	-14	4	16	1.00	1.00	917	0
130	37	-3	26	14	-4	-16	1.00	1.00	917	0
135	-37	21	-26	12	28	-10	1.00	1.00	1140	0
135	42	13	21	-12	-28	10	1.00	1.00	1140	0
140	-42	12	-21	7	83	-9	1.72	1.44	3536	0



CAESAR II FORCE/STRESS REPORT FILE:WV38-1 WVNS 6-55-4/2-038  
CASE 2 (OPE) W+T2+P1 DATE:MAR 19,1992 THERMAL (220F/220F) + WEIGHT

DATA	----Forces(lb.)----			--Moments(ft.lb.)---			(lb./sq.in.)			
POINT	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	RESULT	ALLOW.
140	42	-12	21	-7	-83	9	1.00	1.00	2255	0
150	-42	18	-21	-3	37	-20	1.00	1.00	1383	0

**WEIGHT + INTERNAL PRESSURE ANALYSIS**  
**ANALYSIS OUTPUT**

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.0000	.0000	.0000	.0000	.0000	.0000
10	.0000	-.0067	.0000	.0120	.0000	.0355
15	.0000	-.0167	.0000	.0171	.0000	.0480
20	.0000	-.0315	.0000	.0228	.0000	.0511
25	.0000	-.0530	.0000	.0155	.0000	.0224
30	.0000	-.0381	.0000	-.0227	.0000	-.0549
35	.0000	-.0093	.0000	-.0152	.0000	-.0676
40	.0000	-.0001	.0000	-.0044	.0000	-.0693
50	.0000	-.0264	.0000	-.0330	.0000	-.0461
55	.0000	-.0123	.0000	-.0633	.0000	-.0216
60	.0000	-.0008	.0000	-.0222	.0000	-.0704
65	.0000	-.0484	.0000	-.0082	.0000	-.0898
70	.0000	-.0623	.0000	-.0739	.0000	-.0299
80	.0000	-.0067	.0000	-.1107	.0000	-.0010
85	.0000	-.0076	.0000	-.1067	.0000	-.0117
90	.0000	-.0104	.0000	-.1033	.0000	-.0221
95	.0000	-.0211	.0000	-.0943	.0000	-.0231
100	.0000	-.0010	.0000	-.0582	.0000	.0003
105	.0000	-.0310	.0000	-.0221	.0000	.0040
110	.0000	-.0302	.0000	-.0178	.0000	.0015
115	.0000	-.0282	.0000	-.0115	.0000	-.0039
120	.0000	-.0297	.0000	-.0080	.0000	-.0032
125	.0000	-.0186	.0000	-.0026	.0000	-.0034
130	.0000	-.0274	.0000	-.0065	.0000	.0064
135	.0000	-.0146	.0000	-.0124	.0000	.0159
140	.0000	-.0006	.0000	-.0021	.0000	.0077
150	.0000	.0000	.0000	.0000	.0000	.0000
1000	.0000	.0000	.0000	.0000	.0000	.0000
1010	.0000	-.0024	.0000	.0002	.0000	.0112
1015	.0000	-.0050	.0000	-.0020	.0000	.0113
1020	.0000	-.0077	.0000	-.0064	.0000	.0055
1025	.0000	-.0060	.0000	-.0099	.0000	.0014
1030	.0000	-.0006	.0000	-.0047	.0000	.0052
1035	.0000	-.0029	.0000	-.0002	.0000	.0091
1040	.0000	-.0034	.0000	-.0007	.0000	.0081
1050	.0000	-.0005	.0000	.0033	.0000	.0020
1055	.0000	-.0040	.0000	.0029	.0000	.0000
1060	.0000	-.0007	.0000	-.0019	.0000	.0015
1065	.0000	-.0009	.0000	-.0011	.0000	-.0015
1070	.0000	-.0003	.0000	-.0025	.0000	-.0026
1080	.0000	-.0006	.0000	-.0063	.0000	-.0002
1085	.0000	-.0006	.0000	-.0077	.0000	.0004
1090	.0000	-.0005	.0000	-.0089	.0000	.0000
1095	.0000	-.0009	.0000	-.0123	.0000	-.0010
1100	.0000	-.0008	.0000	-.0260	.0000	-.0100
1105	.0000	-.0285	.0000	-.0396	.0000	-.0083
1110	.0000	-.0282	.0000	-.0431	.0000	-.0003
1115	.0000	-.0230	.0000	-.0437	.0000	.0019
1120	.0000	-.0009	.0000	-.0280	.0000	-.0063
1125	.0000	-.0011	.0000	-.0098	.0000	-.0148
1130	.0000	-.0005	.0000	-.0060	.0000	-.0079

CAESAR II DISPLACEMENT REPORT FILE:WV38-1 WVNS 6-55-4/2-038  
CASE 3 (SUS) W+P1 DATE:MAR 19,1992 WEIGHT + INTERNAL PRESSURE

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1135	.0000	-.0028	.0000	-.0025	.0000	-.0050
1140	.0000	-.0001	.0000	-.0009	.0000	.0017
1150	.0000	.0000	.0000	.0000	.0000	.0000

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1000	0.	-105.	0.	92.	0.	198.	Rigid ANC
1030	0.	-154.	0.	0.	0.	0.	Flex Y
1050	0.	-119.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	-172.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1070	0.	-81.	0.	0.	0.	0.	Flex Y
1090	0.	-124.	0.	0.	0.	0.	Flex Y
1100	0.	-212.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Z
1100	0.	0.	0.	0.	0.	0.	Flex X
1120	0.	-220.	0.	0.	0.	0.	Flex Y
1130	0.	-129.	0.	0.	0.	0.	Flex Y
1150	0.	-81.	0.	0.	0.	82.	Rigid ANC
1	0.	-14.	0.	20.	0.	37.	Rigid ANC
15	0.	-35.	0.	0.	0.	0.	Flex Y
15	0.	0.	0.	0.	0.	0.	Flex Z
35	0.	-57.	0.	0.	0.	0.	Flex +Y
55	0.	-25.	0.	0.	0.	0.	Flex Y
55	0.	0.	0.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex X
60	0.	-67.	0.	0.	0.	0.	Flex Y
60	0.	0.	0.	0.	0.	0.	Flex X
85	0.	-63.	0.	0.	0.	0.	Flex +Y
100	0.	-65.	0.	0.	0.	0.	Flex Y
100	0.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	0.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	-47.	0.	0.	0.	0.	Flex +Y
125	0.	-53.	0.	0.	0.	0.	Flex Y
125	0.	0.	0.	0.	0.	0.	Flex X
135	0.	-35.	0.	0.	0.	0.	Flex Y
135	0.	0.	0.	0.	0.	0.	Flex X
150	0.	-19.	0.	4.	0.	21.	Rigid ANC

CAESAR II STRESS SUMMARY  
CASE 3 (SUS) W+P1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
WEIGHT + INTERNAL PRESSURE

\*\*\*\* CODE STRESS CHECK PASSED

PIPING CODE: B31.3 (1987)

HIGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	2052.	@NODE	60	ALLOWABLE:	16700.
BENDING STRESS:	1583.	@NODE	60		
TORSIONAL STRESS:	130.	@NODE	140		
AXIAL STRESS:	602.	@NODE	1010		
3D MAXIMUM SHEAR:	2052.	@NODE	60		

STRESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES  
IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST  
CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 959.

-----/BETWEEN/---/BELOW/

CODE STRESS 90-100%	1.92	98.08
CODE STRESS 80-90 %	5.77	92.31
CODE STRESS 70-80 %	.00	92.31
CODE STRESS 60-70 %	11.54	80.77
CODE STRESS 50-60 %	13.46	67.31
CODE STRESS 25-50 %	66.35	.96
CODE STRESS 0-25 %	.96	

PIPE ELEMENTS ANALYZED: 52

SAMPLED POINTS: 104

DATA POINT	----Forces(lb.)-----			--Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
1000	0	91	0	-72	0	-160	1.00	1.00	1216	16700
1010	0	-66	0	-40	0	33	1.94	1.61	804	16700
1010	0	66	0	40	0	-33	1.00	1.00	727	16700
1015	0	-55	0	-40	0	-30	1.00	1.00	714	16700
1015	0	20	0	40	0	30	1.00	1.00	714	16700
1020	0	-4	0	-41	0	-47	1.94	1.61	981	16700
1020	0	4	0	41	0	47	1.00	1.00	837	16700
1025	0	20	0	-28	0	-34	1.00	1.00	766	16700
1025	0	-20	0	28	0	34	1.00	1.00	766	16700
1030	0	68	0	110	0	104	1.00	1.00	1168	16700
1030	0	84	0	-110	0	-104	1.00	1.00	1168	16700
1035	0	-60	0	-5	0	-10	1.00	1.00	643	16700
1035	0	2	0	5	0	10	1.00	1.00	643	16700
1040	0	11	0	0	0	-11	1.94	1.61	650	16700
1040	0	-11	0	0	0	11	1.00	1.00	632	16700
1050	0	50	0	76	0	-87	1.00	1.00	1034	16700
1050	0	69	0	-76	0	87	1.00	1.00	1034	16700
1055	0	-24	0	-56	0	45	1.00	1.00	871	16700
1055	0	0	0	56	0	-45	1.00	1.00	871	16700
1060	0	58	0	51	0	-62	1.00	1.00	902	16700
1060	0	47	0	-51	0	62	1.00	1.00	902	16700
1065	0	-5	0	-19	0	7	1.00	1.00	671	16700
1065	0	5	0	19	0	-7	1.00	1.00	671	16700
1070	0	37	0	25	0	-37	1.00	1.00	769	16700
1070	0	42	0	-25	0	37	1.00	1.00	769	16700
1080	0	3	0	-32	0	20	2.71	2.71	810	16700
1080	0	-3	0	32	0	-20	1.00	1.00	678	16700
1085	0	12	0	-32	0	14	1.00	1.00	655	16700
1085	0	-75	0	32	0	-14	1.00	1.00	655	16700
1090	0	83	0	-32	0	-45	1.00	1.00	769	16700
1090	0	40	0	32	0	45	1.00	1.00	769	16700
1095	0	-18	0	-32	0	14	1.00	1.00	655	16700
1095	0	18	0	32	0	-14	1.00	1.00	655	16700
1100	0	69	0	-32	0	-188	1.00	1.00	1303	16700



CAESAR II FORCE/STRESS REPORT  
CASE 3 (SUS) W+P1

FILE:WV38-1

DATE:MAR 19,1992

WVNS 6-55-4/2-038

WEIGHT + INTERNAL PRESSURE

DATA POINT	----Forces(lb.)-----			--Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
1100	0	77	0	32	0	188	1.00	1.00	1303	16700
1105	0	10	0	-32	0	80	1.00	1.00	903	16700
1105	0	-10	0	32	0	-80	1.00	1.00	903	16700
1110	0	19	0	-30	0	69	2.71	2.71	1311	16700
1110	0	-19	0	30	0	-69	1.00	1.00	863	16700
1115	0	28	0	-16	0	55	1.00	1.00	792	16700
1115	0	-75	0	16	0	-55	1.00	1.00	792	16700
1120	0	116	0	233	0	-194	1.00	1.00	1733	16700
1120	0	103	0	-233	0	194	1.00	1.00	1733	16700
1125	0	-51	0	-25	0	64	1.00	1.00	841	16700
1125	0	-1	0	25	0	-64	1.00	1.00	841	16700
1130	0	59	0	86	0	-47	1.00	1.00	954	16700
1130	0	69	0	-86	0	47	1.00	1.00	954	16700
1135	0	-34	0	-30	0	69	1.00	1.00	863	16700
1135	0	0	0	30	0	-69	1.00	1.00	863	16700
1140	0	53	0	34	0	-30	1.94	1.61	615	16700
1140	0	-53	0	-34	0	30	1.00	1.00	610	16700
1150	0	61	0	3	0	-61	1.00	1.00	754	16700
1	0	14	0	-19	0	-36	1.00	1.00	1322	16700
10	0	-2	0	8	0	24	1.72	1.44	1226	16700
10	0	2	0	-8	0	-24	1.00	1.00	996	16700
15	0	4	0	8	0	26	1.00	1.00	1028	16700
15	0	30	0	-8	0	-26	1.00	1.00	1028	16700
20	0	-23	0	6	0	-9	1.72	1.44	538	16700
20	0	23	0	-6	0	9	1.00	1.00	517	16700
25	0	-9	0	-20	0	-36	1.00	1.00	1342	16700
25	0	9	0	20	0	36	1.00	1.00	1342	16700
30	0	15	0	-10	0	-26	1.00	1.00	1034	16700
30	0	-15	0	10	0	26	1.00	1.00	1034	16700
35	0	28	0	24	0	8	1.00	1.00	979	16700
35	0	28	0	-24	0	-8	1.00	1.00	979	16700
40	0	-22	0	2	0	-5	1.72	1.44	636	16700
40	0	22	0	-2	0	5	1.00	1.00	585	16700
50	0	0	0	-27	0	24	1.00	1.00	1252	16700

CAESAR II FORCE/STRESS REPORT  
CASE 3 (SUS) W+P1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
WEIGHT + INTERNAL PRESSURE

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			(lb./sq.in.)			
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
50	0	0	0	27	0	-24	1.00	1.00	1252	16700
55	0	22	0	4	0	-6	1.00	1.00	635	16700
55	0	2	0	-4	0	6	1.00	1.00	635	16700
60	0	27	0	51	0	-53	1.00	1.00	2051	16700
60	0	38	0	-51	0	53	1.00	1.00	2051	16700
65	0	-17	0	-23	0	21	1.00	1.00	1146	16700
65	0	17	0	23	0	-21	1.00	1.00	1146	16700
70	0	5	0	-40	0	37	1.00	1.00	1649	16700
70	0	-5	0	40	0	-37	1.00	1.00	1649	16700
80	0	29	0	7	0	-13	1.72	1.44	884	16700
80	0	-29	0	-7	0	13	1.00	1.00	757	16700
85	0	34	0	7	0	-41	1.00	1.00	1366	16700
85	0	28	0	-7	0	41	1.00	1.00	1366	16700
90	0	-24	0	7	0	-21	1.00	1.00	936	16700
90	0	24	0	-7	0	21	1.00	1.00	936	16700
95	0	-13	0	7	0	15	1.00	1.00	807	16700
95	0	13	0	-7	0	-15	1.00	1.00	807	16700
100	0	33	0	7	0	-63	1.00	1.00	1838	16700
100	0	31	0	-7	0	63	1.00	1.00	1838	16700
105	0	14	0	7	0	4	1.00	1.00	566	16700
105	0	-14	0	-7	0	-4	1.00	1.00	566	16700
110	0	18	0	9	0	-7	1.72	1.44	830	16700
110	0	-18	0	-9	0	7	1.00	1.00	720	16700
115	0	23	0	22	0	-20	1.00	1.00	1129	16700
115	0	23	0	-22	0	20	1.00	1.00	1129	16700
120	0	-1	0	-9	0	11	1.00	1.00	795	16700
120	0	1	0	9	0	-11	1.00	1.00	795	16700
125	0	25	0	29	0	-27	1.00	1.00	1339	16700
125	0	27	0	-29	0	27	1.00	1.00	1339	16700
130	0	3	0	-14	0	16	1.00	1.00	950	16700
130	0	-3	0	14	0	-16	1.00	1.00	950	16700
135	0	21	0	12	0	-10	1.00	1.00	822	16700
135	0	13	0	-12	0	10	1.00	1.00	822	16700
140	0	12	0	7	0	-9	1.72	1.44	517	16700

CAESAR II FORCE/STRESS REPORT  
CASE 3 (SUS) W+P1

FILE: FV38-1  
DATE: MAR 19, 1992

WVNS 6-55-4/2-038  
WEIGHT + INTERNAL PRESSURE

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			CODE	ALLOW.
140	0	-12	0	-7	0	9	1.00	1.00	502	16700
150	0	18	0	-3	0	-20	1.00	1.00	838	16700

**THERMAL EXPANSION ANALYSIS (55F/220F)**

**ANALYSIS OUTPUT**

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.0000	.0000	.0000	.0000	.0000	.0000
10	-.0328	.0000	.0154	.0000	-.0639	.0000
15	-.0521	.0000	-.0028	.0000	-.0861	.0000
20	-.0760	.0000	-.0280	.0000	-.1061	.0000
25	-.1433	.0000	-.0384	.0000	-.1099	.0000
30	-.2539	.0000	-.0450	.0000	-.0588	.0000
35	-.2916	.0000	-.0291	.0000	-.0030	.0000
40	-.2961	.0000	-.0138	.0000	.0753	.0000
50	-.1867	.0000	-.0338	.0000	.1396	.0000
55	-.0646	.0000	-.0605	.0000	.0913	.0000
60	-.0001	.0000	.0000	.0000	-.1037	.0000
65	-.0516	.0000	.1409	.0000	-.2235	.0000
70	-.1429	.0000	.3269	.0000	-.2262	.0000
80	-.1964	.0000	.4791	.0000	-.0639	.0000
85	-.1813	.0000	.4871	.0000	-.0214	.0000
90	-.1686	.0000	.4877	.0000	.0136	.0000
95	-.1349	.0000	.4628	.0000	.1049	.0000
100	-.0002	.0000	-.0001	.0000	.4394	.0000
105	.1344	.0000	-.6583	.0000	.1435	.0000
110	.1466	.0000	-.6709	.0000	-.0267	.0000
115	.1467	.0000	-.6497	.0000	-.1279	.0000
120	.0434	.0000	-.4585	.0000	-.3591	.0000
125	-.1316	.0000	-.1708	.0000	-.2176	.0000
130	-.1166	.0000	-.0606	.0000	.0359	.0000
135	-.0611	.0000	-.0407	.0000	.0180	.0000
140	-.0098	.0000	.0140	.0000	.0184	.0000
150	.0000	.0000	.0000	.0000	.0000	.0000
1000	.0000	.0000	.0000	.0000	.0000	.0000
1010	.0032	.0000	-.0015	.0000	.0067	.0000
1015	.0049	.0000	.0001	.0000	.0082	.0000
1020	.0075	.0000	.0025	.0000	.0102	.0000
1025	.0137	.0000	.0034	.0000	.0103	.0000
1030	.0243	.0000	.0040	.0000	.0061	.0000
1035	.0282	.0000	.0027	.0000	.0016	.0000
1040	.0282	.0000	.0013	.0000	-.0097	.0000
1050	.0177	.0000	.0036	.0000	-.0137	.0000
1055	.0060	.0000	.0061	.0000	-.0083	.0000
1060	.0000	.0000	.0000	.0000	.0099	.0000
1065	.0047	.0000	-.0134	.0000	.0210	.0000
1070	.0134	.0000	-.0312	.0000	.0219	.0000
1080	.0188	.0000	-.0465	.0000	.0030	.0000
1085	.0175	.0000	-.0467	.0000	-.0002	.0000
1090	.0163	.0000	-.0465	.0000	-.0031	.0000
1095	.0130	.0000	-.0435	.0000	-.0109	.0000
1100	.0000	.0000	.0000	.0000	-.0405	.0000
1105	-.0130	.0000	.0631	.0000	-.0173	.0000
1110	-.0142	.0000	.0644	.0000	.0109	.0000
1115	-.0133	.0000	.0617	.0000	.0182	.0000
1120	-.0014	.0000	.0413	.0000	.0361	.0000
1125	.0155	.0000	.0135	.0000	.0200	.0000
1130	.0130	.0000	.0040	.0000	-.0050	.0000

1  
CAESAR II DISPLACEMENT REPORT FILE:WV38-1 WVNS 6-55-4/2-038  
CASE 4 (EXP) D4(EXP)=D1-D3 DATE:MAR 19,1992 THERMAL EXPANSION (55F/220F)

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1135	.0068	.0000	.0029	.0000	-.0034	.0000
1140	.0007	.0000	-.0010	.0000	-.0018	.0000
1150	.0000	.0000	.0000	.0000	.0000	.0000

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1000	0.	0.	-2.	0.	-11.	0.	Rigid ANC
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	-1.	0.	1.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-3.	0.	0.	0.	Flex Z
1100	-4.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	0.	0.	Flex Y
1150	6.	0.	3.	0.	-1.	0.	Rigid ANC
1	6.	0.	-10.	0.	-57.	0.	Rigid ANC
15	0.	0.	0.	0.	0.	0.	Flex Y
15	0.	0.	-9.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	0.	0.	0.	0.	0.	Flex Y
55	-6.	0.	6.	0.	0.	0.	Flex X
60	-8.	0.	-8.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	-19.	0.	19.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	-86.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	-41.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	56.	0.	-56.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
135	-36.	0.	36.	0.	0.	0.	Flex X
150	94.	0.	63.	0.	97.	0.	Rigid ANC



CAESAR II STRESS SUMMARY  
CASE 4 (EXP) D4(EXP)=D1-D3

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL EXPANSION (55F/220F)

\*\*\*\* CODE STRESS CHECK PASSED

PIPING CODE: B31.3 (1987)

HIGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	10335.	@NODE 110	ALLOWABLE:	25050.
BENDING STRESS:	10335.	@NODE 110		
TORSIONAL STRESS:	0.	@NODE 1050		
AXIAL STRESS:	106.	@NODE 105		
3D MAXIMUM SHEAR:	10439.	@NODE 110		

STRESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES  
IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST  
CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 1181.

-----/BETWEEN/---/BELOW/

CODE STRESS 90-100%	.96	99.04
CODE STRESS 80-90 %	.00	99.04
CODE STRESS 70-80 %	.00	99.04
CODE STRESS 60-70 %	.00	99.04
CODE STRESS 50-60 %	2.88	96.15
CODE STRESS 25-50 %	5.77	90.38
CODE STRESS 0-25 %	90.38	

PIPE ELEMENTS ANALYZED: 52

SAMPLED POINTS: 104

CAESAR II FORCE/STRESS REPORT  
CASE 4 (EXP) D4(EXP)=D1-D3

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL EXPANSION (55F/220F)

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			(lb./sq.in.)			
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
1000	6	0	-8	0	-45	0	1.00	1.00	169	25050
1010	-6	0	8	0	40	0	1.94	1.61	295	25050
1010	6	0	-8	0	-40	0	1.00	1.00	152	25050
1015	-6	0	8	0	32	0	1.00	1.00	120	25050
1015	6	0	-16	0	-32	0	1.00	1.00	120	25050
1020	-6	0	16	0	9	0	1.94	1.61	69	25050
1020	6	0	-16	0	-9	0	1.00	1.00	36	25050
1025	-6	0	16	0	-7	0	1.00	1.00	28	25050
1025	6	0	-16	0	7	0	1.00	1.00	28	25050
1030	-6	0	16	0	-40	0	1.00	1.00	151	25050
1030	6	0	-16	0	40	0	1.00	1.00	151	25050
1035	-6	0	16	0	-57	0	1.00	1.00	214	25050
1035	6	0	-16	0	57	0	1.00	1.00	214	25050
1040	-6	0	16	0	-56	0	1.94	1.61	411	25050
1040	6	0	-16	0	56	0	1.00	1.00	212	25050
1050	-6	0	16	0	0	0	1.00	1.00	1	25050
1050	6	0	-16	0	0	0	1.00	1.00	1	25050
1055	-6	0	16	0	65	0	1.00	1.00	245	25050
1055	0	0	-10	0	-65	0	1.00	1.00	245	25050
1060	0	0	10	0	106	0	1.00	1.00	397	25050
1060	-25	0	-1	0	-106	0	1.00	1.00	397	25050
1065	25	0	1	0	40	0	1.00	1.00	151	25050
1065	-25	0	-1	0	-40	0	1.00	1.00	151	25050
1070	25	0	1	0	-29	0	1.00	1.00	109	25050
1070	-25	0	-1	0	29	0	1.00	1.00	109	25050
1080	25	0	1	0	-99	0	2.71	2.71	1004	25050
1080	-25	0	-1	0	99	0	1.00	1.00	370	25050
1085	25	0	1	0	-98	0	1.00	1.00	367	25050
1085	-25	0	-1	0	98	0	1.00	1.00	367	25050
1090	25	0	1	0	-97	0	1.00	1.00	364	25050
1090	-25	0	-1	0	97	0	1.00	1.00	364	25050
1095	25	0	1	0	-95	0	1.00	1.00	357	25050
1095	-25	0	-1	0	95	0	1.00	1.00	357	25050
1100	25	0	1	0	-87	0	1.00	1.00	327	25050

CAESAR II FORCE/STRESS REPORT  
CASE 4 (EXP) D4(EXP)=D1-D3

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL EXPANSION (55F/220F)

DATA POINT	----Forces(lb.)-----			--Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
1100	-108	0	-39	0	87	0	1.00	1.00	327	25050
1105	108	0	39	0	231	0	1.00	1.00	864	25050
1105	-108	0	-39	0	-231	0	1.00	1.00	864	25050
1110	108	0	39	0	247	0	2.71	2.71	2502	25050
1110	-108	0	-39	0	-247	0	1.00	1.00	923	25050
1115	108	0	39	0	209	0	1.00	1.00	780	25050
1115	-108	0	-39	0	-209	0	1.00	1.00	780	25050
1120	108	0	39	0	30	0	1.00	1.00	112	25050
1120	-108	0	-39	0	-30	0	1.00	1.00	112	25050
1125	108	0	39	0	-198	0	1.00	1.00	742	25050
1125	-52	0	-95	0	198	0	1.00	1.00	742	25050
1130	52	0	95	0	-36	0	1.00	1.00	136	25050
1130	-52	0	-95	0	36	0	1.00	1.00	136	25050
1135	52	0	95	0	61	0	1.00	1.00	227	25050
1135	-88	0	-59	0	-61	0	1.00	1.00	227	25050
1140	88	0	59	0	20	0	1.94	1.61	147	25050
1140	-88	0	-59	0	-20	0	1.00	1.00	76	25050
1150	88	0	59	0	98	0	1.00	1.00	369	25050
1	-5	0	9	0	56	0	1.00	1.00	1213	25050
10	5	0	-9	0	-49	0	1.72	1.44	1841	25050
10	-5	0	9	0	49	0	1.00	1.00	1068	25050
15	5	0	-9	0	-38	0	1.00	1.00	825	25050
15	-5	0	18	0	38	0	1.00	1.00	825	25050
20	5	0	-18	0	-14	0	1.72	1.44	532	25050
20	-5	0	18	0	14	0	1.00	1.00	309	25050
25	5	0	-18	0	7	0	1.00	1.00	151	25050
25	-5	0	18	0	-7	0	1.00	1.00	151	25050
30	5	0	-18	0	46	0	1.00	1.00	993	25050
30	-5	0	18	0	-46	0	1.00	1.00	993	25050
35	5	0	-18	0	66	0	1.00	1.00	1428	25050
35	-5	0	18	0	-66	0	1.00	1.00	1428	25050
40	5	0	-18	0	71	0	1.72	1.44	2635	25050
40	-5	0	18	0	-71	0	1.00	1.00	1529	25050
50	5	0	-18	0	6	0	1.00	1.00	146	25050

CAESAR II FORCE/STRESS REPORT  
CASE 4 (EXP) D4(EXP)=D1-D3

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL EXPANSION (55F/220F)

DATA POINT	----Forces(lb.)-----			--Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
50	-5	0	18	0	-6	0	1.00	1.00	146	25050
55	5	0	-18	0	-62	0	1.00	1.00	1328	25050
55	0	0	12	0	62	0	1.00	1.00	1328	25050
60	0	0	-12	0	-107	0	1.00	1.00	2302	25050
60	27	0	1	0	107	0	1.00	1.00	2302	25050
65	-27	0	-1	0	-38	0	1.00	1.00	819	25050
65	27	0	1	0	38	0	1.00	1.00	819	25050
70	-27	0	-1	0	35	0	1.00	1.00	752	25050
70	27	0	1	0	-35	0	1.00	1.00	752	25050
80	-27	0	-1	0	108	0	1.72	1.44	4018	25050
80	27	0	1	0	-108	0	1.00	1.00	2331	25050
85	-27	0	-1	0	107	0	1.00	1.00	2297	25050
85	27	0	1	0	-107	0	1.00	1.00	2297	25050
90	-27	0	-1	0	106	0	1.00	1.00	2269	25050
90	27	0	1	0	-106	0	1.00	1.00	2269	25050
95	-27	0	-1	0	102	0	1.00	1.00	2194	25050
95	27	0	1	0	-102	0	1.00	1.00	2194	25050
100	-27	0	-1	0	88	0	1.00	1.00	1893	25050
100	113	0	43	0	-88	0	1.00	1.00	1893	25050
105	-113	0	-43	0	-257	0	1.00	1.00	5508	25050
105	113	0	43	0	257	0	1.00	1.00	5508	25050
110	-113	0	-43	0	-280	0	1.72	1.44	10335	25050
110	113	0	43	0	280	0	1.00	1.00	5995	25050
115	-113	0	-43	0	-235	0	1.00	1.00	5035	25050
115	113	0	43	0	235	0	1.00	1.00	5035	25050
120	-113	0	-43	0	-50	0	1.00	1.00	1075	25050
120	113	0	43	0	50	0	1.00	1.00	1075	25050
125	-113	0	-43	0	186	0	1.00	1.00	3996	25050
125	57	0	99	0	-186	0	1.00	1.00	3996	25050
130	-57	0	-99	0	33	0	1.00	1.00	712	25050
130	57	0	99	0	-33	0	1.00	1.00	712	25050
135	-57	0	-99	0	-59	0	1.00	1.00	1266	25050
135	94	0	62	0	59	0	1.00	1.00	1266	25050
140	-94	0	-62	0	13	0	1.72	1.44	503	25050

CAESAR II FORCE/STRESS REPORT FILE:WV38-1 WVNS 6-55-4/2-038  
CASE 4 (EXP) D4(EXP)=D1-D3 DATE:MAR 19,1992 THERMAL EXPANSION (55F/220F)

DATA	----Forces(lb.)----			--Moments(ft.lb.)---			(lb./sq.in.)			
POINT	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
140	94	0	62	0	-13	0	1.00	1.00	292	25050
150	-94	0	-62	0	-97	0	1.00	1.00	2086	25050

**THERMAL EXPANSION ANALYSIS (220F/220F)**

**ANALYSIS OUTPUT**

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.0000	.0000	.0000	.0000	.0000	.0000
10	-.0335	.0000	.0146	.0000	-.0673	.0000
15	-.0528	.0000	-.0042	.0000	-.0880	.0000
20	-.0767	.0000	-.0295	.0000	-.1047	.0000
25	-.1432	.0000	-.0391	.0000	-.1070	.0000
30	-.2524	.0000	-.0444	.0000	-.0588	.0000
35	-.2908	.0000	-.0292	.0000	-.0075	.0000
40	-.2966	.0000	-.0145	.0000	.0644	.0000
50	-.1944	.0000	-.0273	.0000	.1274	.0000
55	-.0756	.0000	-.0508	.0000	.0956	.0000
60	-.0017	.0000	.0005	.0000	-.0936	.0000
65	-.0511	.0000	.1393	.0000	-.2245	.0000
70	-.1440	.0000	.3268	.0000	-.2284	.0000
80	-.1964	.0000	.4777	.0000	-.0534	.0000
85	-.1813	.0000	.4835	.0000	-.0083	.0000
90	-.1686	.0000	.4819	.0000	.0282	.0000
95	-.1350	.0000	.4507	.0000	.1193	.0000
100	-.0002	.0000	-.0009	.0000	.3961	.0000
105	.1346	.0000	-.6517	.0000	.2692	.0000
110	.1497	.0000	-.6870	.0000	.1815	.0000
115	.1808	.0000	-.6967	.0000	.1264	.0000
120	.2405	.0000	-.6683	.0000	-.0575	.0000
125	.2030	.0000	-.5181	.0000	-.1909	.0000
130	.0962	.0000	-.2859	.0000	-.2282	.0000
135	.0307	.0000	-.1449	.0000	-.2052	.0000
140	-.0136	.0000	.0103	.0000	-.0265	.0000
150	.0000	.0000	.0000	.0000	.0000	.0000
1000	.0000	.0000	.0000	.0000	.0000	.0000
1010	-.0341	.0000	.0143	.0000	-.0741	.0000
1015	-.0517	.0000	-.0037	.0000	-.0884	.0000
1020	-.0784	.0000	-.0290	.0000	-.1036	.0000
1025	-.1409	.0000	-.0372	.0000	-.1028	.0000
1030	-.2489	.0000	-.0413	.0000	-.0617	.0000
1035	-.2898	.0000	-.0286	.0000	-.0201	.0000
1040	-.2912	.0000	-.0138	.0000	.0845	.0000
1050	-.1918	.0000	-.0298	.0000	.1260	.0000
1055	-.0752	.0000	-.0510	.0000	.0911	.0000
1060	-.0016	.0000	.0005	.0000	-.0890	.0000
1065	-.0473	.0000	.1353	.0000	-.2163	.0000
1070	-.1376	.0000	.3202	.0000	-.2292	.0000
1080	-.1943	.0000	.4780	.0000	-.0208	.0000
1085	-.1810	.0000	.4786	.0000	.0136	.0000
1090	-.1683	.0000	.4739	.0000	.0453	.0000
1095	-.1347	.0000	.4379	.0000	.1252	.0000
1100	-.0002	.0000	-.0008	.0000	.3811	.0000
1105	.1343	.0000	-.6486	.0000	.2930	.0000
1110	.1535	.0000	-.6879	.0000	.1466	.0000
1115	.1776	.0000	-.6933	.0000	.1059	.0000
1120	.2336	.0000	-.6613	.0000	-.0531	.0000
1125	.2020	.0000	-.5172	.0000	-.1829	.0000
1130	.0973	.0000	-.2875	.0000	-.2278	.0000



CAESAR II DISPLACEMENT REPORT FILE:WV38-1 WVNS 6-55-4/2-038  
CASE 5 (EXP) D5(EXP)=D2-D3 DATE:MAR 19,1992 THERMAL EXPANSION (220F/220F)

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1135	.0321	.0000	-.1468	.0000	-.2033	.0000
1140	-.0093	.0000	.0085	.0000	-.0115	.0000
1150	.0000	.0000	.0000	.0000	.0000	.0000

CAESAR II RESTRAINT REPORT  
CASE 5 (EXP) D5(EXP)=D2-D3

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL EXPANSION (220F/220F)

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1000	53.	0.	-160.	0.	-648.	0.	Rigid ANC
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	-145.	0.	-145.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	-260.	0.	260.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-206.	0.	0.	0.	Flex Z
1100	-45.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	0.	0.	Flex Y
1150	397.	0.	251.	0.	-265.	0.	Rigid ANC
1	5.	0.	-14.	0.	-65.	0.	Rigid ANC
15	0.	0.	0.	0.	0.	0.	Flex Y
15	0.	0.	-2.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	0.	0.	0.	0.	0.	Flex Y
55	-1.	0.	1.	0.	0.	0.	Flex X
60	-13.	0.	-13.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	-24.	0.	24.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	-7.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	-19.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	3.	0.	-3.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
135	-5.	0.	5.	0.	0.	0.	Flex X
150	42.	0.	22.	0.	-38.	0.	Rigid ANC

CAESAR II STRESS SUMMARY  
CASE 5 (EXP) D5(EXP)=D2-D3

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL EXPANSION (220F/220F)

\*\*\*\* CODE STRESS CHECK PASSED

PIPING CODE: B31.3 (1987)

HIGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	13236.	@NODE 1110	ALLOWABLE:	25050.
BENDING STRESS:	13236.	@NODE 1110		
TORSIONAL STRESS:	0.	@NODE 1110		
AXIAL STRESS:	130.	@NODE 1110		
3D MAXIMUM SHEAR:	13366.	@NODE 1110		

STRESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES  
IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST  
CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 2132.

-----/BETWEEN/---/BELOW/

CODE STRESS 90-100%	.96	99.04
CODE STRESS 80-90 %	.96	98.08
CODE STRESS 70-80 %	.00	98.08
CODE STRESS 60-70 %	.00	98.08
CODE STRESS 50-60 %	.00	98.08
CODE STRESS 25-50 %	19.23	78.85
CODE STRESS 0-25 %	78.85	

PIPE ELEMENTS ANALYZED: 52

SAMPLED POINTS: 104

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.) CODE ALLOW.	
	FX	FY	FZ	MX	MY	MZ				
1000	-48	0	146	0	583	0	1.00	1.00	2177	25050
1010	48	0	-146	0	-415	0	1.94	1.61	3001	25050
1010	-48	0	146	0	415	0	1.00	1.00	1550	25050
1015	48	0	-146	0	-263	0	1.00	1.00	981	25050
1015	-48	0	144	0	263	0	1.00	1.00	981	25050
1020	48	0	-144	0	-68	0	1.94	1.61	495	25050
1020	-48	0	144	0	68	0	1.00	1.00	256	25050
1025	48	0	-144	0	86	0	1.00	1.00	321	25050
1025	-48	0	144	0	-86	0	1.00	1.00	321	25050
1030	48	0	-144	0	381	0	1.00	1.00	1424	25050
1030	-48	0	144	0	-381	0	1.00	1.00	1424	25050
1035	48	0	-144	0	533	0	1.00	1.00	1993	25050
1035	-48	0	144	0	-533	0	1.00	1.00	1993	25050
1040	48	0	-144	0	533	0	1.94	1.61	3855	25050
1040	-48	0	144	0	-533	0	1.00	1.00	1991	25050
1050	48	0	-144	0	56	0	1.00	1.00	209	25050
1050	-48	0	144	0	-56	0	1.00	1.00	209	25050
1055	48	0	-144	0	-489	0	1.00	1.00	1827	25050
1055	-49	0	145	0	489	0	1.00	1.00	1827	25050
1060	49	0	-145	0	-1212	0	1.00	1.00	4525	25050
1060	318	0	39	0	1212	0	1.00	1.00	4525	25050
1065	-318	0	-39	0	-472	0	1.00	1.00	1763	25050
1065	318	0	39	0	472	0	1.00	1.00	1763	25050
1070	-318	0	-39	0	311	0	1.00	1.00	1163	25050
1070	318	0	39	0	-311	0	1.00	1.00	1163	25050
1080	-318	0	-39	0	1092	0	2.71	2.71	11049	25050
1080	318	0	39	0	-1092	0	1.00	1.00	4079	25050
1085	-318	0	-39	0	1061	0	1.00	1.00	3961	25050
1085	318	0	39	0	-1061	0	1.00	1.00	3961	25050
1090	-318	0	-39	0	1031	0	1.00	1.00	3850	25050
1090	318	0	39	0	-1031	0	1.00	1.00	3850	25050
1095	-318	0	-39	0	952	0	1.00	1.00	3554	25050
1095	318	0	39	0	-952	0	1.00	1.00	3554	25050
1100	-318	0	-39	0	634	0	1.00	1.00	2369	25050

CAESAR II FORCE/STRESS REPORT  
CASE 5 (EXP) D5(EXP)=D2-D3

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
THERMAL EXPANSION (220F/220F)

DATA POINT	----Forces(lb.)----			---Moments(ft.lb.)---			SIFI	SIPO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			CODE	ALLOW.
1100	356	0	227	0	-634	0	1.00	1.00	2369	25050
1105	-356	0	-227	0	-1181	0	1.00	1.00	4409	25050
1105	356	0	227	0	1181	0	1.00	1.00	4409	25050
1110	-356	0	-227	0	-1308	0	2.71	2.71	13236	25050
1110	356	0	227	0	1308	0	1.00	1.00	4886	25050
1115	-356	0	-227	0	-1236	0	1.00	1.00	4615	25050
1115	356	0	227	0	1236	0	1.00	1.00	4615	25050
1120	-356	0	-227	0	-897	0	1.00	1.00	3349	25050
1120	356	0	227	0	897	0	1.00	1.00	3349	25050
1125	-356	0	-227	0	-463	0	1.00	1.00	1728	25050
1125	359	0	224	0	463	0	1.00	1.00	1728	25050
1130	-359	0	-224	0	39	0	1.00	1.00	148	25050
1130	359	0	224	0	-39	0	1.00	1.00	148	25050
1135	-359	0	-224	0	342	0	1.00	1.00	1280	25050
1135	354	0	229	0	-342	0	1.00	1.00	1280	25050
1140	-354	0	-229	0	536	0	1.94	1.61	3874	25050
1140	354	0	229	0	-536	0	1.00	1.00	2001	25050
1150	-354	0	-229	0	226	0	1.00	1.00	846	25050
1	-4	0	14	0	64	0	1.00	1.00	1385	25050
10	4	0	-14	0	-49	0	1.72	1.44	1819	25050
10	-4	0	14	0	49	0	1.00	1.00	1055	25050
15	4	0	-14	0	-32	0	1.00	1.00	702	25050
15	-4	0	16	0	32	0	1.00	1.00	702	25050
20	4	0	-16	0	-11	0	1.72	1.44	438	25050
20	-4	0	16	0	11	0	1.00	1.00	254	25050
25	4	0	-16	0	7	0	1.00	1.00	160	25050
25	-4	0	16	0	-7	0	1.00	1.00	160	25050
30	4	0	-16	0	42	0	1.00	1.00	919	25050
30	-4	0	16	0	-42	0	1.00	1.00	919	25050
35	4	0	-16	0	61	0	1.00	1.00	1310	25050
35	-4	0	16	0	-61	0	1.00	1.00	1310	25050
40	4	0	-16	0	65	0	1.72	1.44	2424	25050
40	-4	0	16	0	-65	0	1.00	1.00	1406	25050
50	4	0	-16	0	11	0	1.00	1.00	236	25050

CAESAR II FORCE/STRESS REPORT  
CASE 5 (EXP) D5(EXP)=D2-D3

FILE:WV38-1

DATE:MAR 19,1992

WVNS 6-55-4/2-038

THERMAL EXPANSION (220F/220F)

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			(lb./sq.in.)			
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
50	-4	0	16	0	-11	0	1.00	1.00	236	25050
55	4	0	-16	0	-47	0	1.00	1.00	1011	25050
55	-3	0	15	0	47	0	1.00	1.00	1011	25050
60	3	0	-15	0	-117	0	1.00	1.00	2511	25050
60	33	0	5	0	117	0	1.00	1.00	2511	25050
65	-33	0	-5	0	-42	0	1.00	1.00	901	25050
65	33	0	5	0	42	0	1.00	1.00	901	25050
70	-33	0	-5	0	37	0	1.00	1.00	805	25050
70	33	0	5	0	-37	0	1.00	1.00	805	25050
80	-33	0	-5	0	117	0	1.72	1.44	4329	25050
80	33	0	5	0	-117	0	1.00	1.00	2511	25050
85	-33	0	-5	0	112	0	1.00	1.00	2415	25050
85	33	0	5	0	-112	0	1.00	1.00	2415	25050
90	-33	0	-5	0	109	0	1.00	1.00	2334	25050
90	33	0	5	0	-109	0	1.00	1.00	2334	25050
95	-33	0	-5	0	99	0	1.00	1.00	2120	25050
95	33	0	5	0	-99	0	1.00	1.00	2120	25050
100	-33	0	-5	0	58	0	1.00	1.00	1261	25050
100	40	0	23	0	-58	0	1.00	1.00	1261	25050
105	-40	0	-23	0	-131	0	1.00	1.00	2813	25050
105	40	0	23	0	131	0	1.00	1.00	2813	25050
110	-40	0	-23	0	-145	0	1.72	1.44	5371	25050
110	40	0	23	0	145	0	1.00	1.00	3116	25050
115	-40	0	-23	0	-135	0	1.00	1.00	2892	25050
115	40	0	23	0	135	0	1.00	1.00	2892	25050
120	-40	0	-23	0	-91	0	1.00	1.00	1968	25050
120	40	0	23	0	91	0	1.00	1.00	1968	25050
125	-40	0	-23	0	-36	0	1.00	1.00	785	25050
125	37	0	26	0	36	0	1.00	1.00	785	25050
130	-37	0	-26	0	4	0	1.00	1.00	91	25050
130	37	0	26	0	-4	0	1.00	1.00	91	25050
135	-37	0	-26	0	28	0	1.00	1.00	619	25050
135	42	0	21	0	-28	0	1.00	1.00	619	25050
140	-42	0	-21	0	83	0	1.72	1.44	3069	25050

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CAESAR II FORCE/STRESS REPORT FILE:WV38-1 WVNS 6-55-4/2-038  
CASE 5 (EXP) D5(EXP)=D2-D3 DATE:MAR 19,1992 THERMAL EXPANSION (220F/220F

DATA	----Forces(lb.)-----			--Moments(ft.lb.)---			(lb./sq.in.)			
POINT	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
140	42	0	21	0	-83	0	1.00	1.00	1780	25050
150	-42	0	-21	0	37	0	1.00	1.00	810	25050



**SEISMIC INERTIA ANALYSIS**  
**ANALYSIS OUTPUT**

# CAESAR II DYNAMICS INPUT DATA CHECKING

JOBNAME = WV38-1

UNITS: Length (in.)  
Force (lb.)  
Mass (lbm)  
Stiff (lb./in.)

## CONTROL PARAMETERS

SPECTRUM<----- Dynamic Analysis Type (HARMONIC/SPECTRUM/MODES/RANGE)

3 <----- Static Load Case for Nonlinear Restraint Status  
0.0 <----- Stiffness Factor for Friction (0.0-Not used)  
0 <----- Max. No. of Eigenvalues calculated (0-Not used)  
33 <----- Frequency cutoff (HZ)

0.1 <----- Closely Spaced Mode Criteria  
20 <----- Earthquake Duration (For DSRSS method) (sec.)  
0.03 <----- Structural Damping (% of critical)  
0.1 <----- Zero Period Acceleration (For Reg. Guide 1.60) (g's)

N <----- <Not used>  
N <----- Re-use Last Eigensolution (Frequencies and Mode Shapes)

MODAL <----- Spatial or Modal Combination first  
SRSS <----- Spatial Combination Method (SRSS/ABS)  
GROUP <----- Modal Combination Method (GROUP/10%/DSRSS/ABS/SRSS)  
Y <----- Include Pseudostatic Components (Y/N)  
ABS <----- Pseudostatic Combination Method (SRSS/ABS)  
ABS <----- Directional Combination Method (SRSS/ABS)

N <----- <Not used>  
Y <----- Sturm Sequence check on computed eigenvalues (Y/N)  
N <----- <Not used>  
6 <----- Estimated no. of significant figures in eigenvalues  
1E-12 <----- Jacobi Sweep Tolerance  
1E10 <----- Decomposition Singularity Tolerance

0 <----- Subspace size (0-Not Used)  
2 <----- No. to Converge before Shift Allowed (0-Not Used)  
0 <----- No. of iterations per shift (0-Pgm computed)  
0 <----- % of iterations per shift before orthogonalization  
N <----- Force orthogonalization after convergence (Y/N)  
Y <----- Use out-of-core eigensolver (Y/N)  
100 <----- Frequency Array Spaces

## LUMPED MASSES

Mass, Direction, Start, End, Inc

\* EXAMPLE --> 1375.6 ALL 15 ...Add mass of 1375.6 at node 15  
\* EXAMPLE --> 0.0 ALL 105 .....Delete all mass from node 105  
\* EXAMPLE --> 0.0 ALL 5 15 5 ..Delete all mass from 5, 10 and 15

# SNUBBERS

Stiffness, Direction, Node, Cnode(Opt.)

-----

\* EXAMPLE --> 10000 X 50 .....Snubber at node 50 Stiffness=10000  
 \* EXAMPLE --> 1E13 (1,0,1) 75 .Skewed 45 Deg. Snubber at 75  
 \* EXAMPLE --> 1E13 Z 55 155 ...Z Snubber at 55, Connecting Node 155

# EXCITATION FREQUENCIES

Starting Frequency, Ending Frequency, Inc

-----

\* EXAMPLE --> 1.1 .....Excitation at 1.1 Hz.  
 \* EXAMPLE --> 1.1 3.1 1.0 ..Excitation at 1.1, 2.1 & 3.1 Hz.

# HARMONIC FORCES

Force, Direction, Phase, Start, End, Inc

-----

\* EXAMPLE --> 1567.3 X 0.0 50 ...."X" Load at 50 Magnitude=1567.3

# HARMONIC DISPLACEMENTS

Displacement, Direction, Phase, Start, End, Inc

-----

\* EXAMPLE --> 0.076 Z 0.0 85 ..."Z" Displacement at 85 = 0.076

# FORCE SPECTRUM EDITING

Force, Direction, Node, Force Set #

-----

\* EXAMPLE --> 832.9 X 50 2 ..832.9 Load at 50 in X, Set #2.

# DYNAMIC LOAD CASE SHOCK CONTRIBUTIONS

Name, Factor, Direction, Start, End, Inc

# DYNAMIC LOAD CASE # 1

1.60H2	1.0	X
1.60H2	1.0	Z
1.60V2	1.0	Y

# STATIC/DYNAMIC COMBINATION CASES

Load case, Factor

# COMBINATION CASE # 1

S3	1.0
D1	1.0

# SPECTRUM DEFINITIONS

Name, Range, Ordinate, Range Interpolation, Ordinate Interpolation

\* Note that: ELCENTRO thru 1.60V10 are RESERVED SPECTRUM NAMES  
\* that can be used without further definition !!!!!

ELCENTRO FREQ DISPL LOG LOG  
\*\*\* NOTE \*\*\* Spectrum completely predefined

\* Based on May 18, 1940 El Centro California earthquake  
\* N-S component. Applies to elastic systems with 5-10% damping.  
\* Taken from Biggs, "Introduction to Structural Dynamics".

1.60H.5 FREQ VEL LOG LOG  
\*\*\* NOTE \*\*\* Spectrum completely predefined

\* AEC Reg. Guide 1.60 Rev.1, Dec.1973 Horizontal Design Response  
\* Spectra for 0.5% critically damped system.

1.60H2 FREQ VEL LOG LOG  
\*\*\* NOTE \*\*\* Spectrum completely predefined

1.60H5 FREQ VEL LOG LOG  
\*\*\* NOTE \*\*\* Spectrum completely predefined

1.60H7 FREQ VEL LOG LOG  
\*\*\* NOTE \*\*\* Spectrum completely predefined

1.60H10 FREQ VEL LOG LOG  
\*\*\* NOTE \*\*\* Spectrum completely predefined

1.60V.5 FREQ VEL LOG LOG  
\*\*\* NOTE \*\*\* Spectrum completely predefined

1.60V2 FREQ VEL LOG LOG  
\*\*\* NOTE \*\*\* Spectrum completely predefined

1.60V5 FREQ VEL LOG LOG  
\*\*\* NOTE \*\*\* Spectrum completely predefined

1.60V7 FREQ VEL LOG LOG  
\*\*\* NOTE \*\*\* Spectrum completely predefined

1.60V10 FREQ VEL LOG LOG  
\*\*\* NOTE \*\*\* Spectrum completely predefined

\*\*\* NOTE \*\*\* Input check completed without errors

MODE	(Hz) FREQUENCY	(Radians/Sec) FREQUENCY	(Sec) PERIOD
1	8.107	50.935	.123
2	12.208	76.707	.082
3	12.662	79.560	.079
4	13.306	83.602	.075
5	14.810	93.057	.068
6	15.342	96.394	.065
7	17.799	111.834	.056
8	18.465	116.017	.054
9	18.528	116.412	.054
10	18.804	118.147	.053
11	19.838	124.647	.050
12	20.536	129.031	.049
13	20.564	129.207	.049
14	24.705	155.228	.040
15	25.088	157.630	.040
16	27.785	174.581	.036
17	28.664	180.104	.035
18	29.312	184.174	.034
19	30.357	190.740	.033
20	32.487	204.122	.031
21	33.078	207.837	.030

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.0000	.0000	.0000	.0000	.0000	.0000
10	.0016	.0008	.0019	.0012	.0155	.0061
15	.0016	.0025	.0064	.0022	.0223	.0090
20	.0020	.0054	.0132	.0033	.0238	.0108
25	.0087	.0094	.0199	.0028	.0118	.0071
30	.0059	.0066	.0169	.0103	.0191	.0076
35	.0023	.0011	.0092	.0134	.0250	.0103
40	.0063	.0034	.0064	.0134	.0174	.0106
50	.0108	.0075	.0109	.0080	.0048	.0102
55	.0054	.0034	.0054	.0078	.0109	.0110
60	.0001	.0000	.0001	.0108	.0118	.0113
65	.0100	.0118	.0100	.0124	.0161	.0129
70	.0123	.0155	.0123	.0106	.0106	.0085
80	.0005	.0030	.0008	.0162	.0251	.0151
85	.0005	.0008	.0053	.0158	.0241	.0146
90	.0005	.0024	.0089	.0155	.0217	.0135
95	.0005	.0068	.0156	.0149	.0090	.0068
100	.0004	.0000	.0001	.0141	.0123	.0072
105	.0005	.0066	.0018	.0145	.0216	.0031
110	.0010	.0064	.0030	.0147	.0340	.0035
115	.0060	.0052	.0099	.0142	.0405	.0037
120	.0300	.0053	.0338	.0087	.0400	.0037
125	.0487	.0048	.0525	.0061	.0148	.0074
130	.0448	.0098	.0486	.0030	.0295	.0044
135	.0253	.0041	.0290	.0064	.0476	.0067
140	.0012	.0001	.0012	.0009	.0141	.0004
150	.0000	.0000	.0000	.0000	.0000	.0000
1000	.0000	.0000	.0000	.0000	.0000	.0000
1010	.0005	.0002	.0007	.0001	.0044	.0007
1015	.0005	.0003	.0017	.0002	.0047	.0006
1020	.0006	.0005	.0030	.0004	.0027	.0002
1025	.0012	.0004	.0035	.0006	.0008	.0001
1030	.0005	.0000	.0029	.0002	.0027	.0008
1035	.0006	.0004	.0018	.0002	.0036	.0011
1040	.0015	.0005	.0015	.0003	.0041	.0011
1050	.0033	.0000	.0033	.0005	.0025	.0009
1055	.0033	.0006	.0034	.0008	.0025	.0007
1060	.0000	.0000	.0001	.0011	.0040	.0009
1065	.0014	.0002	.0014	.0010	.0012	.0011
1070	.0012	.0000	.0012	.0011	.0016	.0012
1080	.0004	.0002	.0005	.0020	.0019	.0005
1085	.0004	.0001	.0008	.0022	.0018	.0005
1090	.0004	.0000	.0010	.0025	.0016	.0004
1095	.0004	.0002	.0016	.0031	.0010	.0006
1100	.0004	.0000	.0001	.0056	.0036	.0020
1105	.0005	.0054	.0019	.0082	.0144	.0025
1110	.0013	.0055	.0051	.0089	.0303	.0010
1115	.0051	.0045	.0089	.0090	.0340	.0005
1120	.0258	.0001	.0295	.0069	.0372	.0011
1125	.0448	.0017	.0484	.0026	.0121	.0034
1130	.0388	.0001	.0424	.0012	.0256	.0026
1135	.0232	.0004	.0267	.0013	.0391	.0011
1140	.0004	.0000	.0004	.0002	.0067	.0002

CAESAR II DISPLACEMENT REPORT FILE:WV38-1 WVNS 6-55-4/2-038  
(OCC) Shock Case # 1 DATE:MAR 19,1992 SEISMIC INERTIA ANALYSIS

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1150	.0000	.0000	.0000	.0000	.0000	.0000



CAESAR II SUPPORT REACTIONS  
(OCC) Shock Case # 1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
SEISMIC INERTIA ANALYSIS

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			
TOTALS....FX	FY	FZ	MX	MY	MZ		
MODAL MAX.FX/Mode	FY/Mode	FZ/Mode	MX/Mode	MY/Mode	MZ/Mode		
1000	9	4	24	5	57	14	Rigid ANC
	5	4	17	4	42	13	
	4 Z(1)	5 Y(1)	4 Z(1)	5 Y(1)	4 Z(1)	5 Y(1)	
1030	0	5	0	0	0	0	Flex Y
		3					
		5 Y(1)					
1050	0	9	0	0	0	0	Flex Y
		4					
		12 Y(1)					
1060	10	0	10	0	0	0	Flex X
	5		5				
	11 Z(1)		11 Z(1)				
1060	0	6	0	0	0	0	Flex Y
		5					
		2 Y(1)					
1060	11	0	11	0	0	0	Flex X
	7		7				
	4 Z(1)		4 Z(1)				
1070	0	2	0	0	0	0	Flex Y
		1					
		6 Y(1)					
1090	0	8	0	0	0	0	Flex Y
		6					
		6 Y(1)					
1100	0	7	0	0	0	0	Flex Y
		7					
		6 Y(1)					
1100	0	0	24	0	0	0	Flex Z
			18				
		1 Z(1)					
1100	104	0	0	0	0	0	Flex X
	77						
	1 Z(1)						
1120	0	19	0	0	0	0	Flex Y
		14					
		6 Y(1)					
1130	0	16	0	0	0	0	Flex Y
		11					
		13 Y(1)					

CAESAR II SUPPORT REACTIONS  
(OCC) Shock Case # 1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
SEISMIC INERTIA ANALYSIS

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			
TOTALS....	FX	FY	FZ	MX	MY	MZ	
MODAL MAX.	FX/Mode	FY/Mode	FZ/Mode	MX/Mode	MY/Mode	MZ/Mode	
1150	30	3	102	5	290	5	Rigid ANC
	20	2	76	4	218	4	
	1 Z(1)	13 Y(1)	1 Z(1)	6 Y(1)	1 Z(1)	13 Y(1)	
1	4	0	2	1	11	3	Rigid ANC
	2		1		8	3	
	19 X(1)	5	19 X(1)	12	4 Z(1)	5 Y(1)	
15	0	6	0	0	0	0	Flex Y
		6					
		5 Y(1)					
15	0	0	14	0	0	0	Flex Z
			11				
			4 Z(1)				
35	0	6	0	0	0	0	Flex +Y
		3					
		12 Y(1)					
55	0	8	0	0	0	0	Flex Y
		3					
		12 Y(1)					
55	6	0	6	0	0	0	Flex X
	3		3				
	4 Z(1)		4 Z(1)				
60	8	0	8	0	0	0	Flex X
	5		5				
	11 Z(1)		11 Z(1)				
60	0	8	0	0	0	0	Flex Y
		8					
		2 Y(1)					
60	7	0	7	0	0	0	Flex X
	3		3				
	3 Z(1)		3 Z(1)				
85	0	6	0	0	0	0	Flex +Y
		3					
		8 Y(1)					
100	0	2	0	0	0	0	Flex Y
		1					
		8 Y(1)					
100	19	0	0	0	0	0	Flex X
	11						
	1 Z(1)						

CAESAR II SUPPORT REACTIONS  
(OCC) Shock Case # 1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
SEISMIC INERTIA ANALYSIS

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			
	TOTALS....FX	FY	FZ	MX	MY	MZ	
	MODAL MAX.FX/Mode	FY/Mode	FZ/Mode	MX/Mode	MY/Mode	MZ/Mode	
100	0	0	5 2 1 Z(1)	0	0	0	Flex Z
110	0	0	0	0	0	0	Flex X w/gap
110	0	0	0	0	0	0	Flex Z w/gap
115	0	6 5 6 Y(1)	0	0	0	0	Flex +Y
125	0	11 9 13 Y(1)	0	0	0	0	Flex Y
125	11 8 1 Z(1)	0	11 8 1 Z(1)	0	0	0	Flex X
135	0	11 9 13 Y(1)	0	0	0	0	Flex Y
135	6 4 1 Z(1)	0	6 4 1 Z(1)	0	0	0	Flex X
150	12 9 20 Z(1)	1 13	16 10 1 Z(1)	2 1 13 Y(1)	41 29 1 Z(1)	0 21	Rigid ANC

CAESAR II FORCE/STRESS REPORT  
(OCC) Shock Case # 1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
SEISMIC INERTIA ANALYSIS

NODE	----Forces(lb.)----			--Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	STRESS	ALLOW
1000	6	5	23	5	47	10	1.00	1.00	187	0
1010	6	5	23	2	18	1	1.94	1.61	135	0
1010	6	5	23	2	18	1	1.00	1.00	70	0
1015	6	5	23	2	9	4	1.00	1.00	40	0
1015	7	1	11	2	9	4	1.00	1.00	40	0
1020	7	1	11	2	19	3	1.94	1.61	149	0
1020	7	1	9	2	19	3	1.00	1.00	79	0
1025	7	1	9	1	23	2	1.00	1.00	91	0
1025	8	1	6	1	23	2	1.00	1.00	90	0
1030	8	1	6	5	15	6	1.00	1.00	68	0
1030	9	4	4	5	15	6	1.00	1.00	68	0
1035	9	4	4	3	8	1	1.00	1.00	35	0
1035	8	2	4	3	8	1	1.00	1.00	35	0
1040	8	2	4	0	6	1	1.94	1.61	50	0
1040	7	3	3	0	6	1	1.00	1.00	26	0
1050	7	3	3	8	24	8	1.00	1.00	104	0
1050	4	5	4	8	24	8	1.00	1.00	104	0
1055	4	5	4	9	35	8	1.00	1.00	143	0
1055	5	3	10	9	35	8	1.00	1.00	143	0
1060	5	3	10	4	22	4	1.00	1.00	89	0
1060	5	0	5	4	22	4	1.00	1.00	89	0
1065	5	0	5	1	20	2	1.00	1.00	78	0
1065	6	1	3	1	20	2	1.00	1.00	78	0
1070	6	1	3	2	13	2	1.00	1.00	54	0
1070	7	2	3	2	13	2	1.00	1.00	54	0
1080	7	2	3	6	7	5	2.71	2.71	97	0
1080	7	2	3	6	7	5	1.00	1.00	37	0
1085	7	2	3	6	7	6	1.00	1.00	39	0
1085	7	6	3	6	7	6	1.00	1.00	39	0
1090	7	6	3	6	8	9	1.00	1.00	48	0
1090	7	2	3	6	8	9	1.00	1.00	48	0
1095	7	2	3	6	11	3	1.00	1.00	48	0
1095	7	2	2	6	11	3	1.00	1.00	48	0
1100	7	2	2	6	22	18	1.00	1.00	110	0
1100	83	4	19	6	22	18	1.00	1.00	129	0
1105	83	4	19	6	132	15	1.00	1.00	525	0

CAESAR II FORCE/STRESS REPORT  
(OCC) Shock Case # 1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
SEISMIC INERTIA ANALYSIS

NODE	----Forces(lb.)----			---Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			STRESS	ALLOW
1105	83	2	19	6	132	15	1.00	1.00	525	0
1110	83	2	19	5	136	13	2.71	2.71	1408	0
1110	83	3	20	5	136	13	1.00	1.00	534	0
1115	83	3	20	4	100	11	1.00	1.00	401	0
1115	82	13	21	4	100	11	1.00	1.00	401	0
1120	82	13	21	30	58	22	1.00	1.00	280	0
1120	74	7	31	30	58	22	1.00	1.00	280	0
1125	74	7	31	19	204	14	1.00	1.00	792	0
1125	46	8	60	19	204	14	1.00	1.00	793	0
1130	46	8	60	12	150	16	1.00	1.00	590	0
1130	34	8	73	12	150	16	1.00	1.00	590	0
1135	34	8	73	7	61	11	1.00	1.00	257	0
1135	20	4	88	7	61	11	1.00	1.00	257	0
1140	20	4	88	6	194	3	1.94	1.61	1417	0
1140	20	4	88	6	194	3	1.00	1.00	739	0
1150	20	4	88	4	251	5	1.00	1.00	955	0
1	4	0	2	1	11	3	1.00	1.00	252	0
10	4	0	2	1	13	5	1.72	1.44	536	0
10	4	1	2	1	13	5	1.00	1.00	318	0
15	4	1	2	1	13	6	1.00	1.00	327	0
15	4	5	14	1	13	6	1.00	1.00	327	0
20	4	5	14	1	5	1	1.72	1.44	228	0
20	5	3	11	1	5	1	1.00	1.00	135	0
25	5	3	11	5	18	7	1.00	1.00	455	0
25	6	0	4	5	18	7	1.00	1.00	453	0
30	6	0	4	4	13	5	1.00	1.00	344	0
30	8	3	3	4	13	5	1.00	1.00	342	0
35	8	3	3	3	3	2	1.00	1.00	118	0
35	7	4	4	3	3	2	1.00	1.00	117	0
40	7	4	4	1	10	0	1.72	1.44	410	0
40	6	3	5	1	10	0	1.00	1.00	241	0
50	6	3	5	8	15	7	1.00	1.00	408	0
50	3	3	8	8	15	7	1.00	1.00	408	0
55	3	3	8	2	6	3	1.00	1.00	165	0

NODE	----Forces(lb.)----			--Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	STRESS	ALLOW
55	6	2	5	2	6	3	1.00	1.00	165	0
60	6	2	5	8	17	9	1.00	1.00	462	0
60	9	5	10	8	17	9	1.00	1.00	461	0
65	9	5	10	6	11	6	1.00	1.00	321	0
65	8	1	7	6	11	6	1.00	1.00	321	0
70	8	1	7	10	18	10	1.00	1.00	518	0
70	10	4	7	10	18	10	1.00	1.00	518	0
80	10	4	7	1	9	2	1.72	1.44	352	0
80	10	4	7	1	9	2	1.00	1.00	211	0
85	10	4	7	1	7	6	1.00	1.00	218	0
85	10	4	7	1	7	6	1.00	1.00	218	0
90	10	4	7	1	10	6	1.00	1.00	260	0
90	10	3	5	1	10	6	1.00	1.00	260	0
95	10	3	5	1	19	10	1.00	1.00	486	0
95	10	1	3	1	19	10	1.00	1.00	486	0
100	10	1	3	1	9	4	1.00	1.00	231	0
100	15	0	3	1	9	4	1.00	1.00	234	0
105	15	0	3	1	19	3	1.00	1.00	436	0
105	15	3	4	1	19	3	1.00	1.00	436	0
110	15	3	4	1	20	1	1.72	1.44	768	0
110	15	4	4	1	20	1	1.00	1.00	451	0
115	15	4	4	2	13	1	1.00	1.00	300	0
115	14	2	6	2	13	1	1.00	1.00	300	0
120	14	2	6	5	14	4	1.00	1.00	359	0
120	11	2	11	5	14	4	1.00	1.00	359	0
125	11	2	11	4	11	5	1.00	1.00	308	0
125	13	3	10	4	11	5	1.00	1.00	308	0
130	13	3	10	9	26	9	1.00	1.00	646	0
130	9	6	17	9	26	9	1.00	1.00	646	0
135	9	6	17	4	2	4	1.00	1.00	146	0
135	12	1	16	4	2	4	1.00	1.00	146	0
140	12	1	16	1	23	0	1.72	1.44	889	0
140	12	1	16	1	23	0	1.00	1.00	518	0
150	12	1	16	2	41	0	1.00	1.00	890	0

**SEISMIC INERTIA + WEIGHT ANALYSIS**  
**ANALYSIS OUTPUT**



CAESAR II SUPPORT REACTIONS  
(OCC)Combination # 1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
SEISMIC INERTIA + WEIGHT

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			
	FX	FY	FZ	MX	MY	MZ	
1000	9	110	24	97	57	212	Rigid ANC
1030	0	159	0	0	0	0	Flex Y
1050	0	128	0	0	0	0	Flex Y
1060	10	0	10	0	0	0	Flex X
1060	0	178	0	0	0	0	Flex Y
1060	11	0	11	0	0	0	Flex X
1070	0	83	0	0	0	0	Flex Y
1090	0	132	0	0	0	0	Flex Y
1100	0	219	0	0	0	0	Flex Y
1100	0	0	24	0	0	0	Flex Z
1100	104	0	0	0	0	0	Flex X
1120	0	239	0	0	0	0	Flex Y
1130	0	145	0	0	0	0	Flex Y
1150	30	84	102	5	290	88	Rigid ANC
1	4	14	2	20	11	40	Rigid ANC
15	0	42	0	0	0	0	Flex Y
15	0	0	14	0	0	0	Flex Z
35	0	63	0	0	0	0	Flex +Y
55	0	33	0	0	0	0	Flex Y
55	6	0	6	0	0	0	Flex X
60	8	0	8	0	0	0	Flex X
60	0	75	0	0	0	0	Flex Y
60	7	0	7	0	0	0	Flex X
85	0	69	0	0	0	0	Flex +Y
100	0	67	0	0	0	0	Flex Y
100	19	0	0	0	0	0	Flex X
100	0	0	5	0	0	0	Flex Z
110	0	0	0	0	0	0	Flex X w/gap
110	0	0	0	0	0	0	Flex Z w/gap
115	0	53	0	0	0	0	Flex +Y
125	0	64	0	0	0	0	Flex Y
125	11	0	11	0	0	0	Flex X
135	0	46	0	0	0	0	Flex Y
135	6	0	6	0	0	0	Flex X
150	12	19	16	5	41	21	Rigid ANC

NODE	----Forces(lb.)----			---Moments(ft.lb.)---					(lb./sq.in.)
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	STRESS ALLOW
1000	6	96	23	77	47	171	1.00	1.00	1404 22211
1010	6	72	23	43	18	35	1.94	1.61	939 22211
1010	6	72	23	43	18	35	1.00	1.00	798 22211
1015	6	61	23	43	9	34	1.00	1.00	754 22211
1015	7	21	11	43	9	34	1.00	1.00	754 22211
1020	7	5	11	44	19	50	1.94	1.61	1130 22211
1020	7	5	9	44	19	50	1.00	1.00	916 22211
1025	7	22	9	29	23	36	1.00	1.00	857 22211
1025	8	22	6	29	23	36	1.00	1.00	856 22211
1030	8	70	6	115	15	110	1.00	1.00	1237 22211
1030	9	89	4	115	15	110	1.00	1.00	1237 22211
1035	9	64	4	8	8	12	1.00	1.00	679 22211
1035	8	5	4	8	8	12	1.00	1.00	679 22211
1040	8	14	4	0	6	12	1.94	1.61	701 22211
1040	7	14	3	0	6	12	1.00	1.00	658 22211
1050	7	53	3	84	24	96	1.00	1.00	1138 22211
1050	4	75	4	84	24	96	1.00	1.00	1138 22211
1055	4	30	4	66	35	54	1.00	1.00	1014 22211
1055	5	3	10	66	35	54	1.00	1.00	1014 22211
1060	5	61	10	55	22	67	1.00	1.00	991 22211
1060	5	48	5	55	22	67	1.00	1.00	991 22211
1065	5	6	5	21	20	9	1.00	1.00	749 22211
1065	6	6	3	21	20	9	1.00	1.00	749 22211
1070	6	39	3	28	13	39	1.00	1.00	823 22211
1070	7	44	3	28	13	39	1.00	1.00	823 22211
1080	7	5	3	38	7	25	2.71	2.71	907 22211
1080	7	5	3	38	7	25	1.00	1.00	715 22211
1085	7	14	3	38	7	21	1.00	1.00	695 22211
1085	7	81	3	38	7	21	1.00	1.00	695 22211
1090	7	89	3	38	8	54	1.00	1.00	818 22211
1090	7	43	3	38	8	54	1.00	1.00	818 22211
1095	7	21	3	38	11	18	1.00	1.00	704 22211
1095	7	21	2	38	11	18	1.00	1.00	704 22211
1100	7	72	2	38	22	207	1.00	1.00	1413 22211
1100	83	82	19	38	22	207	1.00	1.00	1433 22211
1105	83	14	19	38	132	96	1.00	1.00	1428 22211

CAESAR II FORCE/STRESS REPORT  
(OCC)Combination # 1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
SEISMIC INERTIA + WEIGHT

NODE	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)
	FX	FY	FZ	MX	MY	MZ			STRESS ALLOW
1105	83	12	19	38	132	96	1.00	1.00	1428 22211
1110	83	22	19	35	136	83	2.71	2.71	2719 22211
1110	83	23	20	35	136	83	1.00	1.00	1398 22211
1115	83	31	20	20	100	67	1.00	1.00	1194 22211
1115	82	88	21	20	100	67	1.00	1.00	1194 22211
1120	82	129	21	264	58	217	1.00	1.00	2013 22211
1120	74	111	31	264	58	217	1.00	1.00	2013 22211
1125	74	59	31	45	204	79	1.00	1.00	1634 22211
1125	46	9	60	45	204	79	1.00	1.00	1634 22211
1130	46	67	60	98	150	63	1.00	1.00	1545 22211
1130	34	78	73	98	150	63	1.00	1.00	1545 22211
1135	34	43	73	37	61	80	1.00	1.00	1120 22211
1135	20	5	88	37	61	80	1.00	1.00	1120 22211
1140	20	57	88	40	194	34	1.94	1.61	2033 22211
1140	20	57	88	40	194	34	1.00	1.00	1350 22211
1150	20	66	88	8	251	67	1.00	1.00	1710 22211
1	4	14	2	20	11	40	1.00	1.00	1574 22211
10	4	2	2	9	13	29	1.72	1.44	1763 22211
10	4	3	2	9	13	29	1.00	1.00	1315 22211
15	4	5	2	9	13	32	1.00	1.00	1355 22211
15	4	36	14	9	13	32	1.00	1.00	1355 22211
20	4	28	14	7	5	10	1.72	1.44	767 22211
20	5	26	11	7	5	10	1.00	1.00	653 22211
25	5	13	11	26	18	44	1.00	1.00	1798 22211
25	6	9	4	26	18	44	1.00	1.00	1795 22211
30	6	16	4	15	13	32	1.00	1.00	1379 22211
30	8	19	3	15	13	32	1.00	1.00	1376 22211
35	8	32	3	28	3	11	1.00	1.00	1097 22211
35	7	32	4	28	3	11	1.00	1.00	1097 22211
40	7	26	4	3	10	5	1.72	1.44	1047 22211
40	6	25	5	3	10	5	1.00	1.00	827 22211
50	6	3	5	35	15	32	1.00	1.00	1660 22211
50	3	4	8	35	15	32	1.00	1.00	1660 22211
55	3	26	8	6	6	10	1.00	1.00	800 22211

CAESAR II FORCE/STRESS REPORT  
(OCC)Combination # 1

FILE:WV38-1  
DATE:MAR 19,1992

WVNS 6-55-4/2-038  
SEISMIC INERTIA + WEIGHT

NODE	----Forces(lb.)----			--Moments(ft.lb.)---					(lb./sq.in.)
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	STRESS ALLOW
55	6	5	5	6	6	10	1.00	1.00	800 22211
60	6	30	5	59	17	62	1.00	1.00	2513 22211
60	9	44	10	59	17	62	1.00	1.00	2513 22211
65	9	23	10	29	11	27	1.00	1.00	1468 22211
65	8	18	7	29	11	27	1.00	1.00	1468 22211
70	8	7	7	50	18	48	1.00	1.00	2168 22211
70	10	9	7	50	18	48	1.00	1.00	2168 22211
80	10	33	7	9	9	16	1.72	1.44	1236 22211
80	10	33	7	9	9	16	1.00	1.00	968 22211
85	10	38	7	9	7	48	1.00	1.00	1584 22211
85	10	33	7	9	7	48	1.00	1.00	1584 22211
90	10	29	7	9	10	28	1.00	1.00	1197 22211
90	10	28	5	9	10	28	1.00	1.00	1197 22211
95	10	16	5	9	19	26	1.00	1.00	1293 22211
95	10	14	3	9	19	26	1.00	1.00	1293 22211
100	10	34	3	9	9	68	1.00	1.00	2069 22211
100	15	32	3	9	9	68	1.00	1.00	2072 22211
105	15	15	3	9	19	8	1.00	1.00	1003 22211
105	15	18	4	9	19	8	1.00	1.00	1003 22211
110	15	22	4	10	20	9	1.72	1.44	1599 22211
110	15	22	4	10	20	9	1.00	1.00	1172 22211
115	15	28	4	25	13	22	1.00	1.00	1430 22211
115	14	25	6	25	13	22	1.00	1.00	1430 22211
120	14	4	6	15	14	16	1.00	1.00	1155 22211
120	11	4	11	15	14	16	1.00	1.00	1155 22211
125	11	28	11	34	11	32	1.00	1.00	1647 22211
125	13	31	10	34	11	32	1.00	1.00	1647 22211
130	13	7	10	24	26	26	1.00	1.00	1596 22211
130	9	9	17	24	26	26	1.00	1.00	1597 22211
135	9	27	17	16	2	15	1.00	1.00	968 22211
135	12	15	16	16	2	15	1.00	1.00	969 22211
140	12	13	16	8	23	10	1.72	1.44	1407 22211
140	12	13	16	8	23	10	1.00	1.00	1020 22211
150	12	19	16	5	41	21	1.00	1.00	1728 22211

**X - DIRECTION SEISMIC RELATIVE DISPLACEMENT  
ANALYSIS**

**DATA INPUT AND ANALYSIS OUTPUT**

Job Description:

WEST VALLEY NUCLEAR SERVICES COMPANAY INC;  
WEST VALLEY DEMONSTRATION PROJECT  
SLUDGE MOBILIZATION SYSTEM  
HLW TRANSFER PIPING 6-55-4/2-038  
FILE WV38RX  
X DIRECTION RELATIVE SEISMIC DISPLACEMENT

PIPE DATA

-----  
 From 1000 To 1010 DX= -1.414 ft. DZ= 1.413 ft.

PIPE

Dia= 4.500 in. Wall= .237 in. Insul= .000 in.

GENERAL

T1= 55 F T2= 220 F P1= 150 lb./sq.in. P2= 0.0 lb./sq.in.

Mat= (6)AUSTENITIC STAINLESS E= 28,300,000 lb./sq.in. v = .292

Density= .2893 lb./cu.in.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 44.999

DISPLACEMENTS

Node 1000 DX= .233 in. DY= .000 in. DZ= -.233 in. RX= .000

RY= .000 RZ= .000

ALLOWABLE STRESSES

B31.3 (1987) Sc= 16,700 lb./sq.in. Sh1= 16,700 lb./sq.in.

Sh2= 16,700 lb./sq.in. F1= 1.00 F2= 1.00

-----  
 From 1010 To 1015 DX= -1.250 ft.

-----  
 From 1015 To 1020 DX= -1.250 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000

-----  
 From 1020 To 1025 DX= -1.761 ft. DZ= 1.761 ft.

-----  
 From 1025 To 1030 DX= -3.085 ft. DZ= 3.085 ft.

RESTRAINTS

Node 1030 Y K= 250,000 lb./in.

-----  
 From 1030 To 1035 DX= -1.591 ft. DZ= 1.591 ft.

-----  
 From 1035 To 1040 DX= -.707 ft. DZ= .707 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

-----  
 From 1040 To 1050 DX= 2.828 ft. DZ= 2.828 ft.

RESTRAINTS

Node 1050 Y K= 250,000 lb./in.

-----  
 From 1050 To 1055 DX= 2.828 ft. DZ= 2.828 ft.

-----  
 From 1055 To 1060 DX= 3.712 ft. DZ= 3.712 ft.

RESTRAINTS

Node 1060 X K= 250,000 lb./in. Dir Vec= .7071 .0000 .7071

Node 1060 Y K= 250,000 lb./in.

Node 1060 X K= 250,000 lb./in. Dir Vec= .7071 .0000 -.7071

-----  
 From 1060 To 1065 DX= 2.651 ft. DZ= 2.651 ft.

-----  
 From 1065 To 1070 DX= 2.810 ft. DZ= 2.810 ft.

RESTRAINTS

Node 1070 Y K= 250,000 lb./in.



PIPE DATA

-----  
 From 1070 To 1080 DX= 2.828 ft. DZ= 2.828 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Mitters= 1  
 -----

From 1080 To 1085 DX= 1.000 ft.  
 -----

From 1085 To 1090 DX= .749 ft.

RESTRAINTS

Node 1090 Y K= 250,000 lb./in.  
 -----

From 1090 To 1095 DX= 1.999 ft.  
 -----

From 1095 To 1100 DX= 7.999 ft.

RESTRAINTS

Node 1100 Y K= 250,000 lb./in.

Node 1100 Z K= 250,000 lb./in.

Node 1100 X K= 250,000 lb./in.  
 -----

From 1100 To 1105 DX= 7.999 ft.  
 -----

From 1105 To 1110 DX= .646 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Mitters= 1  
 -----

From 1110 To 1115 DX= .707 ft. DZ= .707 ft.  
 -----

From 1115 To 1120 DX= 2.615 ft. DZ= 2.615 ft.

RESTRAINTS

Node 1120 Y K= 250,000 lb./in.  
 -----

From 1120 To 1125 DX= 3.349 ft. DZ= 3.349 ft.  
 -----

From 1125 To 1130 DX= 3.721 ft. DZ= 3.721 ft.

RESTRAINTS

Node 1130 Y K= 250,000 lb./in.  
 -----

From 1130 To 1135 DX= 2.243 ft. DZ= 2.243 ft.  
 -----

From 1135 To 1140 DX= 3.182 ft. DZ= 3.182 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000  
 -----

From 1140 To 1150 DX= .883 ft. DZ= -.883 ft.

DISPLACEMENTS

Node 1150 DX= -.233 in. DY= .000 in. DZ= .233 in. RX= .000

RY= .000 RZ= .000  
 -----

From 1 To 10 DX= -1.414 ft. DZ= 1.413 ft.

PIPE

Dia= 2.375 in. Wall= .154 in. Insul= .000 in.

GENERAL

T1= 220 F T2= 220 F Fluid= .0505 lb./cu.in.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 44.999

## PIPE DATA

Continued...

## RESTRAINTS

Node 1 ANC Cnode 1000

-----  
From 10 To 15 DX= -1.250 ft.

## RESTRAINTS

Node 15 Y Cnode 1015 K= 3,000 lb./in.

Node 15 Z Cnode 1015 K= 3,000 lb./in.

-----  
From 15 To 20 DX= -1.250 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

-----  
From 20 To 25 DX= -1.761 ft. DZ= 1.761 ft.-----  
From 25 To 30 DX= -3.085 ft. DZ= 3.085 ft.-----  
From 30 To 35 DX= -1.591 ft. DZ= 1.591 ft.

## RESTRAINTS

Node 35 +Y Cnode 1035 K= 9,000 lb./in.

-----  
From 35 To 40 DX= -.707 ft. DZ= .707 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000

-----  
From 40 To 50 DX= 2.828 ft. DZ= 2.828 ft.-----  
From 50 To 55 DX= 2.828 ft. DZ= 2.828 ft.

## RESTRAINTS

Node 55 Y Cnode 1055 K= 3,000 lb./in.

Node 55 X Cnode 1055 K= 3,000 lb./in. Dir Vec= -.7071 .0000 .7071

-----  
From 55 To 60 DX= 3.712 ft. DZ= 3.712 ft.

## RESTRAINTS

Node 60 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
.7071

Node 60 Y Cnode 1060 K= 603,000 lb./in.

Node 60 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
-.7071-----  
From 60 To 65 DX= 2.651 ft. DZ= 2.651 ft.-----  
From 65 To 70 DX= 2.810 ft. DZ= 2.810 ft.-----  
From 70 To 80 DX= 2.828 ft. DZ= 2.828 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

-----  
From 80 To 85 DX= 1.000 ft.

## RESTRAINTS

Node 85 +Y Cnode 1085 K= 9,000 lb./in.

## PIPE DATA

-----  
 From 85 To 90 DX= .749 ft.  
 -----

From 90 To 95 DX= 1.999 ft.  
 -----

From 95 To 100 DX= 7.999 ft.  
 -----

## RESTRAINTS

Node 100 Y Cnode 1100 K= 603,000 lb./in.

Node 100 X Cnode 1100 K= 603,000 lb./in.

Node 100 Z Cnode 1100 K= 603,000 lb./in.  
 -----

From 100 To 105 DX= 7.999 ft.  
 -----

From 105 To 110 DX= .646 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

## RESTRAINTS

Node 110 X Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.

Dir Vec= .7070 .0000 .7070

Node 110 Z Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.

Dir Vec= .7070 .0000 -.7070  
 -----

From 110 To 115 DX= .707 ft. DZ= .707 ft.

## RESTRAINTS

Node 115 +Y Cnode 1115 K= 9,000 lb./in.  
 -----

From 115 To 120 DX= 2.615 ft. DZ= 2.615 ft.

## ALLOWABLE STRESSES

B31.3 (1987)  
 -----

From 120 To 125 DX= 3.349 ft. DZ= 3.349 ft.

## RESTRAINTS

Node 125 Y Cnode 1125 K= 3,000 lb./in.

Node 125 X Cnode 1125 K= 3,000 lb./in. Dir Vec= .7071 .0000  
 -.7071  
 -----

From 125 To 130 DX= 3.721 ft. DZ= 3.721 ft.  
 -----

From 130 To 135 DX= 2.243 ft. DZ= 2.243 ft.

## RESTRAINTS

Node 135 Y Cnode 1135 K= 3,000 lb./in.

Node 135 X Cnode 1135 K= 3,000 lb./in. Dir Vec= .7071 .0000  
 -.7071  
 -----

From 135 To 140 DX= 3.182 ft. DZ= 3.182 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000  
 -----

From 140 To 150 DX= .883 ft. DZ= -.883 ft.

## RESTRAINTS

Node 150 ANC Cnode 1150

1CAESAR II DISPLACEMENT REPORT  
CASE 1 (EXP) DIS

FILE:WV38RX

DATE:MAR 18,1992

WVNS 6-55-4/2-038

X - RELATIVE SEISMIC DISPL.

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.2333	.0000	-.2330	.0000	.0000	.0000
10	.2358	.0000	-.2301	.0000	.0204	.0000
15	.2358	.0000	-.2245	.0000	.0257	.0000
20	.2362	.0000	-.2171	.0000	.0263	.0000
25	.2445	.0000	-.2088	.0000	.0190	.0000
30	.2464	.0000	-.2068	.0000	-.0180	.0000
35	.2355	.0000	-.2177	.0000	-.0491	.0000
40	.2238	.0000	-.2235	.0000	-.0902	.0000
50	.1603	.0000	-.1600	.0000	-.1315	.0000
55	.0805	.0000	-.0802	.0000	-.1301	.0000
60	.0005	.0000	-.0002	.0000	-.0644	.0000
65	-.0183	.0000	.0186	.0000	-.0081	.0000
70	-.0131	.0000	.0134	.0000	.0202	.0000
80	-.0007	.0000	.0007	.0000	.0124	.0000
85	-.0007	.0000	-.0012	.0000	.0082	.0000
90	-.0007	.0000	-.0022	.0000	.0052	.0000
95	-.0007	.0000	-.0030	.0000	-.0008	.0000
100	-.0007	.0000	-.0002	.0000	.0056	.0000
105	-.0007	.0000	-.0049	.0000	-.0184	.0000
110	-.0012	.0000	-.0015	.0000	-.0334	.0000
115	-.0062	.0000	.0036	.0000	-.0427	.0000
120	-.0384	.0000	.0357	.0000	-.0721	.0000
125	-.0961	.0000	.0934	.0000	-.0884	.0000
130	-.1642	.0000	.1615	.0000	-.0829	.0000
135	-.2004	.0000	.1976	.0000	-.0695	.0000
140	-.2340	.0000	.2326	.0000	-.0102	.0000
150	-.2333	.0000	.2333	.0000	.0000	.0000
1000	.2333	.0000	-.2330	.0000	.0000	.0000
1010	.2354	.0000	-.2301	.0000	.0218	.0000
1015	.2354	.0000	-.2248	.0000	.0251	.0000
1020	.2361	.0000	-.2174	.0000	.0229	.0000
1025	.2429	.0000	-.2106	.0000	.0158	.0000
1030	.2442	.0000	-.2092	.0000	-.0156	.0000
1035	.2350	.0000	-.2184	.0000	-.0409	.0000
1040	.2207	.0000	-.2205	.0000	-.1016	.0000
1050	.1590	.0000	-.1588	.0000	-.1311	.0000
1055	.0802	.0000	-.0800	.0000	-.1283	.0000
1060	.0005	.0000	-.0002	.0000	-.0650	.0000
1065	-.0188	.0000	.0191	.0000	-.0092	.0000
1070	-.0139	.0000	.0142	.0000	.0202	.0000
1080	-.0008	.0000	.0006	.0000	.0100	.0000
1085	-.0008	.0000	-.0008	.0000	.0070	.0000
1090	-.0008	.0000	-.0017	.0000	.0044	.0000
1095	-.0007	.0000	-.0024	.0000	-.0005	.0000
1100	-.0007	.0000	-.0002	.0000	.0048	.0000
1105	-.0007	.0000	-.0046	.0000	-.0149	.0000
1110	-.0017	.0000	-.0010	.0000	-.0397	.0000
1115	-.0068	.0000	.0041	.0000	-.0465	.0000
1120	-.0396	.0000	.0369	.0000	-.0714	.0000
1125	-.0963	.0000	.0935	.0000	-.0870	.0000
1130	-.1640	.0000	.1611	.0000	-.0827	.0000

1CAESAR II DISPLACEMENT REPORT FILE:WV38RX WVNS 6-55-4/2-038  
CASE 1 (EXP) DIS DATE:MAR 18,1992 X - RELATIVE SEISMIC DISPL.

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1135	-.2000	.0000	.1970	.0000	-.0688	.0000
1140	-.2335	.0000	.2331	.0000	-.0050	.0000
1150	-.2333	.0000	.2333	.0000	.0000	.0000

1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38RX

WVNS 6-55-4/2-038

DATE:MAR 18,1992

X - RELATIVE SEISMIC DISPL.

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	31.	0.	31.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	85.	0.	-85.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-57.	0.	0.	0.	Flex Z
1100	-163.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	0.	0.	Flex Y
1	-2.	0.	6.	0.	21.	0.	Rigid ANC
15	0.	0.	0.	0.	0.	0.	Flex Y
15	0.	0.	1.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	0.	0.	0.	0.	0.	Flex Y
55	1.	0.	-1.	0.	0.	0.	Flex X
60	2.	0.	2.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	7.	0.	-7.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	-16.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	-6.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	1.	0.	-1.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
135	-1.	0.	1.	0.	0.	0.	Flex X
150	8.	0.	3.	0.	-19.	0.	Rigid ANC
1000	-23.	0.	72.	0.	209.	0.	Displ. Reaction
1150	71.	0.	39.	0.	-158.	0.	Displ. Reaction

1 CAESAR II STRESS SUMMARY  
CASE 1 (EXP) DIS

FILE:WV38RX  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
X - RELATIVE SEISMIC DISPL.

\*\*\*\* CODE STRESS CHECK PASSED

PIPING CODE: B31.3 (1987)

HIGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	2270.	@NODE 1040	ALLOWABLE:	25050.
BENDING STRESS:	2270.	@NODE 1040		
TORSIONAL STRESS:	0.	@NODE 80		
AXIAL STRESS:	26.	@NODE 1080		
3D MAXIMUM SHEAR:	2279.	@NODE 1040		

STRESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES  
IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST  
CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 526.

-----/BETWEEN/---/BELOW/

CODE STRESS 90-100%	1.92	98.08
CODE STRESS 80-90 %	.00	98.08
CODE STRESS 70-80 %	1.92	96.15
CODE STRESS 60-70 %	1.92	94.23
CODE STRESS 50-60 %	2.88	91.35
CODE STRESS 25-50 %	22.12	69.23
CODE STRESS 0-25 %	69.23	

PIPE ELEMENTS ANALYZED: 52

SAMPLED POINTS: 104



1 CAESAR II FORCE/STRESS REPORT FILE:WV38RX WVNS 6-55-4/2-038  
CASE 1 (EXP) DIS DATE:MAR 18,1992 X - RELATIVE SEISMIC DISPL.

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			(lb./sq.in.)			
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
1000	21	0	-65	0	-188	0	1.00	1.00	703	25050
1010	-21	0	65	0	112	0	1.94	1.61	813	25050
1010	21	0	-65	0	-112	0	1.00	1.00	420	25050
1015	-21	0	65	0	44	0	1.00	1.00	166	25050
1015	21	0	-64	0	-44	0	1.00	1.00	166	25050
1020	-21	0	64	0	-41	0	1.94	1.61	303	25050
1020	21	0	-64	0	41	0	1.00	1.00	156	25050
1025	-21	0	64	0	-111	0	1.00	1.00	416	25050
1025	21	0	-64	0	111	0	1.00	1.00	416	25050
1030	-21	0	64	0	-244	0	1.00	1.00	914	25050
1030	21	0	-64	0	244	0	1.00	1.00	914	25050
1035	-21	0	64	0	-313	0	1.00	1.00	1170	25050
1035	21	0	-64	0	313	0	1.00	1.00	1170	25050
1040	-21	0	64	0	-314	0	1.94	1.61	2269	25050
1040	21	0	-64	0	314	0	1.00	1.00	1172	25050
1050	-21	0	64	0	-103	0	1.00	1.00	385	25050
1050	21	0	-64	0	103	0	1.00	1.00	385	25050
1055	-21	0	64	0	137	0	1.00	1.00	514	25050
1055	21	0	-65	0	-137	0	1.00	1.00	514	25050
1060	-21	0	65	0	460	0	1.00	1.00	1717	25050
1060	-83	0	-15	0	-460	0	1.00	1.00	1717	25050
1065	83	0	15	0	279	0	1.00	1.00	1042	25050
1065	-83	0	-15	0	-279	0	1.00	1.00	1042	25050
1070	83	0	15	0	87	0	1.00	1.00	327	25050
1070	-83	0	-15	0	-87	0	1.00	1.00	327	25050
1080	83	0	15	0	-101	0	2.71	2.71	1030	25050
1080	-83	0	-15	0	101	0	1.00	1.00	380	25050
1085	83	0	15	0	-89	0	1.00	1.00	333	25050
1085	-83	0	-15	0	89	0	1.00	1.00	333	25050
1090	83	0	15	0	-77	0	1.00	1.00	289	25050
1090	-83	0	-15	0	77	0	1.00	1.00	289	25050
1095	83	0	15	0	-46	0	1.00	1.00	172	25050
1095	-83	0	-15	0	46	0	1.00	1.00	172	25050
1100	83	0	15	0	79	0	1.00	1.00	296	25050

1 CAESAR II FORCE/STRESS REPORT FILE:WV38RX WVNS 6-55-4/2-038  
CASE 1 (EXP) DIS DATE:MAR 18,1992 X - RELATIVE SEISMIC DISPL.

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			CODE	ALLOW.
1100	63	0	35	0	-79	0	1.00	1.00	296	25050
1105	-63	0	-35	0	-201	0	1.00	1.00	753	25050
1105	63	0	35	0	201	0	1.00	1.00	753	25050
1110	-63	0	-35	0	-220	0	2.71	2.71	2228	25050
1110	63	0	35	0	220	0	1.00	1.00	822	25050
1115	-63	0	-35	0	-204	0	1.00	1.00	762	25050
1115	63	0	35	0	204	0	1.00	1.00	762	25050
1120	-63	0	-35	0	-129	0	1.00	1.00	484	25050
1120	63	0	35	0	129	0	1.00	1.00	484	25050
1125	-63	0	-35	0	-34	0	1.00	1.00	128	25050
1125	64	0	34	0	34	0	1.00	1.00	128	25050
1130	-64	0	-34	0	75	0	1.00	1.00	282	25050
1130	64	0	34	0	-75	0	1.00	1.00	282	25050
1135	-64	0	-34	0	141	0	1.00	1.00	529	25050
1135	62	0	36	0	-141	0	1.00	1.00	529	25050
1140	-62	0	-36	0	191	0	1.94	1.61	1384	25050
1140	62	0	36	0	-191	0	1.00	1.00	714	25050
1150	-62	0	-36	0	139	0	1.00	1.00	519	25050
1	2	0	-6	0	-20	0	1.00	1.00	444	25050
10	-2	0	6	0	14	0	1.72	1.44	522	25050
10	2	0	-6	0	-14	0	1.00	1.00	303	25050
15	-2	0	6	0	6	0	1.00	1.00	148	25050
15	2	0	-7	0	-6	0	1.00	1.00	148	25050
20	-2	0	7	0	-2	0	1.72	1.44	96	25050
20	2	0	-7	0	2	0	1.00	1.00	55	25050
25	-2	0	7	0	-11	0	1.00	1.00	243	25050
25	2	0	-7	0	11	0	1.00	1.00	243	25050
30	-2	0	7	0	-27	0	1.00	1.00	586	25050
30	2	0	-7	0	27	0	1.00	1.00	586	25050
35	-2	0	7	0	-35	0	1.00	1.00	763	25050
35	2	0	-7	0	35	0	1.00	1.00	763	25050
40	-2	0	7	0	-37	0	1.72	1.44	1389	25050
40	2	0	-7	0	37	0	1.00	1.00	805	25050
50	-2	0	7	0	-12	0	1.00	1.00	269	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38RX  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
X - RELATIVE SEISMIC DISPL.

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.) CODE ALLOW.	
	FX	FY	FZ	MX	MY	MZ				
50	2	0	-7	0	12	0	1.00	1.00	269	25050
55	-2	0	7	0	14	0	1.00	1.00	301	25050
55	1	0	-6	0	-14	0	1.00	1.00	301	25050
60	-1	0	6	0	43	0	1.00	1.00	921	25050
60	-8	0	-1	0	-43	0	1.00	1.00	921	25050
65	8	0	1	0	25	0	1.00	1.00	547	25050
65	-8	0	-1	0	-25	0	1.00	1.00	547	25050
70	8	0	1	0	7	0	1.00	1.00	150	25050
70	-8	0	-1	0	-7	0	1.00	1.00	150	25050
80	8	0	1	0	-11	0	1.72	1.44	422	25050
80	-8	0	-1	0	11	0	1.00	1.00	245	25050
85	8	0	1	0	-9	0	1.00	1.00	211	25050
85	-8	0	-1	0	9	0	1.00	1.00	211	25050
90	8	0	1	0	-8	0	1.00	1.00	183	25050
90	-8	0	-1	0	8	0	1.00	1.00	183	25050
95	8	0	1	0	-5	0	1.00	1.00	109	25050
95	-8	0	-1	0	5	0	1.00	1.00	109	25050
100	8	0	1	0	8	0	1.00	1.00	188	25050
100	7	0	3	0	-8	0	1.00	1.00	188	25050
105	-7	0	-3	0	-22	0	1.00	1.00	482	25050
105	7	0	3	0	22	0	1.00	1.00	482	25050
110	-7	0	-3	0	-24	0	1.72	1.44	915	25050
110	7	0	3	0	24	0	1.00	1.00	531	25050
115	-7	0	-3	0	-22	0	1.00	1.00	484	25050
115	7	0	3	0	22	0	1.00	1.00	484	25050
120	-7	0	-3	0	-13	0	1.00	1.00	292	25050
120	7	0	3	0	13	0	1.00	1.00	292	25050
125	-7	0	-3	0	-2	0	1.00	1.00	45	25050
125	6	0	4	0	2	0	1.00	1.00	45	25050
130	-6	0	-4	0	6	0	1.00	1.00	147	25050
130	6	0	4	0	-6	0	1.00	1.00	147	25050
135	-6	0	-4	0	12	0	1.00	1.00	264	25050
135	8	0	2	0	-12	0	1.00	1.00	264	25050
140	-8	0	-2	0	27	0	1.72	1.44	1010	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38RX  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
X - RELATIVE SEISMIC DISPL.

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			CODE	ALLOW.
140	8	0	2	0	-27	0	1.00	1.00	586	25050
150	-8	0	-2	0	19	0	1.00	1.00	415	25050

**. Y - DIRECTION SEISMIC RELATIVE DISPLACEMENT  
ANALYSIS**

**DATA INPUT AND ANALYSIS OUTPUT**

Job Description:

WEST VALLEY NUCLEAR SERVICES COMPANY INC;  
WEST VALLEY DEMONSTRATION PROJECT  
SLUDGE MOBILIZATION SYSTEM  
HLW TRANSFER PIPING 6-55-4/2-038  
FILE WV38RY    Y DIRECTION RELATIVE SEISMIC DISPLACEMENT

PIPE DATA

-----  
 From 1000 To 1010 DX= -1.414 ft. DZ= 1.413 ft.

PIPE

Dia= 4.500 in. Wall= .237 in. Insul= .000 in.

GENERAL

T1= 55 F T2= 220 F P1= 150 lb./sq.in. P2= 0.0 lb./sq.in.

Mat= (6)AUSTENITIC STAINLESS E= 28,300,000 lb./sq.in. v = .292

Density= .2893 lb./cu.in.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 44.999

DISPLACEMENTS

Node 1000 DX= .000 in. DY= .250 in. DZ= .000 in. RX= .000

RY= .000 RZ= .000

ALLOWABLE STRESSES

B31.3 (1987) Sc= 16,700 lb./sq.in. Sh1= 16,700 lb./sq.in.

Sh2= 16,700 lb./sq.in. F1= 1.00 F2= 1.00

-----  
 From 1010 To 1015 DX= -1.250 ft.

-----  
 From 1015 To 1020 DX= -1.250 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000

-----  
 From 1020 To 1025 DX= -1.761 ft. DZ= 1.761 ft.

-----  
 From 1025 To 1030 DX= -3.085 ft. DZ= 3.085 ft.

RESTRAINTS

Node 1030 Y K= 250,000 lb./in.

-----  
 From 1030 To 1035 DX= -1.591 ft. DZ= 1.591 ft.

-----  
 From 1035 To 1040 DX= -.707 ft. DZ= .707 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

-----  
 From 1040 To 1050 DX= 2.828 ft. DZ= 2.828 ft.

RESTRAINTS

Node 1050 Y K= 250,000 lb./in.

-----  
 From 1050 To 1055 DX= 2.828 ft. DZ= 2.828 ft.

-----  
 From 1055 To 1060 DX= 3.712 ft. DZ= 3.712 ft.

RESTRAINTS

Node 1060 X K= 250,000 lb./in. Dir Vec= .7071 .0000 .7071

Node 1060 Y K= 250,000 lb./in.

Node 1060 X K= 250,000 lb./in. Dir Vec= .7071 .0000 -.7071

-----  
 From 1060 To 1065 DX= 2.651 ft. DZ= 2.651 ft.

-----  
 From 1065 To 1070 DX= 2.810 ft. DZ= 2.810 ft.

RESTRAINTS

Node 1070 Y K= 250,000 lb./in.



PIPE DATA

From 1070 To 1080 DX= 2.828 ft. DZ= 2.828 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Mitters= 1

From 1080 To 1085 DX= 1.000 ft.

From 1085 To 1090 DX= .749 ft.

RESTRAINTS

Node 1090 Y K= 250,000 lb./in.

From 1090 To 1095 DX= 1.999 ft.

From 1095 To 1100 DX= 7.999 ft.

RESTRAINTS

Node 1100 Y K= 250,000 lb./in.

Node 1100 Z K= 250,000 lb./in.

Node 1100 X K= 250,000 lb./in.

From 1100 To 1105 DX= 7.999 ft.

From 1105 To 1110 DX= .646 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Mitters= 1

From 1110 To 1115 DX= .707 ft. DZ= .707 ft.

From 1115 To 1120 DX= 2.615 ft. DZ= 2.615 ft.

RESTRAINTS

Node 1120 Y K= 250,000 lb./in.

From 1120 To 1125 DX= 3.349 ft. DZ= 3.349 ft.

From 1125 To 1130 DX= 3.721 ft. DZ= 3.721 ft.

RESTRAINTS

Node 1130 Y K= 250,000 lb./in.

From 1130 To 1135 DX= 2.243 ft. DZ= 2.243 ft.

From 1135 To 1140 DX= 3.182 ft. DZ= 3.182 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

From 1140 To 1150 DX= .883 ft. DZ= -.883 ft.

DISPLACEMENTS

Node 1150 DX= .000 in. DY= -.250 in. DZ= .000 in. RX= .000

RY= .000 RZ= .000

From 1 To 10 DX= -1.414 ft. DZ= 1.413 ft.

PIPE

Dia= 2.375 in. Wall= .154 in. Insul= .000 in.

GENERAL

T1= 220 F T2= 220 F Fluid= .0505 lb./cu.in.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 44.999

## PIPE DATA

Continued...

## RESTRAINTS

Node 1    ANC    Cnode 1000

-----  
From 10 To 15    DX= -1.250 ft.

## RESTRAINTS

Node 15    Y    Cnode 1015    K= 3,000 lb./in.

Node 15    Z    Cnode 1015    K= 3,000 lb./in.

-----  
From 15 To 20    DX= -1.250 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG)    Bend Angle= 45.000

-----  
From 20 To 25    DX= -1.761 ft.    DZ= 1.761 ft.-----  
From 25 To 30    DX= -3.085 ft.    DZ= 3.085 ft.-----  
From 30 To 35    DX= -1.591 ft.    DZ= 1.591 ft.

## RESTRAINTS

Node 35    +Y    Cnode 1035    K= 9,000 lb./in.

-----  
From 35 To 40    DX= -.707 ft.    DZ= .707 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG)    Bend Angle= 90.000

-----  
From 40 To 50    DX= 2.828 ft.    DZ= 2.828 ft.-----  
From 50 To 55    DX= 2.828 ft.    DZ= 2.828 ft.

## RESTRAINTS

Node 55    Y    Cnode 1055    K= 3,000 lb./in.

Node 55    X    Cnode 1055    K= 3,000 lb./in.    Dir Vec= -.7071    .0000    .7071

-----  
From 55 To 60    DX= 3.712 ft.    DZ= 3.712 ft.

## RESTRAINTS

Node 60    X    Cnode 1060    K= 603,000 lb./in.    Dir Vec= .7071    .0000  
.7071

Node 60    Y    Cnode 1060    K= 603,000 lb./in.

Node 60    X    Cnode 1060    K= 603,000 lb./in.    Dir Vec= .7071    .0000  
-.7071-----  
From 60 To 65    DX= 2.651 ft.    DZ= 2.651 ft.-----  
From 65 To 70    DX= 2.810 ft.    DZ= 2.810 ft.-----  
From 70 To 80    DX= 2.828 ft.    DZ= 2.828 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG)    Bend Angle= 45.000

-----  
From 80 To 85    DX= 1.000 ft.

## RESTRAINTS

Node 85    +Y    Cnode 1085    K= 9,000 lb./in.

PIPE DATA

-----  
 From 85 To 90 DX= .749 ft.  
 -----

From 90 To 95 DX= 1.999 ft.  
 -----

From 95 To 100 DX= 7.999 ft.  
 -----

RESTRAINTS

Node 100 Y Cnode 1100 K= 603,000 lb./in.

Node 100 X Cnode 1100 K= 603,000 lb./in.

Node 100 Z Cnode 1100 K= 603,000 lb./in.  
 -----

From 100 To 105 DX= 7.999 ft.  
 -----

From 105 To 110 DX= .646 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

RESTRAINTS

Node 110 X Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.

Dir Vec= .7070 .0000 .7070

Node 110 Z Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.

Dir Vec= .7070 .0000 -.7070  
 -----

From 110 To 115 DX= .707 ft. DZ= .707 ft.

RESTRAINTS

Node 115 +Y Cnode 1115 K= 9,000 lb./in.  
 -----

From 115 To 120 DX= 2.615 ft. DZ= 2.615 ft.

ALLOWABLE STRESSES

B31.3 (1987)  
 -----

From 120 To 125 DX= 3.349 ft. DZ= 3.349 ft.

RESTRAINTS

Node 125 Y Cnode 1125 K= 3,000 lb./in.

Node 125 X Cnode 1125 K= 3,000 lb./in. Dir Vec= .7071 .0000  
 -.7071  
 -----

From 125 To 130 DX= 3.721 ft. DZ= 3.721 ft.  
 -----

From 130 To 135 DX= 2.243 ft. DZ= 2.243 ft.

RESTRAINTS

Node 135 Y Cnode 1135 K= 3,000 lb./in.

Node 135 X Cnode 1135 K= 3,000 lb./in. Dir Vec= .7071 .0000  
 -.7071  
 -----

From 135 To 140 DX= 3.182 ft. DZ= 3.182 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000  
 -----

From 140 To 150 DX= .883 ft. DZ= -.883 ft.

RESTRAINTS

Node 150 ANC Cnode 1150

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.0000	.2500	.0000	.0000	.0000	.0000
10	.0000	.2385	.0000	.0227	.0000	.0507
15	.0000	.2251	.0000	.0289	.0000	.0584
20	.0000	.2082	.0000	.0367	.0000	.0608
25	.0000	.1720	.0000	.0466	.0000	.0600
30	.0000	.1005	.0000	.0593	.0000	.0528
35	.0000	.0635	.0000	.0630	.0000	.0464
40	.0000	.0468	.0000	.0643	.0000	.0415
50	.0000	.0316	.0000	.0610	.0000	.0311
55	.0000	.0146	.0000	.0516	.0000	.0258
60	.0000	.0003	.0000	.0341	.0000	.0241
65	.0000	-.0022	.0000	.0224	.0000	.0221
70	.0000	-.0013	.0000	.0140	.0000	.0160
80	.0000	-.0013	.0000	.0100	.0000	.0042
85	.0000	-.0008	.0000	.0098	.0000	.0016
90	.0000	-.0007	.0000	.0096	.0000	-.0004
95	.0000	-.0017	.0000	.0091	.0000	-.0037
100	.0000	-.0001	.0000	.0070	.0000	.0139
105	.0000	.0433	.0000	.0050	.0000	.0287
110	.0000	.0475	.0000	.0052	.0000	.0262
115	.0000	.0501	.0000	.0050	.0000	.0237
120	.0000	.0556	.0000	.0094	.0000	.0082
125	.0000	.0390	.0000	.0272	.0000	-.0238
130	.0000	-.0328	.0000	.0635	.0000	-.0759
135	.0000	-.1144	.0000	.0942	.0000	-.1161
140	.0000	-.2488	.0000	.0333	.0000	-.0451
150	.0000	-.2500	.0000	.0000	.0000	.0000
1000	.0000	.2500	.0000	.0000	.0000	.0000
1010	.0000	.2373	.0000	.0281	.0000	.0772
1015	.0000	.2184	.0000	.0371	.0000	.0941
1020	.0000	.1861	.0000	.0556	.0000	.1266
1025	.0000	.1204	.0000	.0609	.0000	.1395
1030	.0000	.0009	.0000	.0285	.0000	.1215
1035	.0000	-.0417	.0000	.0058	.0000	.1063
1040	.0000	-.0493	.0000	-.0062	.0000	.1020
1050	.0000	-.0007	.0000	.0094	.0000	.0742
1055	.0000	.0142	.0000	.0373	.0000	.0325
1060	.0000	.0003	.0000	.0332	.0000	.0184
1065	.0000	-.0022	.0000	.0181	.0000	.0205
1070	.0000	-.0002	.0000	.0118	.0000	.0130
1080	.0000	-.0011	.0000	.0060	.0000	.0041
1085	.0000	-.0005	.0000	.0041	.0000	.0038
1090	.0000	.0001	.0000	.0022	.0000	.0039
1095	.0000	.0018	.0000	-.0027	.0000	.0040
1100	.0000	-.0001	.0000	-.0223	.0000	-.0100
1105	.0000	-.0281	.0000	-.0420	.0000	-.0173
1110	.0000	-.0293	.0000	-.0457	.0000	-.0120
1115	.0000	-.0252	.0000	-.0474	.0000	-.0105
1120	.0000	.0005	.0000	-.0588	.0000	-.0001
1125	.0000	.0389	.0000	-.0440	.0000	-.0159
1130	.0000	-.0014	.0000	.0491	.0000	-.1103

1CAESAR II DISPLACEMENT REPORT FILE:WV38RY

WVNS 6-55-4/2-038

CASE 1 (EXP) DIS

DATE:MAR 18,1992

Y - RELATIVE SEISMIC DISPL.

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1135	.0000	-.1035	.0000	.0935	.0000	-.1556
1140	.0000	-.2494	.0000	.0204	.0000	-.0284
1150	.0000	-.2500	.0000	.0000	.0000	.0000

1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38RY

WVNS 6-55-4/2-038

DATE:MAR 18,1992

Y - RELATIVE SEISMIC DISPL.

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	220.	0.	0.	0.	0.	Flex Y
1050	0.	-175.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	83.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1070	0.	-40.	0.	0.	0.	0.	Flex Y
1090	0.	24.	0.	0.	0.	0.	Flex Y
1100	0.	-19.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Z
1100	0.	0.	0.	0.	0.	0.	Flex X
1120	0.	116.	0.	0.	0.	0.	Flex Y
1130	0.	-353.	0.	0.	0.	0.	Flex Y
1	0.	-21.	0.	40.	0.	60.	Rigid ANC
15	0.	20.	0.	0.	0.	0.	Flex Y
15	0.	0.	0.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	1.	0.	0.	0.	0.	Flex Y
55	0.	0.	0.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex X
60	0.	1.	0.	0.	0.	0.	Flex Y
60	0.	0.	0.	0.	0.	0.	Flex X
85	0.	-3.	0.	0.	0.	0.	Flex +Y
100	0.	4.	0.	0.	0.	0.	Flex Y
100	0.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	0.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	0.	0.	0.	0.	0.	0.	Flex X
135	0.	-33.	0.	0.	0.	0.	Flex Y
135	0.	0.	0.	0.	0.	0.	Flex X
150	0.	31.	0.	45.	0.	-94.	Rigid ANC
1000	0.	-104.	0.	322.	0.	638.	Displ. Reaction
1150	0.	249.	0.	479.	0.	-909.	Displ. Reaction

1 CAESAR II STRESS SUMMARY  
CASE 1 (EXP) DIS

FILE:WV38RY  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
Y - RELATIVE SEISMIC DISPL.

\*\*\*\* CODE STRESS CHECK PASSED

PIPING CODE: B31.3 (1987)

HIGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	3450.	@NODE 1150	ALLOWABLE:	25050.
BENDING STRESS:	3338.	@NODE 1130		
TORSIONAL STRESS:	1650.	@NODE 1140		
AXIAL STRESS:	0.	@NODE 1		
3D MAXIMUM SHEAR:	3450.	@NODE 1150		

STRESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES  
IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST  
CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 662.

-----/BETWEEN/---/BELOW/

CODE STRESS 90-100%	4.81	95.19
CODE STRESS 80-90 %	.00	95.19
CODE STRESS 70-80 %	.96	94.23
CODE STRESS 60-70 %	3.85	90.38
CODE STRESS 50-60 %	.96	89.42
CODE STRESS 25-50 %	11.54	77.88
CODE STRESS 0-25 %	77.88	

PIPE ELEMENTS ANALYZED: 52

SAMPLED POINTS: 104



1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38RY

WVNS 6-55-4/2-038

DATE:MAR 18,1992

Y - RELATIVE SEISMIC DISPL.

DATA POINT	----Forces(lb.)-----			--Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
1000	0	82	0	-282	0	-578	1.00	1.00	2401	25050
1010	0	-82	0	165	0	443	1.94	1.61	2743	25050
1010	0	82	0	-165	0	-443	1.00	1.00	1767	25050
1015	0	-82	0	165	0	357	1.00	1.00	1469	25050
1015	0	102	0	-165	0	-357	1.00	1.00	1469	25050
1020	0	-102	0	150	0	213	1.94	1.61	1558	25050
1020	0	102	0	-150	0	-213	1.00	1.00	974	25050
1025	0	-102	0	-16	0	47	1.00	1.00	187	25050
1025	0	102	0	16	0	-47	1.00	1.00	187	25050
1030	0	-102	0	-333	0	-269	1.00	1.00	1602	25050
1030	0	-116	0	333	0	269	1.00	1.00	1602	25050
1035	0	116	0	-147	0	-84	1.00	1.00	634	25050
1035	0	-116	0	147	0	84	1.00	1.00	634	25050
1040	0	116	0	-23	0	-42	1.94	1.61	193	25050
1040	0	-116	0	23	0	42	1.00	1.00	182	25050
1050	0	116	0	265	0	-331	1.00	1.00	1586	25050
1050	0	58	0	-265	0	331	1.00	1.00	1586	25050
1055	0	-58	0	100	0	-166	1.00	1.00	726	25050
1055	0	59	0	-100	0	166	1.00	1.00	726	25050
1060	0	-59	0	-119	0	53	1.00	1.00	489	25050
1060	0	-22	0	119	0	-53	1.00	1.00	489	25050
1065	0	22	0	-60	0	-5	1.00	1.00	227	25050
1065	0	-22	0	60	0	5	1.00	1.00	227	25050
1070	0	22	0	2	0	-68	1.00	1.00	256	25050
1070	0	17	0	-2	0	68	1.00	1.00	256	25050
1080	0	-17	0	-47	0	-15	2.71	2.71	237	25050
1080	0	17	0	47	0	15	1.00	1.00	185	25050
1085	0	-17	0	-47	0	-2	1.00	1.00	176	25050
1085	0	14	0	47	0	2	1.00	1.00	176	25050
1090	0	-14	0	-47	0	9	1.00	1.00	179	25050
1090	0	-8	0	47	0	-9	1.00	1.00	179	25050
1095	0	8	0	-47	0	-8	1.00	1.00	178	25050
1095	0	-8	0	47	0	8	1.00	1.00	178	25050
1100	0	8	0	-47	0	-78	1.00	1.00	341	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38RY

WVNS 6-55-4/2-038

DATE:MAR 18,1992

Y - RELATIVE SEISMIC DISPL.

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			CODE	ALLOW.
1100	0	13	0	47	0	78	1.00	1.00	341	25050
1105	0	-13	0	-47	0	33	1.00	1.00	215	25050
1105	0	13	0	47	0	-33	1.00	1.00	215	25050
1110	0	-13	0	-49	0	44	2.71	2.71	670	25050
1110	0	13	0	49	0	-44	1.00	1.00	247	25050
1115	0	-13	0	-57	0	52	1.00	1.00	289	25050
1115	0	13	0	57	0	-52	1.00	1.00	289	25050
1120	0	-13	0	-93	0	88	1.00	1.00	482	25050
1120	0	-102	0	93	0	-88	1.00	1.00	482	25050
1125	0	102	0	249	0	-254	1.00	1.00	1328	25050
1125	0	-102	0	-249	0	254	1.00	1.00	1328	25050
1130	0	102	0	629	0	-634	1.00	1.00	3337	25050
1130	0	250	0	-629	0	634	1.00	1.00	3337	25050
1135	0	-250	0	67	0	-71	1.00	1.00	366	25050
1135	0	218	0	-67	0	71	1.00	1.00	366	25050
1140	0	-218	0	-550	0	699	1.94	1.61	3361	25050
1140	0	218	0	550	0	-699	1.00	1.00	3323	25050
1150	0	-218	0	-434	0	815	1.00	1.00	3449	25050
1	0	21	0	-39	0	-59	1.00	1.00	1536	25050
10	0	-21	0	9	0	27	1.72	1.44	868	25050
10	0	21	0	-9	0	-27	1.00	1.00	621	25050
15	0	-21	0	9	0	2	1.00	1.00	212	25050
15	0	1	0	-9	0	-2	1.00	1.00	212	25050
20	0	-1	0	9	0	1	1.72	1.44	263	25050
20	0	1	0	-9	0	-1	1.00	1.00	203	25050
25	0	-1	0	7	0	0	1.00	1.00	157	25050
25	0	1	0	-7	0	0	1.00	1.00	157	25050
30	0	-1	0	3	0	-4	1.00	1.00	121	25050
30	0	1	0	-3	0	4	1.00	1.00	121	25050
35	0	-1	0	1	0	-6	1.00	1.00	140	25050
35	0	1	0	-1	0	6	1.00	1.00	140	25050
40	0	-1	0	0	0	-7	1.72	1.44	191	25050
40	0	1	0	0	0	7	1.00	1.00	150	25050
50	0	-1	0	-2	0	-3	1.00	1.00	99	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38RY

WVNS 6-55-4/2-038

DATE:MAR 18,1992

Y ~ RELATIVE SEISMIC DISPL.

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			(lb./sq.in.)			
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
50	0	1	0	2	0	3	1.00	1.00	99	25050
55	0	-1	0	-6	0	0	1.00	1.00	131	25050
55	0	0	0	6	0	0	1.00	1.00	131	25050
60	0	0	0	-7	0	0	1.00	1.00	155	25050
60	0	0	0	7	0	0	1.00	1.00	155	25050
65	0	0	0	-5	0	-1	1.00	1.00	112	25050
65	0	0	0	5	0	1	1.00	1.00	112	25050
70	0	0	0	-2	0	-3	1.00	1.00	99	25050
70	0	0	0	2	0	3	1.00	1.00	99	25050
80	0	0	0	0	0	-6	1.72	1.44	188	25050
80	0	0	0	0	0	6	1.00	1.00	131	25050
85	0	0	0	0	0	-6	1.00	1.00	146	25050
85	0	1	0	0	0	6	1.00	1.00	146	25050
90	0	-1	0	0	0	-5	1.00	1.00	118	25050
90	0	1	0	0	0	5	1.00	1.00	118	25050
95	0	-1	0	0	0	-2	1.00	1.00	44	25050
95	0	1	0	0	0	2	1.00	1.00	44	25050
100	0	-1	0	0	0	12	1.00	1.00	258	25050
100	0	-1	0	0	0	-12	1.00	1.00	258	25050
105	0	1	0	0	0	-3	1.00	1.00	77	25050
105	0	-1	0	0	0	3	1.00	1.00	77	25050
110	0	1	0	0	0	-4	1.72	1.44	129	25050
110	0	-1	0	0	0	4	1.00	1.00	107	25050
115	0	1	0	0	0	-6	1.00	1.00	134	25050
115	0	-1	0	0	0	6	1.00	1.00	134	25050
120	0	1	0	6	0	-11	1.00	1.00	275	25050
120	0	-1	0	-6	0	11	1.00	1.00	275	25050
125	0	1	0	12	0	-17	1.00	1.00	468	25050
125	0	-2	0	-12	0	17	1.00	1.00	468	25050
130	0	2	0	20	0	-25	1.00	1.00	705	25050
130	0	-2	0	-20	0	25	1.00	1.00	705	25050
135	0	2	0	25	0	-30	1.00	1.00	848	25050
135	0	30	0	-25	0	30	1.00	1.00	848	25050
140	0	-30	0	-66	0	72	1.72	1.44	2101	25050

1 CAESAR II FORCE/STRESS REPORT FILE:WV38RY WVNS 6-55-4/2-038  
CASE 1 (EXP) DIS DATE:MAR 18,1992 Y - RELATIVE SEISMIC DISPL.

DATA	----Forces(lb.)-----			--Moments(ft.lb.)---			(lb./sq.in.)			
POINT	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
140	0	30	0	66	0	-72	1.00	1.00	2099	25050
150	0	-30	0	-44	0	93	1.00	1.00	2223	25050

**. Z - DIRECTION SEISMIC RELATIVE DISPLACEMENT  
ANALYSIS**

**DATA INPUT AND ANALYSIS OUTPUT**

Job Description:

WEST VALLEY NUCLEAR SERVICES COMPANY INC;  
WEST VALLEY DEMONSTRATION PROJECT  
SLUDGE MOBILIZATION SYSTEM  
HLW TRANSFER PIPING 6-55-4/2-038  
FILE WV38RZ        Z DIRECTION RELATIVE SEISMIC DISPLACEMENT

PIPE DATA

From 1000 To 1010 DX= -1.414 ft. DZ= 1.413 ft.

PIPE

Dia= 4.500 in. Wall= .237 in. Insul= .000 in.

GENERAL

T1= 55 F T2= 220 F P1= 150 lb./sq.in. P2= 0.0 lb./sq.in.

Mat= (6)AUSTENITIC STAINLESS E= 28,300,000 lb./sq.in. v = .292

Density= .2893 lb./cu.in.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 44.999

DISPLACEMENTS

Node 1000 DX= .233 in. DY= .000 in. DZ= .233 in. RX= .000

RY= .000 RZ= .000

ALLOWABLE STRESSES

B31.3 (1987) Sc= 16,700 lb./sq.in. Sh1= 16,700 lb./sq.in.

Sh2= 16,700 lb./sq.in. F1= 1.00 F2= 1.00

From 1010 To 1015 DX= -1.250 ft.

From 1015 To 1020 DX= -1.250 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000

From 1020 To 1025 DX= -1.761 ft. DZ= 1.761 ft.

From 1025 To 1030 DX= -3.085 ft. DZ= 3.085 ft.

RESTRAINTS

Node 1030 Y K= 250,000 lb./in.

From 1030 To 1035 DX= -1.591 ft. DZ= 1.591 ft.

From 1035 To 1040 DX= -.707 ft. DZ= .707 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

From 1040 To 1050 DX= 2.828 ft. DZ= 2.828 ft.

RESTRAINTS

Node 1050 Y K= 250,000 lb./in.

From 1050 To 1055 DX= 2.828 ft. DZ= 2.828 ft.

From 1055 To 1060 DX= 3.712 ft. DZ= 3.712 ft.

RESTRAINTS

Node 1060 X K= 250,000 lb./in. Dir Vec= .7071 .0000 .7071

Node 1060 Y K= 250,000 lb./in.

Node 1060 X K= 250,000 lb./in. Dir Vec= .7071 .0000 -.7071

From 1060 To 1065 DX= 2.651 ft. DZ= 2.651 ft.

From 1065 To 1070 DX= 2.810 ft. DZ= 2.810 ft.

RESTRAINTS

Node 1070 Y K= 250,000 lb./in.



## PIPE DATA

-----  
 From 1070 To 1080 DX= 2.828 ft. DZ= 2.828 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Mitters= 1  
 -----

From 1080 To 1085 DX= 1.000 ft.  
 -----

From 1085 To 1090 DX= .749 ft.

## RESTRAINTS

Node 1090 Y K= 250,000 lb./in.  
 -----

From 1090 To 1095 DX= 1.999 ft.  
 -----

From 1095 To 1100 DX= 7.999 ft.

## RESTRAINTS

Node 1100 Y K= 250,000 lb./in.

Node 1100 Z K= 250,000 lb./in.

Node 1100 X K= 250,000 lb./in.  
 -----

From 1100 To 1105 DX= 7.999 ft.  
 -----

From 1105 To 1110 DX= .646 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Mitters= 1  
 -----

From 1110 To 1115 DX= .707 ft. DZ= .707 ft.  
 -----

From 1115 To 1120 DX= 2.615 ft. DZ= 2.615 ft.

## RESTRAINTS

Node 1120 Y K= 250,000 lb./in.  
 -----

From 1120 To 1125 DX= 3.349 ft. DZ= 3.349 ft.  
 -----

From 1125 To 1130 DX= 3.721 ft. DZ= 3.721 ft.

## RESTRAINTS

Node 1130 Y K= 250,000 lb./in.  
 -----

From 1130 To 1135 DX= 2.243 ft. DZ= 2.243 ft.  
 -----

From 1135 To 1140 DX= 3.182 ft. DZ= 3.182 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000  
 -----

From 1140 To 1150 DX= .883 ft. DZ= -.883 ft.

## DISPLACEMENTS

Node 1150 DX= -.233 in. DY= .000 in. DZ= -.233 in. RX= .000

RY= .000 RZ= .000  
 -----

From 1 To 10 DX= -1.414 ft. DZ= 1.413 ft.

## PIPE

Dia= 2.375 in. Wall= .154 in. Insul= .000 in.

## GENERAL

T1= 220 F T2= 220 F Fluid= .0505 lb./cu.in.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 44.999

## PIPE DATA

Continued...

## RESTRAINTS

Node 1 ANC Cnode 1000

-----  
From 10 To 15 DX= -1.250 ft.

## RESTRAINTS

Node 15 Y Cnode 1015 K= 3,000 lb./in.

Node 15 Z Cnode 1015 K= 3,000 lb./in.

-----  
From 15 To 20 DX= -1.250 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

-----  
From 20 To 25 DX= -1.761 ft. DZ= 1.761 ft.-----  
From 25 To 30 DX= -3.085 ft. DZ= 3.085 ft.-----  
From 30 To 35 DX= -1.591 ft. DZ= 1.591 ft.

## RESTRAINTS

Node 35 +Y Cnode 1035 K= 9,000 lb./in.

-----  
From 35 To 40 DX= -.707 ft. DZ= .707 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000

-----  
From 40 To 50 DX= 2.828 ft. DZ= 2.828 ft.-----  
From 50 To 55 DX= 2.828 ft. DZ= 2.828 ft.

## RESTRAINTS

Node 55 Y Cnode 1055 K= 3,000 lb./in.

Node 55 X Cnode 1055 K= 3,000 lb./in. Dir Vec= -.7071 .0000 .7071

-----  
From 55 To 60 DX= 3.712 ft. DZ= 3.712 ft.

## RESTRAINTS

Node 60 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
.7071

Node 60 Y Cnode 1060 K= 603,000 lb./in.

Node 60 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
-.7071-----  
From 60 To 65 DX= 2.651 ft. DZ= 2.651 ft.-----  
From 65 To 70 DX= 2.810 ft. DZ= 2.810 ft.-----  
From 70 To 80 DX= 2.828 ft. DZ= 2.828 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

-----  
From 80 To 85 DX= 1.000 ft.

## RESTRAINTS

Node 85 +Y Cnode 1085 K= 9,000 lb./in.

PIPE DATA

-----  
From 85 To 90 DX= .749 ft.  
-----

From 90 To 95 DX= 1.999 ft.  
-----

From 95 To 100 DX= 7.999 ft.  
-----

RESTRAINTS

Node 100 Y Cnode 1100 K= 603,000 lb./in.  
Node 100 X Cnode 1100 K= 603,000 lb./in.  
Node 100 Z Cnode 1100 K= 603,000 lb./in.  
-----

From 100 To 105 DX= 7.999 ft.  
-----

From 105 To 110 DX= .646 ft.  
-----

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

RESTRAINTS

Node 110 X Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.  
Dir Vec= .7070 .0000 .7070  
Node 110 Z Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.  
Dir Vec= .7070 .0000 -.7070  
-----

From 110 To 115 DX= .707 ft. DZ= .707 ft.  
-----

RESTRAINTS

Node 115 +Y Cnode 1115 K= 9,000 lb./in.  
-----

From 115 To 120 DX= 2.615 ft. DZ= 2.615 ft.  
-----

ALLOWABLE STRESSES

B31.3 (1987)  
-----

From 120 To 125 DX= 3.349 ft. DZ= 3.349 ft.  
-----

RESTRAINTS

Node 125 Y Cnode 1125 K= 3,000 lb./in.  
Node 125 X Cnode 1125 K= 3,000 lb./in. Dir Vec= .7071 .0000  
-.7071  
-----

From 125 To 130 DX= 3.721 ft. DZ= 3.721 ft.  
-----

From 130 To 135 DX= 2.243 ft. DZ= 2.243 ft.  
-----

RESTRAINTS

Node 135 Y Cnode 1135 K= 3,000 lb./in.  
Node 135 X Cnode 1135 K= 3,000 lb./in. Dir Vec= .7071 .0000  
-.7071  
-----

From 135 To 140 DX= 3.182 ft. DZ= 3.182 ft.  
-----

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000  
-----

From 140 To 150 DX= .883 ft. DZ= -.883 ft.  
-----

RESTRAINTS

Node 150 ANC Cnode 1150  
-----

1CAESAR II DISPLACEMENT REPORT  
CASE 1 (EXP) DIS

FILE:WV38RZ  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
Z - RELATIVE SEISMIC DISPL.

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.2333	.0000	.2330	.0000	.0000	.0000
10	.2258	.0000	.2242	.0000	-.0646	.0000
15	.2258	.0000	.2059	.0000	-.0873	.0000
20	.2240	.0000	.1784	.0000	-.1183	.0000
25	.1774	.0000	.1318	.0000	-.1423	.0000
30	.0828	.0000	.0372	.0000	-.1406	.0000
35	.0395	.0000	-.0061	.0000	-.1166	.0000
40	.0204	.0000	-.0188	.0000	-.0761	.0000
50	-.0063	.0000	.0080	.0000	-.0241	.0000
55	-.0103	.0000	.0120	.0000	.0063	.0000
60	.0008	.0000	.0008	.0000	.0188	.0000
65	.0103	.0000	-.0087	.0000	.0132	.0000
70	.0127	.0000	-.0110	.0000	-.0080	.0000
80	-.0023	.0000	.0052	.0000	-.0535	.0000
85	-.0023	.0000	.0160	.0000	-.0610	.0000
90	-.0023	.0000	.0259	.0000	-.0640	.0000
95	-.0023	.0000	.0521	.0000	-.0577	.0000
100	-.0022	.0000	-.0017	.0000	.1783	.0000
105	-.0024	.0000	-.4386	.0000	.2228	.0000
110	.0003	.0000	-.4693	.0000	.1601	.0000
115	.0188	.0000	-.4879	.0000	.1201	.0000
120	.0456	.0000	-.5147	.0000	-.0137	.0000
125	-.0034	.0000	-.4659	.0000	-.1117	.0000
130	-.1066	.0000	-.3628	.0000	-.1421	.0000
135	-.1712	.0000	-.2983	.0000	-.1286	.0000
140	-.2339	.0000	-.2336	.0000	-.0126	.0000
150	-.2333	.0000	-.2330	.0000	.0000	.0000
1000	.2333	.0000	.2330	.0000	.0000	.0000
1010	.2268	.0000	.2239	.0000	-.0714	.0000
1015	.2268	.0000	.2065	.0000	-.0876	.0000
1020	.2232	.0000	.1775	.0000	-.1239	.0000
1025	.1779	.0000	.1321	.0000	-.1418	.0000
1030	.0840	.0000	.0382	.0000	-.1408	.0000
1035	.0398	.0000	-.0060	.0000	-.1222	.0000
1040	.0176	.0000	-.0159	.0000	-.0637	.0000
1050	-.0048	.0000	.0064	.0000	-.0247	.0000
1055	-.0099	.0000	.0115	.0000	.0047	.0000
1060	.0008	.0000	.0008	.0000	.0176	.0000
1065	.0092	.0000	-.0075	.0000	.0108	.0000
1070	.0108	.0000	-.0090	.0000	-.0078	.0000
1080	-.0024	.0000	.0066	.0000	-.0573	.0000
1085	-.0024	.0000	.0166	.0000	-.0622	.0000
1090	-.0023	.0000	.0266	.0000	-.0641	.0000
1095	-.0023	.0000	.0525	.0000	-.0556	.0000
1100	-.0022	.0000	-.0016	.0000	.1730	.0000
1105	-.0025	.0000	-.4362	.0000	.2375	.0000
1110	.0025	.0000	-.4708	.0000	.1337	.0000
1115	.0164	.0000	-.4848	.0000	.1045	.0000
1120	.0404	.0000	-.5090	.0000	-.0102	.0000
1125	-.0040	.0000	-.4651	.0000	-.1056	.0000
1130	-.1056	.0000	-.3638	.0000	-.1419	.0000

1CAESAR II DISPLACEMENT REPORT  
CASE 1 (EXP) DIS

FILE:WV38RZ  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
Z - RELATIVE SEISMIC DISPL.

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1135	-.1703	.0000	-.2994	.0000	-.1277	.0000
1140	-.2333	.0000	-.2330	.0000	-.0041	.0000
1150	-.2333	.0000	-.2330	.0000	.0000	.0000

1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38RZ

WVNS 6-55-4/2-038

DATE:MAR 18,1992

Z - RELATIVE SEISMIC DISPL.

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	195.	0.	195.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	-6.	0.	6.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-406.	0.	0.	0.	Flex Z
1100	-538.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	0.	0.	Flex Y
1	-2.	0.	-6.	0.	-61.	0.	Rigid ANC
15	0.	0.	0.	0.	0.	0.	Flex Y
15	0.	0.	-2.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	0.	0.	0.	0.	0.	Flex Y
55	-1.	0.	1.	0.	0.	0.	Flex X
60	19.	0.	19.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	0.	0.	0.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	-53.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	-38.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	2.	0.	-2.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
135	-3.	0.	3.	0.	0.	0.	Flex X
150	39.	0.	25.	0.	-7.	0.	Rigid ANC
1000	-27.	0.	-68.	0.	-613.	0.	Displ. Reaction
1150	376.	0.	274.	0.	13.	0.	Displ. Reaction

1 CAESAR II STRESS SUMMARY  
CASE 1 (EXP) DIS

FILE:WV38RZ  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
Z - RELATIVE SEISMIC DISPL.

\*\*\*\* CODE STRESS CHECK PASSED

PIPING CODE: B31.3 (1987)

HIGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	9493.	@NODE 1110	ALLOWABLE:	25050.
BENDING STRESS:	9493.	@NODE 1110		
TORSIONAL STRESS:	0.	@NODE 1000		
AXIAL STRESS:	131.	@NODE 1110		
3D MAXIMUM SHEAR:	9624.	@NODE 1110		

STRESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES  
IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST  
CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 1172.

-----/BETWEEN/---/BELOW/

CODE STRESS 90-100%	.96	99.04
CODE STRESS 80-90 %	.00	99.04
CODE STRESS 70-80 %	.00	99.04
CODE STRESS 60-70 %	.00	99.04
CODE STRESS 50-60 %	.00	99.04
CODE STRESS 25-50 %	12.50	86.54
CODE STRESS 0-25 %	86.54	

PIPE ELEMENTS ANALYZED: 52

SAMPLED POINTS: 104



1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38RZ  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
Z - RELATIVE SEISMIC DISPL.

DATA POINT	----Forces(lb.)-----			--Moments(ft.lb.)---			(lb./sq.in.)			
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
1000	24	0	62	0	551	0	1.00	1.00	2060	25050
1010	-24	0	-62	0	-416	0	1.94	1.61	3007	25050
1010	24	0	62	0	416	0	1.00	1.00	1553	25050
1015	-24	0	-62	0	-351	0	1.00	1.00	1311	25050
1015	24	0	60	0	351	0	1.00	1.00	1311	25050
1020	-24	0	-60	0	-263	0	1.94	1.61	1903	25050
1020	24	0	60	0	263	0	1.00	1.00	983	25050
1025	-24	0	-60	0	-125	0	1.00	1.00	469	25050
1025	24	0	60	0	125	0	1.00	1.00	469	25050
1030	-24	0	-60	0	137	0	1.00	1.00	512	25050
1030	24	0	60	0	-137	0	1.00	1.00	512	25050
1035	-24	0	-60	0	272	0	1.00	1.00	1018	25050
1035	24	0	60	0	-272	0	1.00	1.00	1018	25050
1040	-24	0	-60	0	320	0	1.94	1.61	2317	25050
1040	24	0	60	0	-320	0	1.00	1.00	1196	25050
1050	-24	0	-60	0	232	0	1.00	1.00	868	25050
1050	24	0	60	0	-232	0	1.00	1.00	868	25050
1055	-24	0	-60	0	132	0	1.00	1.00	493	25050
1055	23	0	61	0	-132	0	1.00	1.00	493	25050
1060	-23	0	-61	0	-9	0	1.00	1.00	37	25050
1060	-146	0	-120	0	9	0	1.00	1.00	37	25050
1065	146	0	120	0	-79	0	1.00	1.00	296	25050
1065	-146	0	-120	0	79	0	1.00	1.00	296	25050
1070	146	0	120	0	-153	0	1.00	1.00	571	25050
1070	-146	0	-120	0	153	0	1.00	1.00	571	25050
1080	146	0	120	0	-202	0	2.71	2.71	2043	25050
1080	-146	0	-120	0	202	0	1.00	1.00	754	25050
1085	146	0	120	0	-106	0	1.00	1.00	397	25050
1085	-146	0	-120	0	106	0	1.00	1.00	397	25050
1090	146	0	120	0	-15	0	1.00	1.00	58	25050
1090	-146	0	-120	0	15	0	1.00	1.00	58	25050
1095	146	0	120	0	225	0	1.00	1.00	842	25050
1095	-146	0	-120	0	-225	0	1.00	1.00	842	25050
1100	146	0	120	0	1191	0	1.00	1.00	4449	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38RZ

WVNS 6-55-4/2-038

DATE:MAR 18,1992

Z - RELATIVE SEISMIC DISPL.

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			CODE	ALLOW.
1100	338	0	247	0	-1191	0	1.00	1.00	4449	25050
1105	-338	0	-247	0	-791	0	1.00	1.00	2956	25050
1105	338	0	247	0	791	0	1.00	1.00	2956	25050
1110	-338	0	-247	0	-938	0	2.71	2.71	9493	25050
1110	338	0	247	0	938	0	1.00	1.00	3504	25050
1115	-338	0	-247	0	-888	0	1.00	1.00	3315	25050
1115	338	0	247	0	888	0	1.00	1.00	3315	25050
1120	-338	0	-247	0	-651	0	1.00	1.00	2430	25050
1120	338	0	247	0	651	0	1.00	1.00	2430	25050
1125	-338	0	-247	0	-347	0	1.00	1.00	1298	25050
1125	340	0	245	0	347	0	1.00	1.00	1298	25050
1130	-340	0	-245	0	4	0	1.00	1.00	18	25050
1130	340	0	245	0	-4	0	1.00	1.00	18	25050
1135	-340	0	-245	0	217	0	1.00	1.00	811	25050
1135	337	0	248	0	-217	0	1.00	1.00	811	25050
1140	-337	0	-248	0	291	0	1.94	1.61	2110	25050
1140	337	0	248	0	-291	0	1.00	1.00	1089	25050
1150	-337	0	-248	0	-19	0	1.00	1.00	71	25050
1	2	0	5	0	61	0	1.00	1.00	1306	25050
10	-2	0	-5	0	-48	0	1.72	1.44	1793	25050
10	2	0	5	0	48	0	1.00	1.00	1040	25050
15	-2	0	-5	0	-41	0	1.00	1.00	894	25050
15	2	0	7	0	41	0	1.00	1.00	894	25050
20	-2	0	-7	0	-31	0	1.72	1.44	1163	25050
20	2	0	7	0	31	0	1.00	1.00	674	25050
25	-2	0	-7	0	-14	0	1.00	1.00	312	25050
25	2	0	7	0	14	0	1.00	1.00	312	25050
30	-2	0	-7	0	16	0	1.00	1.00	350	25050
30	2	0	7	0	-16	0	1.00	1.00	350	25050
35	-2	0	-7	0	32	0	1.00	1.00	692	25050
35	2	0	7	0	-32	0	1.00	1.00	692	25050
40	-2	0	-7	0	38	0	1.72	1.44	1422	25050
40	2	0	7	0	-38	0	1.00	1.00	824	25050
50	-2	0	-7	0	24	0	1.00	1.00	529	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38RZ

DATE:MAR 18,1992

WVNS 6-55-4/2-038

Z - RELATIVE SEISMIC DISPL.

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			CODE	ALLOW.
50	2	0	7	0	-24	0	1.00	1.00	529	25050
55	-2	0	-7	0	10	0	1.00	1.00	214	25050
55	3	0	6	0	-10	0	1.00	1.00	214	25050
60	-3	0	-6	0	0	0	1.00	1.00	17	25050
60	-15	0	-12	0	0	0	1.00	1.00	17	25050
65	15	0	12	0	-7	0	1.00	1.00	164	25050
65	-15	0	-12	0	7	0	1.00	1.00	164	25050
70	15	0	12	0	-16	0	1.00	1.00	356	25050
70	-15	0	-12	0	16	0	1.00	1.00	356	25050
80	15	0	12	0	-24	0	1.72	1.44	904	25050
80	-15	0	-12	0	24	0	1.00	1.00	524	25050
85	15	0	12	0	-13	0	1.00	1.00	293	25050
85	-15	0	-12	0	13	0	1.00	1.00	293	25050
90	15	0	12	0	-4	0	1.00	1.00	101	25050
90	-15	0	-12	0	4	0	1.00	1.00	101	25050
95	15	0	12	0	19	0	1.00	1.00	413	25050
95	-15	0	-12	0	-19	0	1.00	1.00	413	25050
100	15	0	12	0	115	0	1.00	1.00	2469	25050
100	37	0	25	0	-115	0	1.00	1.00	2469	25050
105	-37	0	-25	0	-89	0	1.00	1.00	1925	25050
105	37	0	25	0	89	0	1.00	1.00	1925	25050
110	-37	0	-25	0	-105	0	1.72	1.44	3898	25050
110	37	0	25	0	105	0	1.00	1.00	2261	25050
115	-37	0	-25	0	-98	0	1.00	1.00	2100	25050
115	37	0	25	0	98	0	1.00	1.00	2100	25050
120	-37	0	-25	0	-67	0	1.00	1.00	1436	25050
120	37	0	25	0	67	0	1.00	1.00	1436	25050
125	-37	0	-25	0	-27	0	1.00	1.00	586	25050
125	35	0	27	0	27	0	1.00	1.00	586	25050
130	-35	0	-27	0	1	0	1.00	1.00	22	25050
130	35	0	27	0	-1	0	1.00	1.00	22	25050
135	-35	0	-27	0	18	0	1.00	1.00	390	25050
135	38	0	24	0	-18	0	1.00	1.00	390	25050
140	-38	0	-24	0	51	0	1.72	1.44	1889	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38RZ  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
Z - RELATIVE SEISMIC DISPL.

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			CODE	ALLOW.
140	38	0	24	0	-51	0	1.00	1.00	1095	25050
150	-38	0	-24	0	6	0	1.00	1.00	139	25050

**X - DIRECTION SEISMIC WAVE MOTION ANALYSIS**  
**DATA INPUT AND ANALYSIS OUTPUT**

Job Description:

WEST VALLEY NUCLEAR SERVICES COMPANY INC;  
WEST VALLEY DEMONSTRATION PROJECT  
SLUDGE MOBILIZATION SYSTEM  
HLW TRANSFER PIPING 6-55-4/2-038  
FILE WV38WX    X DIPECTION SEISMIC WAVE MOTION

## PIPE DATA

-----  
 From 1000 To 1010 DX= -1.414 ft. DZ= 1.413 ft.

## PIPE

Dia= 4.500 in. Wall= .237 in. Insul= .000 in.

## GENERAL

T1= 55 F T2= 220 F P1= 150 lb./sq.in. P2= 0.0 lb./sq.in.

Mat= (6)AUSTENITIC STAINLESS E= 28,300,000 lb./sq.in. v = .292

Density= .2893 lb./cu.in.

## BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 44.999

## DISPLACEMENTS

Node 1000 DX= .050 in. DY= .000 in. DZ= .000 in. RX= .000

RY= .000 RZ= .000

## ALLOWABLE STRESSES

B31.3 (1987) Sc= 16,700 lb./sq.in. Sh1= 16,700 lb./sq.in.

Sh2= 16,700 lb./sq.in. F1= 1.00 F2= 1.00

-----  
 From 1010 To 1015 DX= -1.250 ft.

-----  
 From 1015 To 1020 DX= -1.250 ft.

## BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000

-----  
 From 1020 To 1025 DX= -1.761 ft. DZ= 1.761 ft.

-----  
 From 1025 To 1030 DX= -3.085 ft. DZ= 3.085 ft.

## RESTRAINTS

Node 1030 Y K= 250,000 lb./in.

-----  
 From 1030 To 1035 DX= -1.591 ft. DZ= 1.591 ft.

-----  
 From 1035 To 1040 DX= -.707 ft. DZ= .707 ft.

## BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

-----  
 From 1040 To 1050 DX= 2.828 ft. DZ= 2.828 ft.

## RESTRAINTS

Node 1050 Y K= 250,000 lb./in.

-----  
 From 1050 To 1055 DX= 2.828 ft. DZ= 2.828 ft.

-----  
 From 1055 To 1060 DX= 3.712 ft. DZ= 3.712 ft.

## RESTRAINTS

Node 1060 X Cnode 10600 K= 250,000 lb./in. Dir Vec= .7071 .0000  
 .7071

Node 1060 Y Cnode 10600 K= 250,000 lb./in.

Node 1060 X Cnode 10600 K= 250,000 lb./in. Dir Vec= .7071 .0000  
 -.7071

## DISPLACEMENTS

Node 10600 DX= .014 in. DY= FREE DZ= FREE RX= FREE RY= FREE

RZ= FREE

-----  
 From 1060 To 1065 DX= 2.651 ft. DZ= 2.651 ft.



PIPE DATA

From 1065 To 1070 DX= 2.810 ft. DZ= 2.810 ft.

RESTRAINTS

Node 1070 Y K= 250,000 lb./in.

From 1070 To 1080 DX= 2.828 ft. DZ= 2.828 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Mitters= 1

From 1080 To 1085 DX= 1.000 ft.

From 1085 To 1090 DX= .749 ft.

RESTRAINTS

Node 1090 Y K= 250,000 lb./in.

From 1090 To 1095 DX= 1.999 ft.

From 1095 To 1100 DX= 7.999 ft.

RESTRAINTS

Node 1100 Y Cnode 11000 K= 250,000 lb./in.

Node 1100 Z Cnode 11000 K= 250,000 lb./in.

Node 1100 X Cnode 11000 K= 250,000 lb./in.

DISPLACEMENTS

Node 11000 DX= -.002 in. DY= FREE DZ= FREE RX= FREE RY= FREE

RZ= FREE

From 1100 To 1105 DX= 7.999 ft.

From 1105 To 1110 DX= .646 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Mitters= 1

From 1110 To 1115 DX= .707 ft. DZ= .707 ft.

From 1115 To 1120 DX= 2.615 ft. DZ= 2.615 ft.

RESTRAINTS

Node 1120 Y K= 250,000 lb./in.

From 1120 To 1125 DX= 3.349 ft. DZ= 3.349 ft.

From 1125 To 1130 DX= 3.721 ft. DZ= 3.721 ft.

RESTRAINTS

Node 1130 Y K= 250,000 lb./in.

From 1130 To 1135 DX= 2.243 ft. DZ= 2.243 ft.

From 1135 To 1140 DX= 3.182 ft. DZ= 3.182 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

From 1140 To 1150 DX= .883 ft. DZ= -.883 ft.

DISPLACEMENTS

Node 1150 DX= -.032 in. DY= .000 in. DZ= .000 in. RX= .000

RY= .000 RZ= .000

## PIPE DATA

-----  
 From 1 To 10 DX= -1.414 ft. DZ= 1.413 ft.

## PIPE

Dia= 2.375 in. Wall= .154 in. Insul= .000 in.

## GENERAL

T1= 220 F T2= 220 F Fluid= .0505 lb./cu.in.

## BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 44.999

## RESTRAINTS

Node 1 ANC Cnode 1000  
 -----

From 10 To 15 DX= -1.250 ft.

## RESTRAINTS

Node 15 Y Cnode 1015 K= 3,000 lb./in.

Node 15 Z Cnode 1015 K= 3,000 lb./in.  
 -----

From 15 To 20 DX= -1.250 ft.

## BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000  
 -----

From 20 To 25 DX= -1.761 ft. DZ= 1.761 ft.

From 25 To 30 DX= -3.085 ft. DZ= 3.085 ft.  
 -----

From 30 To 35 DX= -1.591 ft. DZ= 1.591 ft.

## RESTRAINTS

Node 35 +Y Cnode 1035 K= 9,000 lb./in.  
 -----

From 35 To 40 DX= -.707 ft. DZ= .707 ft.

## BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000  
 -----

From 40 To 50 DX= 2.828 ft. DZ= 2.828 ft.

From 50 To 55 DX= 2.828 ft. DZ= 2.828 ft.

## RESTRAINTS

Node 55 Y Cnode 1055 K= 3,000 lb./in.

Node 55 X Cnode 1055 K= 3,000 lb./in. Dir Vec= -.7071 .0000 .7071  
 -----

From 55 To 60 DX= 3.712 ft. DZ= 3.712 ft.

## RESTRAINTS

Node 50 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
 .7071

Node 60 Y Cnode 1060 K= 603,000 lb./in.

Node 60 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
 -.7071  
 -----

From 60 To 65 DX= 2.651 ft. DZ= 2.651 ft.

From 65 To 70 DX= 2.810 ft. DZ= 2.810 ft.  
 -----

From 70 To 80 DX= 2.828 ft. DZ= 2.828 ft.

## BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

## PIPE DATA

-----  
From 80 To 85 DX= 1.000 ft.

## RESTRAINTS

Node 85 +Y Cnode 1085 K= 9,000 lb./in.  
-----

From 85 To 90 DX= .749 ft.

-----  
From 90 To 95 DX= 1.999 ft.-----  
From 95 To 100 DX= 7.999 ft.

## RESTRAINTS

Node 100 Y Cnode 1100 K= 603,000 lb./in.

Node 100 X Cnode 1100 K= 603,000 lb./in.

Node 100 Z Cnode 1100 K= 603,000 lb./in.  
-----

From 100 To 105 DX= 7.999 ft.

-----  
From 105 To 110 DX= .646 ft.

## BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

## RESTRAINTS

Node 110 X Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.

Dir Vec= .7070 .0000 .7070

Node 110 Z Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.

Dir Vec= .7070 .0000 -.7070  
-----

From 110 To 115 DX= .707 ft. DZ= .707 ft.

## RESTRAINTS

Node 115 +Y Cnode 1115 K= 9,000 lb./in.  
-----

From 115 To 120 DX= 2.615 ft. DZ= 2.615 ft.

## ALLOWABLE STRESSES

B31.3 (1987)  
-----

From 120 To 125 DX= 3.349 ft. DZ= 3.349 ft.

## RESTRAINTS

Node 125 Y Cnode 1125 K= 3,000 lb./in.

Node 125 X Cnode 1125 K= 3,000 lb./in. Dir Vec= .7071 .0000

-.7071  
-----

From 125 To 130 DX= 3.721 ft. DZ= 3.721 ft.

-----  
From 130 To 135 DX= 2.243 ft. DZ= 2.243 ft.

## RESTRAINTS

Node 135 Y Cnode 1135 K= 3,000 lb./in.

Node 135 X Cnode 1135 K= 3,000 lb./in. Dir Vec= .7071 .0000

-.7071  
-----

From 135 To 140 DX= 3.182 ft. DZ= 3.182 ft.

## BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000  
-----

From 140 To 150 DX= .883 ft. DZ= -.883 ft.

## RESTRAINTS

Node 150 ANC Cnode 1150

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.0500	.0000	.0000	.0000	.0000	.0000
10	.0494	.0000	-.0007	.0000	-.0054	.0000
15	.0494	.0000	-.0023	.0000	-.0073	.0000
20	.0492	.0000	-.0046	.0000	-.0100	.0000
25	.0452	.0000	-.0086	.0000	-.0123	.0000
30	.0367	.0000	-.0171	.0000	-.0134	.0000
35	.0324	.0000	-.0214	.0000	-.0123	.0000
40	.0303	.0000	-.0227	.0000	-.0102	.0000
50	.0253	.0000	-.0178	.0000	-.0079	.0000
55	.0208	.0000	-.0133	.0000	-.0077	.0000
60	.0139	.0000	-.0064	.0000	-.0105	.0000
65	.0075	.0000	-.0001	.0000	-.0118	.0000
70	.0012	.0000	.0062	.0000	-.0088	.0000
80	-.0020	.0000	.0095	.0000	.0005	.0000
85	-.0020	.0000	.0092	.0000	.0026	.0000
90	-.0020	.0000	.0086	.0000	.0042	.0000
95	-.0020	.0000	.0061	.0000	.0079	.0000
100	-.0020	.0000	-.0137	.0000	.0133	.0000
105	-.0020	.0000	-.0300	.0000	.0038	.0000
110	-.0020	.0000	-.0304	.0000	.0006	.0000
115	-.0020	.0000	-.0304	.0000	-.0013	.0000
120	-.0046	.0000	-.0278	.0000	-.0077	.0000
125	-.0118	.0000	-.0206	.0000	-.0119	.0000
130	-.0215	.0000	-.0109	.0000	-.0123	.0000
135	-.0269	.0000	-.0055	.0000	-.0106	.0000
140	-.0321	.0000	-.0001	.0000	-.0016	.0000
150	-.0320	.0000	.0000	.0000	.0000	.0000
1000	.0500	.0000	.0000	.0000	.0000	.0000
1010	.0495	.0000	-.0008	.0000	-.0060	.0000
1015	.0495	.0000	-.0022	.0000	-.0074	.0000
1020	.0492	.0000	-.0047	.0000	-.0106	.0000
1025	.0452	.0000	-.0086	.0000	-.0124	.0000
1030	.0368	.0000	-.0171	.0000	-.0133	.0000
1035	.0324	.0000	-.0214	.0000	-.0125	.0000
1040	.0299	.0000	-.0224	.0000	-.0096	.0000
1050	.0254	.0000	-.0179	.0000	-.0080	.0000
1055	.0208	.0000	-.0133	.0000	-.0078	.0000
1060	.0139	.0000	-.0064	.0000	-.0103	.0000
1065	.0077	.0000	-.0002	.0000	-.0114	.0000
1070	.0016	.0000	.0059	.0000	-.0089	.0000
1080	-.0020	.0000	.0094	.0000	.0020	.0000
1085	-.0020	.0000	.0090	.0000	.0036	.0000
1090	-.0020	.0000	.0083	.0000	.0050	.0000
1095	-.0020	.0000	.0055	.0000	.0081	.0000
1100	-.0020	.0000	-.0137	.0000	.0127	.0000
1105	-.0020	.0000	-.0299	.0000	.0046	.0000
1110	-.0020	.0000	-.0305	.0000	-.0006	.0000
1115	-.0021	.0000	-.0303	.0000	-.0021	.0000
1120	-.0049	.0000	-.0276	.0000	-.0076	.0000
1125	-.0118	.0000	-.0206	.0000	-.0117	.0000
1130	-.0214	.0000	-.0110	.0000	-.0122	.0000

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1135	-.0269	.0000	-.0056	.0000	-.0105	.0000
1140	-.0320	.0000	.0000	.0000	-.0008	.0000
1150	-.0320	.0000	.0000	.0000	.0000	.0000
10600	.0140	.0000	-.0064	.0000	.0000	.0000
11000	-.0020	.0000	-.0137	.0000	.0000	.0000

1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38WX

DATE:MAR 18,1992

WVNS 6-55-4/2-038

X - SEISMIC WAVE MOTION

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	-7.	0.	-7.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	-7.	0.	7.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Z
1100	4.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	0.	0.	Flex Y
1	0.	0.	0.	0.	-5.	0.	Rigid ANC
15	0.	0.	0.	0.	0.	0.	Flex Y
15	0.	0.	0.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	0.	0.	0.	0.	0.	Flex Y
55	0.	0.	0.	0.	0.	0.	Flex X
60	-1.	0.	-1.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	-1.	0.	1.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	0.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	0.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	0.	0.	0.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
135	0.	0.	0.	0.	0.	0.	Flex X
150	1.	0.	0.	0.	-3.	0.	Rigid ANC
1000	-1.	0.	-5.	0.	-50.	0.	Displ. Reaction
10600	-14.	0.	0.	0.	0.	0.	Displ. Reaction
11000	4.	0.	0.	0.	0.	0.	Displ. Reaction
1150	11.	0.	5.	0.	-25.	0.	Displ. Reaction

1 CAESAR II STRESS SUMMARY  
CASE 1 (EXP) DIS

FILE:WV38WX  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
X - SEISMIC WAVE MOTION

\*\*\*\* CODE STRESS CHECK PASSED

PIPING CODE: B31.3 (1987)

HIGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	516.	@NODE 1080	ALLOWABLE:	25050.
BENDING STRESS:	516.	@NODE 1080		
TORSIONAL STRESS:	0.	@NODE 1080		
AXIAL STRESS:	4.	@NODE 1080		
3D MAXIMUM SHEAR:	521.	@NODE 1080		

STRESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES  
IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST  
CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 89.

-----/BETWEEN/---/BELOW/

CODE STRESS 90-100%	1.92	98.08
CODE STRESS 80-90 %	.00	98.08
CODE STRESS 70-80 %	.00	98.08
CODE STRESS 60-70 %	.00	98.08
CODE STRESS 50-60 %	.00	98.08
CODE STRESS 25-50 %	18.27	79.81
CODE STRESS 0-25 %	79.81	

PIPE ELEMENTS ANALYZED: 52

SAMPLED POINTS: 104



1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38WX

DATE:MAR 18,1992

WVNS 6-55-4/2-038

X - SEISMIC WAVE MOTION

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			(lb./sq.in.)			
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
1000	1	0	4	0	45	0	1.00	1.00	168	25050
1010	-1	0	-4	0	-35	0	1.94	1.61	258	25050
1010	1	0	4	0	35	0	1.00	1.00	133	25050
1015	-1	0	-4	0	-30	0	1.00	1.00	114	25050
1015	1	0	4	0	30	0	1.00	1.00	114	25050
1020	-1	0	-4	0	-23	0	1.94	1.61	171	25050
1020	1	0	4	0	23	0	1.00	1.00	88	25050
1025	-1	0	-4	0	-14	0	1.00	1.00	53	25050
1025	1	0	4	0	14	0	1.00	1.00	53	25050
1030	-1	0	-4	0	3	0	1.00	1.00	14	25050
1030	1	0	4	0	-3	0	1.00	1.00	14	25050
1035	-1	0	-4	0	13	0	1.00	1.00	48	25050
1035	1	0	4	0	-13	0	1.00	1.00	48	25050
1040	-1	0	-4	0	15	0	1.94	1.61	114	25050
1040	1	0	4	0	-15	0	1.00	1.00	59	25050
1050	-1	0	-4	0	6	0	1.00	1.00	23	25050
1050	1	0	4	0	-6	0	1.00	1.00	23	25050
1055	-1	0	-4	0	-4	0	1.00	1.00	16	25050
1055	0	0	4	0	4	0	1.00	1.00	16	25050
1060	0	0	-4	0	-18	0	1.00	1.00	70	25050
1060	13	0	4	0	18	0	1.00	1.00	70	25050
1065	-13	0	-4	0	3	0	1.00	1.00	14	25050
1065	13	0	4	0	-3	0	1.00	1.00	14	25050
1070	-13	0	-4	0	27	0	1.00	1.00	104	25050
1070	13	0	4	0	-27	0	1.00	1.00	104	25050
1080	-13	0	-4	0	51	0	2.71	2.71	516	25050
1080	13	0	4	0	-51	0	1.00	1.00	190	25050
1085	-13	0	-4	0	47	0	1.00	1.00	176	25050
1085	13	0	4	0	-47	0	1.00	1.00	176	25050
1090	-13	0	-4	0	43	0	1.00	1.00	162	25050
1090	13	0	4	0	-43	0	1.00	1.00	162	25050
1095	-13	0	-4	0	33	0	1.00	1.00	125	25050
1095	13	0	4	0	-33	0	1.00	1.00	125	25050
1100	-13	0	-4	0	-5	0	1.00	1.00	20	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38WX

DATE:MAR 18,1992

WVNS 6-55-4/2-038

X - SEISMIC WAVE MOTION

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.) CODE ALLOW.	
	FX	FY	FZ	MX	MY	MZ				
1100	10	0	4	0	5	0	1.00	1.00	20	25050
1105	-10	0	-4	0	-44	0	1.00	1.00	165	25050
1105	10	0	4	0	44	0	1.00	1.00	165	25050
1110	-10	0	-4	0	-46	0	2.71	2.71	472	25050
1110	10	0	4	0	46	0	1.00	1.00	174	25050
1115	-10	0	-4	0	-43	0	1.00	1.00	163	25050
1115	10	0	4	0	43	0	1.00	1.00	163	25050
1120	-10	0	-4	0	-30	0	1.00	1.00	112	25050
1120	10	0	4	0	30	0	1.00	1.00	112	25050
1125	-10	0	-4	0	-12	0	1.00	1.00	47	25050
1125	10	0	4	0	12	0	1.00	1.00	47	25050
1130	-10	0	-4	0	7	0	1.00	1.00	27	25050
1130	10	0	4	0	-7	0	1.00	1.00	27	25050
1135	-10	0	-4	0	19	0	1.00	1.00	73	25050
1135	9	0	5	0	-19	0	1.00	1.00	73	25050
1140	-9	0	-5	0	30	0	1.94	1.61	217	25050
1140	9	0	5	0	-30	0	1.00	1.00	112	25050
1150	-9	0	-5	0	22	0	1.00	1.00	82	25050
1	0	0	0	0	5	0	1.00	1.00	107	25050
10	0	0	0	0	-4	0	1.72	1.44	151	25050
10	0	0	0	0	4	0	1.00	1.00	87	25050
15	0	0	0	0	-3	0	1.00	1.00	76	25050
15	0	0	0	0	3	0	1.00	1.00	76	25050
20	0	0	0	0	-2	0	1.72	1.44	102	25050
20	0	0	0	0	2	0	1.00	1.00	59	25050
25	0	0	0	0	-1	0	1.00	1.00	34	25050
25	0	0	0	0	1	0	1.00	1.00	34	25050
30	0	0	0	0	0	0	1.00	1.00	10	25050
30	0	0	0	0	0	0	1.00	1.00	10	25050
35	0	0	0	0	1	0	1.00	1.00	34	25050
35	0	0	0	0	-1	0	1.00	1.00	34	25050
40	0	0	0	0	2	0	1.72	1.44	74	25050
40	0	0	0	0	-2	0	1.00	1.00	42	25050
50	0	0	0	0	0	0	1.00	1.00	17	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38WX

DATE:MAR 18,1992

WVNS 6-55-4/2-038

X - SEISMIC WAVE MOTION

DATA POINT	----Forces(lb.)----			---Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
50	0	0	0	0	0	0	1.00	1.00	17	25050
55	0	0	0	0	0	0	1.00	1.00	10	25050
55	0	0	0	0	0	0	1.00	1.00	10	25050
60	0	0	0	0	-2	0	1.00	1.00	42	25050
60	1	0	0	0	2	0	1.00	1.00	42	25050
65	-1	0	0	0	0	0	1.00	1.00	9	25050
65	1	0	0	0	0	0	1.00	1.00	9	25050
70	-1	0	0	0	3	0	1.00	1.00	64	25050
70	1	0	0	0	-3	0	1.00	1.00	64	25050
80	-1	0	0	0	5	0	1.72	1.44	204	25050
80	1	0	0	0	-5	0	1.00	1.00	118	25050
85	-1	0	0	0	5	0	1.00	1.00	108	25050
85	1	0	0	0	-5	0	1.00	1.00	108	25050
90	-1	0	0	0	4	0	1.00	1.00	100	25050
90	1	0	0	0	-4	0	1.00	1.00	100	25050
95	-1	0	0	0	3	0	1.00	1.00	77	25050
95	1	0	0	0	-3	0	1.00	1.00	77	25050
100	-1	0	0	0	0	0	1.00	1.00	11	25050
100	1	0	0	0	0	0	1.00	1.00	11	25050
105	-1	0	0	0	-4	0	1.00	1.00	104	25050
105	1	0	0	0	4	0	1.00	1.00	104	25050
110	-1	0	0	0	-5	0	1.72	1.44	190	25050
110	1	0	0	0	5	0	1.00	1.00	110	25050
115	-1	0	0	0	-4	0	1.00	1.00	102	25050
115	1	0	0	0	4	0	1.00	1.00	102	25050
120	-1	0	0	0	-3	0	1.00	1.00	66	25050
120	1	0	0	0	3	0	1.00	1.00	66	25050
125	-1	0	0	0	0	0	1.00	1.00	20	25050
125	1	0	0	0	0	0	1.00	1.00	20	25050
130	-1	0	0	0	0	0	1.00	1.00	14	25050
130	1	0	0	0	0	0	1.00	1.00	14	25050
135	-1	0	0	0	1	0	1.00	1.00	36	25050
135	1	0	0	0	-1	0	1.00	1.00	36	25050
140	-1	0	0	0	4	0	1.72	1.44	157	25050

1 CAESAR II FORCE/STRESS REPORT FILE:WV38WX WVNS 6-55-4/2-038  
CASE 1 (EXP) DIS DATE:MAR 18,1992 X - SEISMIC WAVE MOTION

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
140	1	0	0	0	-4	0	1.00	1.00	91	25050
150	-1	0	0	0	3	0	1.00	1.00	65	25050

## **Y - DIRECTION SEISMIC WAVE MOTION ANALYSIS**

### **DATA INPUT AND ANALYSIS OUTPUT**

Job Description:

WEST VALLEY NUCLEAR SERVICES COMPANY INC;  
WEST VALLEY DEMONSTRATION PROJECT  
SLUDGE MOBILIZATION SYSTEM  
HLW TRANSFER PIPING 6-55-4/2-038  
FILE WV38WY        Y DIRECTION SEISMIC WAVE MOTION

PIPE DATA

-----  
From 1000 To 1010 DX= -1.414 ft. DZ= 1.413 ft.

PIPE

Dia= 4.500 in. Wall= .237 in. Insul= .000 in.

GENERAL

T1= 55 F T2= 220 F P1= 150 lb./sq.in. P2= 0.0 lb./sq.in.

Mat= (6)AUSTENITIC STAINLESS E= 28,300,000 lb./sq.in. v = .292

Density= .2893 lb./cu.in.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 44.999

DISPLACEMENTS

Node 1000 DX= .000 in. DY= .050 in. DZ= .000 in. RX= .000

RY= .000 RZ= .000

ALLOWABLE STRESSES

B31.3 (1987) Sc= 16,700 lb./sq.in. Sh1= 16,700 lb./sq.in.

Sh2= 16,700 lb./sq.in. F1= 1.00 F2= 1.00

-----  
From 1010 To 1015 DX= -1.250 ft.

-----  
From 1015 To 1020 DX= -1.250 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000

-----  
From 1020 To 1025 DX= -1.761 ft. DZ= 1.761 ft.

-----  
From 1025 To 1030 DX= -3.085 ft. DZ= 3.085 ft.

RESTRAINTS

Node 1030 Y Cnode 10300 K= 250,000 lb./in.

DISPLACEMENTS

Node 10300 DX= FREE DY= .033 in. DZ= FREE RX= FREE RY= FREE

RZ= FREE

-----  
From 1030 To 1035 DX= -1.591 ft. DZ= 1.591 ft.

-----  
From 1035 To 1040 DX= -.707 ft. DZ= .707 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

-----  
From 1040 To 1050 DX= 2.828 ft. DZ= 2.828 ft.

RESTRAINTS

Node 1050 Y Cnode 10500 K= 250,000 lb./in.

DISPLACEMENTS

Node 10500 DX= FREE DY= .034 in. DZ= FREE RX= FREE RY= FREE

RZ= FREE

-----  
From 1050 To 1055 DX= 2.828 ft. DZ= 2.828 ft.

-----  
From 1055 To 1060 DX= 3.712 ft. DZ= 3.712 ft.

RESTRAINTS

Node 1060 X Cnode 10600 K= 250,000 lb./in. Dir Vec= .7071 .0000

.7071

Node 1060 Y Cnode 10600 K= 250,000 lb./in.

Node 1060 X Cnode 10600 K= 250,000 lb./in. Dir Vec= .7071 .0000

-.7071

DISPLACEMENTS



## PIPE DATA

Continued...

Node 10600 DX= FREE DY= .047 in. DZ= FREE RX= FREE RY= FREE  
RZ= FREE

-----  
From 1060 To 1065 DX= 2.651 ft. DZ= 2.651 ft.  
-----

From 1065 To 1070 DX= 2.810 ft. DZ= 2.810 ft.

## RESTRAINTS

Node 1070 Y Cnode 10700 K= 250,000 lb./in.

## DISPLACEMENTS

Node 10700 DX= FREE DY= .042 in. DZ= FREE RX= FREE RY= FREE  
RZ= FREE

-----  
From 1070 To 1080 DX= 2.828 ft. DZ= 2.828 ft.

## BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Meters= 1

-----  
From 1080 To 1085 DX= 1.000 ft.  
-----

From 1085 To 1090 DX= .749 ft.

## RESTRAINTS

Node 1090 Y Cnode 10900 K= 250,000 lb./in.

## DISPLACEMENTS

Node 10900 DX= FREE DY= .033 in. DZ= FREE RX= FREE RY= FREE  
RZ= FREE

-----  
From 1090 To 1095 DX= 1.999 ft.  
-----

From 1095 To 1100 DX= 7.999 ft.

## RESTRAINTS

Node 1100 Y Cnode 11000 K= 250,000 lb./in.

Node 1100 Z Cnode 11000 K= 250,000 lb./in.

Node 1100 X Cnode 11000 K= 250,000 lb./in.

## DISPLACEMENTS

Node 11000 DX= FREE DY= .013 in. DZ= FREE RX= FREE RY= FREE  
RZ= FREE

-----  
From 1100 To 1105 DX= 7.999 ft.  
-----

From 1105 To 1110 DX= .646 ft.

## BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Meters= 1

-----  
From 1110 To 1115 DX= .707 ft. DZ= .707 ft.  
-----

From 1115 To 1120 DX= 2.615 ft. DZ= 2.615 ft.

## RESTRAINTS

Node 1120 Y Cnode 11200 K= 250,000 lb./in.

## DISPLACEMENTS

Node 11200 DX= FREE DY= -.011 in. DZ= FREE RX= FREE RY= FREE  
RZ= FREE

PIPE DATA

-----  
 From 1120 To 1125 DX= 3.349 ft. DZ= 3.349 ft.  
 -----

From 1125 To 1130 DX= 3.721 ft. DZ= 3.721 ft.

RESTRAINTS

Node 1130 Y Cnode 11300 K= 250,000 lb./in.

DISPLACEMENTS

Node 11300 DX= FREE DY= -.025 in. DZ= FREE RX= FREE RY= FREE  
 RZ= FREE

-----  
 From 1130 To 1135 DX= 2.243 ft. DZ= 2.243 ft.  
 -----

From 1135 To 1140 DX= 3.182 ft. DZ= 3.182 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

-----  
 From 1140 To 1150 DX= .883 ft. DZ= -.883 ft.

DISPLACEMENTS

Node 1150 DX= .000 in. DY= -.038 in. DZ= .000 in. RX= .000  
 RY= .000 RZ= .000

-----  
 From 1 To 10 DX= -1.414 ft. DZ= 1.413 ft.

PIPE

Dia= 2.375 in. Wall= .154 in. Insul= .000 in.

GENERAL

T1= 220 F T2= 220 F Fluid= .0505 lb./cu.in.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 44.999

RESTRAINTS

Node 1 ANC Cnode 1000

-----  
 From 10 To 15 DX= -1.250 ft.

RESTRAINTS

Node 15 Y Cnode 1015 K= 3,000 lb./in.

Node 15 Z Cnode 1015 K= 3,000 lb./in.

-----  
 From 15 To 20 DX= -1.250 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

-----  
 From 20 To 25 DX= -1.761 ft. DZ= 1.761 ft.  
 -----

From 25 To 30 DX= -3.085 ft. DZ= 3.085 ft.

-----  
 From 30 To 35 DX= -1.591 ft. DZ= 1.591 ft.

RESTRAINTS

Node 35 +Y Cnode 1035 K= 9,000 lb./in.

-----  
 From 35 To 40 DX= -.707 ft. DZ= .707 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000

-----  
 From 40 To 50 DX= 2.828 ft. DZ= 2.828 ft.

PIPE DATA

-----  
From 50 To 55 DX= 2.828 ft. DZ= 2.828 ft.

RESTRAINTS

Node 55 Y Cnode 1055 K= 3,000 lb./in.  
Node 55 X Cnode 1055 K= 3,000 lb./in. Dir Vec= -.7071 .0000 .7071  
-----

From 55 To 60 DX= 3.712 ft. DZ= 3.712 ft.

RESTRAINTS

Node 60 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
.7071  
Node 60 Y Cnode 1060 K= 603,000 lb./in.  
Node 60 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
-.7071  
-----

From 60 To 65 DX= 2.651 ft. DZ= 2.651 ft.

-----  
From 65 To 70 DX= 2.810 ft. DZ= 2.810 ft.  
-----

From 70 To 80 DX= 2.828 ft. DZ= 2.828 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000  
-----

From 80 To 85 DX= 1.000 ft.

RESTRAINTS

Node 85 +Y Cnode 1085 K= 9,000 lb./in.  
-----

From 85 To 90 DX= .749 ft.

-----  
From 90 To 95 DX= 1.999 ft.  
-----

From 95 To 100 DX= 7.999 ft.

RESTRAINTS

Node 100 Y Cnode 1100 K= 603,000 lb./in.  
Node 100 X Cnode 1100 K= 603,000 lb./in.  
Node 100 Z Cnode 1100 K= 603,000 lb./in.  
-----

From 100 To 105 DX= 7.999 ft.

-----  
From 105 To 110 DX= .646 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000  
-----

RESTRAINTS

Node 110 X Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.  
Dir Vec= .7070 .0000 .7070  
Node 110 Z Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.  
Dir Vec= .7070 .0000 -.7070  
-----

From 110 To 115 DX= .707 ft. DZ= .707 ft.

RESTRAINTS

Node 115 +Y Cnode 1115 K= 9,000 lb./in.  
-----

From 115 To 120 DX= 2.615 ft. DZ= 2.615 ft.

ALLOWABLE STRESSES

B31.3 (1987)

PIPE DATA

-----  
 From 120 To 125 DX= 3.349 ft. DZ= 3.349 ft.

RESTRAINTS

Node 125 Y Cnode 1125 K= 3,000 lb./in.  
 Node 125 X Cnode 1125 K= 3,000 lb./in. Dir Vec= .7071 .0000  
 -.7071

-----  
 From 125 To 130 DX= 3.721 ft. DZ= 3.721 ft.

-----  
 From 130 To 135 DX= 2.243 ft. DZ= 2.243 ft.

RESTRAINTS

Node 135 Y Cnode 1135 K= 3,000 lb./in.  
 Node 135 X Cnode 1135 K= 3,000 lb./in. Dir Vec= .7071 .0000  
 -.7071

-----  
 From 135 To 140 DX= 3.182 ft. DZ= 3.182 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000

-----  
 From 140 To 150 DX= .883 ft. DZ= -.883 ft.

RESTRAINTS

Node 150 ANC Cnode 1150

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.0000	.0500	.0000	.0000	.0000	.0000
10	.0000	.0493	.0000	.0012	.0000	.0034
15	.0000	.0484	.0000	.0015	.0000	.0041
20	.0000	.0472	.0000	.0020	.0000	.0047
25	.0000	.0446	.0000	.0024	.0000	.0053
30	.0000	.0395	.0000	.0024	.0000	.0055
35	.0000	.0370	.0000	.0020	.0000	.0053
40	.0000	.0360	.0000	.0014	.0000	.0050
50	.0000	.0382	.0000	-.0002	.0000	.0043
55	.0000	.0416	.0000	-.0028	.0000	.0043
60	.0000	.0470	.0000	-.0031	.0000	.0013
65	.0000	.0476	.0000	-.0012	.0000	-.0030
70	.0000	.0451	.0000	.0000	.0000	-.0066
80	.0000	.0399	.0000	.0004	.0000	-.0098
85	.0000	.0380	.0000	.0005	.0000	-.0102
90	.0000	.0364	.0000	.0005	.0000	-.0105
95	.0000	.0319	.0000	.0006	.0000	-.0112
100	.0000	.0130	.0000	.0010	.0000	-.0105
105	.0000	-.0025	.0000	.0013	.0000	-.0083
110	.0000	-.0038	.0000	.0014	.0000	-.0082
115	.0000	-.0050	.0000	.0014	.0000	-.0080
120	.0000	-.0102	.0000	.0019	.0000	-.0077
125	.0000	-.0172	.0000	.0029	.0000	-.0076
130	.0000	-.0258	.0000	.0040	.0000	-.0076
135	.0000	-.0314	.0000	.0045	.0000	-.0073
140	.0000	-.0379	.0000	.0014	.0000	-.0021
150	.0000	-.0380	.0000	.0000	.0000	.0000
1000	.0000	.0500	.0000	.0000	.0000	.0000
1010	.0000	.0493	.0000	.0015	.0000	.0047
1015	.0000	.0481	.0000	.0020	.0000	.0058
1020	.0000	.0461	.0000	.0032	.0000	.0083
1025	.0000	.0419	.0000	.0035	.0000	.0098
1030	.0000	.0330	.0000	.0024	.0000	.0109
1035	.0000	.0288	.0000	.0013	.0000	.0109
1040	.0000	.0279	.0000	-.0005	.0000	.0108
1050	.0000	.0340	.0000	-.0021	.0000	.0104
1055	.0000	.0412	.0000	-.0026	.0000	.0085
1060	.0000	.0470	.0000	.0002	.0000	.0027
1065	.0000	.0462	.0000	.0027	.0000	-.0020
1070	.0000	.0420	.0000	.0036	.0000	-.0053
1080	.0000	.0357	.0000	.0037	.0000	-.0081
1085	.0000	.0343	.0000	.0036	.0000	-.0084
1090	.0000	.0330	.0000	.0035	.0000	-.0086
1095	.0000	.0293	.0000	.0034	.0000	-.0092
1100	.0000	.0130	.0000	.0028	.0000	-.0099
1105	.0000	-.0029	.0000	.0022	.0000	-.0090
1110	.0000	-.0045	.0000	.0020	.0000	-.0085
1115	.0000	-.0057	.0000	.0019	.0000	-.0083
1120	.0000	-.0110	.0000	.0017	.0000	-.0075
1125	.0000	-.0171	.0000	.0019	.0000	-.0070
1130	.0000	-.0250	.0000	.0039	.0000	-.0081

1CAESAR II DISPLACEMENT REPORT FILE:WV38WY WVNS 6-55-4/2-038  
CASE 1 (EXP) DIS DATE:MAR 18,1992 Y - SEISMIC WAVE MOTION

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1135	.0000	-.0311	.0000	.0046	.0000	-.0082
1140	.0000	-.0380	.0000	.0009	.0000	-.0013
1150	.0000	-.0380	.0000	.0000	.0000	.0000
10300	.0000	.0330	.0000	.0000	.0000	.0000
10500	.0000	.0340	.0000	.0000	.0000	.0000
10600	.0000	.0470	.0000	.0000	.0000	.0000
10700	.0000	.0420	.0000	.0000	.0000	.0000
10900	.0000	.0330	.0000	.0000	.0000	.0000
11000	.0000	.0130	.0000	.0000	.0000	.0000
11200	.0000	-.0110	.0000	.0000	.0000	.0000
11300	.0000	-.0250	.0000	.0000	.0000	.0000

1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38WY  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
Y - SEISMIC WAVE MOTION

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	5.	0.	0.	0.	0.	Flex Y
1050	0.	5.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	-9.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1070	0.	2.	0.	0.	0.	0.	Flex Y
1090	0.	1.	0.	0.	0.	0.	Flex Y
1100	0.	1.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Z
1100	0.	0.	0.	0.	0.	0.	Flex X
1120	0.	3.	0.	0.	0.	0.	Flex Y
1130	0.	-10.	0.	0.	0.	0.	Flex Y
1	0.	-1.	0.	2.	0.	4.	Rigid ANC
15	0.	1.	0.	0.	0.	0.	Flex Y
15	0.	0.	0.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	1.	0.	0.	0.	0.	Flex Y
55	0.	0.	0.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex X
60	0.	-1.	0.	0.	0.	0.	Flex Y
60	0.	0.	0.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	0.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	0.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
110	0.	0.	0.	0.	0.	0.	Flex +Y
115	0.	0.	0.	0.	0.	0.	Flex Y
125	0.	0.	0.	0.	0.	0.	Flex X
125	0.	0.	0.	0.	0.	0.	Flex Y
135	0.	-1.	0.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
150	0.	1.	0.	2.	0.	-4.	Rigid ANC
1000	0.	-4.	0.	16.	0.	37.	Displ. Reaction
10300	0.	5.	0.	0.	0.	0.	Displ. Reaction
10500	0.	5.	0.	0.	0.	0.	Displ. Reaction
10600	0.	-9.	0.	0.	0.	0.	Displ. Reaction
10700	0.	2.	0.	0.	0.	0.	Displ. Reaction
10900	0.	1.	0.	0.	0.	0.	Displ. Reaction
11000	0.	1.	0.	0.	0.	0.	Displ. Reaction
11200	0.	3.	0.	0.	0.	0.	Displ. Reaction
11300	0.	-10.	0.	0.	0.	0.	Displ. Reaction
1150	0.	8.	0.	22.	0.	-39.	Displ. Reaction



1 CAESAR II STRESS SUMMARY  
CASE 1 (EXP) DIS

FILE:WV38WY  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
Y - SEISMIC WAVE MOTION

\*\*\*\* CODE STRESS CHECK PASSED

PIPING CODE: B31.3 (1987)

HIGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	172.	@NODE 1010	ALLOWABLE:	25050.
BENDING STRESS:	168.	@NODE 1010		
TORSIONAL STRESS:	73.	@NODE 1140		
AXIAL STRESS:	0.	@NODE 1110		
3D MAXIMUM SHEAR:	172.	@NODE 1010		

STRESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES  
IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST  
CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 44.

-----/BETWEEN/---/BELOW/

CODE STRESS 90-100%	.96	99.04
CODE STRESS 80-90 %	4.81	94.23
CODE STRESS 70-80 %	.96	93.27
CODE STRESS 60-70 %	1.92	91.35
CODE STRESS 50-60 %	8.65	82.69
CODE STRESS 25-50 %	18.27	64.42
CODE STRESS 0-25 %	64.42	

PIPE ELEMENTS ANALYZED: 52

SAMPLED POINTS: 104

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38WY

WVNS 6-55-4/2-038

DATE:MAR 18,1992

Y - SEISMIC WAVE MOTION

DATA POINT	----Forces(lb.)----			---Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.) CODE ALLOW.	
	FX	FY	FZ	MX	MY	MZ				
1000	0	3	0	-14	0	-33	1.00	1.00	135	25050
1010	0	-3	0	9	0	27	1.94	1.61	171	25050
1010	0	3	0	-9	0	-27	1.00	1.00	109	25050
1015	0	-3	0	9	0	24	1.00	1.00	97	25050
1015	0	4	0	-9	0	-24	1.00	1.00	97	25050
1020	0	-4	0	8	0	18	1.94	1.61	117	25050
1020	0	4	0	-8	0	-18	1.00	1.00	75	25050
1025	0	-4	0	1	0	11	1.00	1.00	43	25050
1025	0	4	0	-1	0	-11	1.00	1.00	43	25050
1030	0	-4	0	-11	0	-1	1.00	1.00	43	25050
1030	0	0	0	11	0	1	1.00	1.00	43	25050
1035	0	0	0	-10	0	-1	1.00	1.00	40	25050
1035	0	0	0	10	0	1	1.00	1.00	40	25050
1040	0	0	0	-10	0	0	1.94	1.61	49	25050
1040	0	0	0	10	0	0	1.00	1.00	38	25050
1050	0	0	0	-9	0	-2	1.00	1.00	34	25050
1050	0	-5	0	9	0	2	1.00	1.00	34	25050
1055	0	5	0	6	0	-17	1.00	1.00	69	25050
1055	0	-4	0	-6	0	17	1.00	1.00	69	25050
1060	0	4	0	23	0	-34	1.00	1.00	154	25050
1060	0	3	0	-23	0	34	1.00	1.00	154	25050
1065	0	-3	0	13	0	-24	1.00	1.00	102	25050
1065	C	3	0	-13	0	24	1.00	1.00	102	25050
1070	0	-3	0	2	0	-13	1.00	1.00	51	25050
1070	0	1	0	-2	0	13	1.00	1.00	51	25050
1080	0	-1	0	-1	0	-9	2.71	2.71	95	25050
1080	0	1	0	1	0	9	1.00	1.00	35	25050
1085	0	-1	0	-1	0	-8	1.00	1.00	31	25050
1085	0	1	0	1	0	8	1.00	1.00	31	25050
1090	0	-1	0	-1	0	-7	1.00	1.00	28	25050
1090	0	0	0	1	0	7	1.00	1.00	28	25050
1095	0	0	0	-1	0	-5	1.00	1.00	21	25050
1095	0	0	0	1	0	5	1.00	1.00	21	25050
1100	0	0	0	-1	0	1	1.00	1.00	7	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38WY

DATE:MAR 18,1992

WVNS 6-55-4/2-038

Y - SEISMIC WAVE MOTION

DATA POINT	----Forces(lb.)-----			--Moments(ft.lb.)---			(lb./sq.in.)		
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE ALLOW.
1100	0	0	0	1	0	-1	1.00	1.00	7 25050
1105	0	0	0	-1	0	4	1.00	1.00	17 25050
1105	0	0	0	1	0	-4	1.00	1.00	17 25050
1110	0	0	0	-1	0	4	2.71	2.71	44 25050
1110	0	0	0	1	0	-4	1.00	1.00	18 25050
1115	0	0	0	-1	0	4	1.00	1.00	19 25050
1115	0	0	0	1	0	-4	1.00	1.00	19 25050
1120	0	0	0	-2	0	5	1.00	1.00	24 25050
1120	0	-2	0	2	0	-5	1.00	1.00	24 25050
1125	0	2	0	4	0	-1	1.00	1.00	18 25050
1125	0	-2	0	-4	0	1	1.00	1.00	18 25050
1130	0	2	0	13	0	-10	1.00	1.00	62 25050
1130	0	7	0	-13	0	10	1.00	1.00	62 25050
1135	0	-7	0	-4	0	7	1.00	1.00	31 25050
1135	0	6	0	4	0	-7	1.00	1.00	31 25050
1140	0	-6	0	-23	0	31	1.94	1.61	149 25050
1140	0	6	0	23	0	-31	1.00	1.00	147 25050
1150	0	-6	0	-20	0	35	1.00	1.00	151 25050
1	0	1	0	-2	0	-3	1.00	1.00	88 25050
10	0	-1	0	0	0	2	1.72	1.44	63 25050
10	0	1	0	0	0	-2	1.00	1.00	45 25050
15	0	-1	0	0	0	0	1.00	1.00	21 25050
15	0	0	0	0	0	0	1.00	1.00	21 25050
20	0	0	0	0	0	0	1.72	1.44	25 25050
20	0	0	0	0	0	0	1.00	1.00	17 25050
25	0	0	0	0	0	0	1.00	1.00	9 25050
25	0	0	0	0	0	0	1.00	1.00	9 25050
30	0	0	0	0	0	0	1.00	1.00	5 25050
30	0	0	0	0	0	0	1.00	1.00	5 25050
35	0	0	0	0	0	0	1.00	1.00	13 25050
35	0	0	0	0	0	0	1.00	1.00	13 25050
40	0	0	0	0	0	0	1.72	1.44	17 25050
40	0	0	0	0	0	0	1.00	1.00	17 25050
50	0	0	0	-1	0	0	1.00	1.00	22 25050

1 CAESAR II FORCE/STRESS REPORT FILE:WV38WY WVNS 6-55-4/2-038  
CASE 1 (EXP) DIS DATE:MAR 18,1992 Y - SEISMIC WAVE MOTION

DATA	----Forces(lb.)----			--Moments(ft.lb.)---					(lb./sq.in.)	
POINT	FX	FY	FZ	MX	MY	MZ	SIFI	SIPO	CODE	ALLOW.
50	0	0	0	1	0	0	1.00	1.00	22	25050
55	0	0	0	-1	0	0	1.00	1.00	33	25050
55	0	0	0	1	0	0	1.00	1.00	33	25050
60	0	0	0	1	0	-2	1.00	1.00	66	25050
60	0	0	0	-1	0	2	1.00	1.00	66	25050
65	0	0	0	1	0	-2	1.00	1.00	52	25050
65	0	0	0	-1	0	2	1.00	1.00	52	25050
70	0	0	0	0	0	-1	1.00	1.00	38	25050
70	0	0	0	0	0	1	1.00	1.00	38	25050
80	0	0	0	0	0	-1	1.72	1.44	36	25050
80	0	0	0	0	0	1	1.00	1.00	25	25050
85	0	0	0	0	0	-1	1.00	1.00	21	25050
85	0	0	0	0	0	1	1.00	1.00	21	25050
90	0	0	0	0	0	0	1.00	1.00	19	25050
90	0	0	0	0	0	0	1.00	1.00	19	25050
95	0	0	0	0	0	0	1.00	1.00	11	25050
95	0	0	0	0	0	0	1.00	1.00	11	25050
100	0	0	0	0	0	0	1.00	1.00	19	25050
100	0	0	0	0	0	0	1.00	1.00	19	25050
105	0	0	0	0	0	0	1.00	1.00	7	25050
105	0	0	0	0	0	0	1.00	1.00	7	25050
110	0	0	0	0	0	0	1.72	1.44	7	25050
110	0	0	0	0	0	0	1.00	1.00	6	25050
115	0	0	0	0	0	0	1.00	1.00	6	25050
115	0	0	0	0	0	0	1.00	1.00	6	25050
120	0	0	0	0	0	0	1.00	1.00	6	25050
120	0	0	0	0	0	0	1.00	1.00	6	25050
125	0	0	0	0	0	0	1.00	1.00	11	25050
125	0	0	0	0	0	0	1.00	1.00	11	25050
130	0	0	0	0	0	0	1.00	1.00	7	25050
130	0	0	0	0	0	0	1.00	1.00	7	25050
135	0	0	0	0	0	0	1.00	1.00	5	25050
135	0	0	0	0	0	0	1.00	1.00	5	25050
140	0	0	0	-2	0	3	1.72	1.44	94	25050

1 CAESAR II FORCE/STRESS REPORT FILE:WV38WY WVNS 6-55-4/2-038  
CASE 1 (EXP) DIS DATE:MAR 18,1992 Y - SEISMIC WAVE MOTION

DATA	----Forces(lb.)----			--Moments(ft.lb.)---					(lb./sq.in.)	
POINT	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
140	0	0	0	2	0	-3	1.00	1.00	93	25050
150	0	0	0	-2	0	4	1.00	1.00	98	25050

**Z - DIRECTION SEISMIC WAVE MOTION ANALYSIS**

**DATA INPUT AND ANALYSIS OUTPUT**

Job Description:

WEST VALLEY NUCLEAR SERVICES COMPANY INC;  
WEST VALLEY DEMONSTRATION PROJECT  
SLUDGE MOBILIZATION SYSTEM  
HLW TRANSFER PIPING 6-55-4/2-038  
FILE WV38WZ        Z DIRECTION SEISMIC WAVE MOTION



PIPE DATA

-----  
From 1000 To 1010 DX= -1.414 ft. DZ= 1.413 ft.

PIPE

Dia= 4.500 in. Wall= .237 in. Insul= .000 in.

GENERAL

T1= 55 F T2= 220 F P1= 150 lb./sq.in. P2= 0.0 lb./sq.in.

Mat= (6)AUSTENITIC STAINLESS E= 28,300,000 lb./sq.in. v = .292

Density= .2893 lb./cu.in.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 44.999

DISPLACEMENTS

Node 1000 DX .000 in. DY= .000 in. DZ= .050 in. RX= .000

RY= .000 RZ= .000

ALLOWABLE STRESSES

B31.3 (1987) Sc= 16,700 lb./sq.in. Sh1= 16,700 lb./sq.in.

Sh2= 16,700 lb./sq.in. F1= 1.00 F2= 1.00

-----  
From 1010 To 1015 DX= -1.250 ft.

-----  
From 1015 To 1020 DX= -1.250 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000

-----  
From 1020 To 1025 DX= -1.761 ft. DZ= 1.761 ft.

-----  
From 1025 To 1030 DX= -3.085 ft. DZ= 3.085 ft.

RESTRAINTS

Node 1030 Y K= 250,000 lb./in.

-----  
From 1030 To 1035 DX= -1.591 ft. DZ= 1.591 ft.

-----  
From 1035 To 1040 DX= -.707 ft. DZ= .707 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

-----  
From 1040 To 1050 DX= 2.828 ft. DZ= 2.828 ft.

RESTRAINTS

Node 1050 Y K= 250,000 lb./in.

-----  
From 1050 To 1055 DX= 2.828 ft. DZ= 2.828 ft.

-----  
From 1055 To 1060 DX= 3.712 ft. DZ= 3.712 ft.

RESTRAINTS

Node 1060 X Cnode 10600 K= 250,000 lb./in. Dir Vec= .7071 .0000  
.7071

Node 1060 Y Cnode 10600 K= 250,000 lb./in.

Node 1060 X Cnode 10600 K= 250,000 lb./in. Dir Vec= .7071 .0000  
-.7071

DISPLACEMENTS

Node 10600 DX= FREE DY= FREE DZ= .047 in. RX= FREE RY= FREE

RZ= FREE

-----  
From 1060 To 1065 DX= 2.651 ft. DZ= 2.651 ft.

PIPE DATA

-----  
 From 1065 To 1070 DX= 2.810 ft. DZ= 2.810 ft.

RESTRAINTS

Node 1070 Y K= 250,000 lb./in.

-----  
 From 1070 To 1080 DX= 2.828 ft. DZ= 2.828 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Miters= 1

-----  
 From 1080 To 1085 DX= 1.000 ft.

-----  
 From 1085 To 1090 DX= .749 ft.

RESTRAINTS

Node 1090 Y K= 250,000 lb./in.

-----  
 From 1090 To 1095 DX= 1.999 ft.

-----  
 From 1095 To 1100 DX= 7.999 ft.

RESTRAINTS

Node 1100 Y Cnode 11000 K= 250,000 lb./in.

Node 1100 Z Cnode 11000 K= 250,000 lb./in.

Node 1100 X Cnode 11000 K= 250,000 lb./in.

DISPLACEMENTS

Node 11000 DX= FREE DY= FREE DZ= .013 in. RX= FREE RY= FREE

RZ= FREE

-----  
 From 1100 To 1105 DX= 7.999 ft.

-----  
 From 1105 To 1110 DX= .646 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 45.000 Miters= 1

-----  
 From 1110 To 1115 DX= .707 ft. DZ= .707 ft.

-----  
 From 1115 To 1120 DX= 2.615 ft. DZ= 2.615 ft.

RESTRAINTS

Node 1120 Y K= 250,000 lb./in.

-----  
 From 1120 To 1125 DX= 3.349 ft. DZ= 3.349 ft.

-----  
 From 1125 To 1130 DX= 3.721 ft. DZ= 3.721 ft.

RESTRAINTS

Node 1130 Y K= 250,000 lb./in.

-----  
 From 1130 To 1135 DX= 2.243 ft. DZ= 2.243 ft.

-----  
 From 1135 To 1140 DX= 3.182 ft. DZ= 3.182 ft.

BEND at "TO" end

Radius= 6.000 in. (LONG) Bend Angle= 90.000

-----  
 From 1140 To 1150 DX= .883 ft. DZ= -.883 ft.

DISPLACEMENTS

Node 1150 DX= .000 in. DY= .000 in. DZ= -.038 in. RX= .000

RY= .000 RZ= .000

PIPE DATA

-----  
From 1 To 10 DX= -1.414 ft. DZ= 1.413 ft.

PIPE

Dia= 2.375 in. Wall= .154 in. Insul= .000 in.

GENERAL

T1= 220 F T2= 220 F Fluid= .0505 lb./cu.in.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 44.999

RESTRAINTS

Node 1 ANC Cnode 1000

-----  
From 10 To 15 DX= -1.250 ft.

RESTRAINTS

Node 15 Y Cnode 1015 K= 3,000 lb./in.

Node 15 Z Cnode 1015 K= 3,000 lb./in.

-----  
From 15 To 20 DX= -1.250 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

-----  
From 20 To 25 DX= -1.761 ft. DZ= 1.761 ft.

-----  
From 25 To 30 DX= -3.085 ft. DZ= 3.085 ft.

-----  
From 30 To 35 DX= -1.591 ft. DZ= 1.591 ft.

RESTRAINTS

Node 35 +Y Cnode 1035 K= 9,000 lb./in.

-----  
From 35 To 40 DX= -.707 ft. DZ= .707 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000

-----  
From 40 To 50 DX= 2.828 ft. DZ= 2.828 ft.

-----  
From 50 To 55 DX= 2.828 ft. DZ= 2.828 ft.

RESTRAINTS

Node 55 Y Cnode 1055 K= 3,000 lb./in.

Node 55 X Cnode 1055 K= 3,000 lb./in. Dir Vec= -.7071 .0000 .7071

-----  
From 55 To 60 DX= 3.712 ft. DZ= 3.712 ft.

RESTRAINTS

Node 60 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
.7071

Node 60 Y Cnode 1060 K= 603,000 lb./in.

Node 60 X Cnode 1060 K= 603,000 lb./in. Dir Vec= .7071 .0000  
-.7071

-----  
From 60 To 65 DX= 2.651 ft. DZ= 2.651 ft.

-----  
From 65 To 70 DX= 2.810 ft. DZ= 2.810 ft.

-----  
From 70 To 80 DX= 2.828 ft. DZ= 2.828 ft.

BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

## PIPE DATA

-----  
From 80 To 85 DX= 1.000 ft.

## RESTRAINTS

Node 85 +Y Cnode 1085 K= 9,000 lb./in.  
-----From 85 To 90 DX= .749 ft.  
-----From 90 To 95 DX= 1.999 ft.  
-----

From 95 To 100 DX= 7.999 ft.

## RESTRAINTS

Node 100 Y Cnode 1100 K= 603,000 lb./in.

Node 100 X Cnode 1100 K= 603,000 lb./in.

Node 100 Z Cnode 1100 K= 603,000 lb./in.  
-----From 100 To 105 DX= 7.999 ft.  
-----

From 105 To 110 DX= .646 ft.

## BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 45.000

## RESTRAINTS

Node 110 X Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.

Dir Vec= .7070 .0000 .7070

Node 110 Z Cnode 1110 K= 1,000,000 lb./in. Gap= .825 in.

Dir Vec= .7070 .0000 -.7070  
-----

From 110 To 115 DX= .707 ft. DZ= .707 ft.

## RESTRAINTS

Node 115 +Y Cnode 1115 K= 9,000 lb./in.  
-----

From 115 To 120 DX= 2.615 ft. DZ= 2.615 ft.

## ALLOWABLE STRESSES

B31.3 (1987)  
-----

From 120 To 125 DX= 3.349 ft. DZ= 3.349 ft.

## RESTRAINTS

Node 125 Y Cnode 1125 K= 3,000 lb./in.

Node 125 X Cnode 1125 K= 3,000 lb./in. Dir Vec= .7071 .0000  
-.7071  
-----From 125 To 130 DX= 3.721 ft. DZ= 3.721 ft.  
-----

From 130 To 135 DX= 2.243 ft. DZ= 2.243 ft.

## RESTRAINTS

Node 135 Y Cnode 1135 K= 3,000 lb./in.

Node 135 X Cnode 1135 K= 3,000 lb./in. Dir Vec= .7071 .0000  
-.7071  
-----

From 135 To 140 DX= 3.182 ft. DZ= 3.182 ft.

## BEND at "TO" end

Radius= 3.000 in. (LONG) Bend Angle= 90.000  
-----

From 140 To 150 DX= .883 ft. DZ= -.883 ft.

## RESTRAINTS

Node 150 ANC Cnode 1150

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1	.0000	.0000	.0500	.0000	.0000	.0000
10	-.0004	.0000	.0496	.0000	-.0031	.0000
15	-.0004	.0000	.0487	.0000	-.0043	.0000
20	-.0005	.0000	.0473	.0000	-.0062	.0000
25	-.0030	.0000	.0447	.0000	-.0081	.0000
30	-.0089	.0000	.0389	.0000	-.0097	.0000
35	-.0121	.0000	.0356	.0000	-.0097	.0000
40	-.0139	.0000	.0346	.0000	-.0091	.0000
50	-.0186	.0000	.0393	.0000	-.0078	.0000
55	-.0227	.0000	.0434	.0000	-.0061	.0000
60	-.0263	.0000	.0470	.0000	-.0031	.0000
65	-.0273	.0000	.0480	.0000	-.0003	.0000
70	-.0265	.0000	.0472	.0000	.0031	.0000
80	-.0235	.0000	.0439	.0000	.0081	.0000
85	-.0235	.0000	.0423	.0000	.0090	.0000
90	-.0235	.0000	.0409	.0000	.0098	.0000
95	-.0235	.0000	.0364	.0000	.0116	.0000
100	-.0235	.0000	.0130	.0000	.0155	.0000
105	-.0235	.0000	-.0125	.0000	.0139	.0000
110	-.0233	.0000	-.0146	.0000	.0130	.0000
115	-.0216	.0000	-.0162	.0000	.0124	.0000
120	-.0154	.0000	-.0224	.0000	.0102	.0000
125	-.0091	.0000	-.0287	.0000	.0078	.0000
130	-.0040	.0000	-.0339	.0000	.0054	.0000
135	-.0018	.0000	-.0360	.0000	.0039	.0000
140	.0001	.0000	-.0379	.0000	.0007	.0000
150	.0000	.0000	-.0380	.0000	.0000	.0000
1000	.0000	.0000	.0500	.0000	.0000	.0000
1010	-.0003	.0000	.0496	.0000	-.0035	.0000
1015	-.0003	.0000	.0487	.0000	-.0044	.0000
1020	-.0005	.0000	.0472	.0000	-.0068	.0000
1025	-.0030	.0000	.0447	.0000	-.0082	.0000
1030	-.0089	.0000	.0388	.0000	-.0096	.0000
1035	-.0121	.0000	.0356	.0000	-.0096	.0000
1040	-.0142	.0000	.0349	.0000	-.0088	.0000
1050	-.0185	.0000	.0392	.0000	-.0078	.0000
1055	-.0227	.0000	.0434	.0000	-.0061	.0000
1060	-.0263	.0000	.0470	.0000	-.0030	.0000
1065	-.0272	.0000	.0479	.0000	-.0002	.0000
1070	-.0264	.0000	.0470	.0000	.0031	.0000
1080	-.0234	.0000	.0438	.0000	.0088	.0000
1085	-.0234	.0000	.0423	.0000	.0095	.0000
1090	-.0234	.0000	.0407	.0000	.0101	.0000
1095	-.0234	.0000	.0361	.0000	.0117	.0000
1100	-.0235	.0000	.0130	.0000	.0153	.0000
1105	-.0235	.0000	-.0125	.0000	.0142	.0000
1110	-.0231	.0000	-.0147	.0000	.0127	.0000
1115	-.0216	.0000	-.0162	.0000	.0122	.0000
1120	-.0154	.0000	-.0224	.0000	.0103	.0000
1125	-.0091	.0000	-.0287	.0000	.0079	.0000
1130	-.0039	.0000	-.0338	.0000	.0053	.0000

1CAESAR II DISPLACEMENT REPORT FILE:WV38WZ WVNS 6-55-4/2-038  
CASE 1 (EXP) DIS DATE:MAR 18,1992 Z - SEISMIC WAVE MOTION

NODE	-----Translations(in.)-----			-----Rotations(deg.)-----		
	DX	DY	DZ	RX	RY	RZ
1135	-.0018	.0000	-.0360	.0000	.0039	.0000
1140	.0000	.0000	-.0380	.0000	.0004	.0000
1150	.0000	.0000	-.0380	.0000	.0000	.0000
10600	-.0263	.0000	.0470	.0000	.0000	.0000
11000	-.0235	.0000	.0130	.0000	.0000	.0000

1 CAESAR II RESTRAINT REPORT  
CASE 1 (EXP) DIS

FILE:WV38WZ

DATE:MAR 18,1992

WVNS 6-55-4/2-038

Z - SEISMIC WAVE MOTION

NODE	-----Forces(lb.)-----			-----Moments(ft.lb.)-----			TYPE
	FX	FY	FZ	MX	MY	MZ	
1030	0.	0.	0.	0.	0.	0.	Flex Y
1050	0.	0.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1060	0.	0.	0.	0.	0.	0.	Flex Y
1060	0.	0.	0.	0.	0.	0.	Flex X
1070	0.	0.	0.	0.	0.	0.	Flex Y
1090	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	0.	0.	0.	0.	Flex Y
1100	0.	0.	-1.	0.	0.	0.	Flex Z
1100	0.	0.	0.	0.	0.	0.	Flex X
1120	0.	0.	0.	0.	0.	0.	Flex Y
1130	0.	0.	0.	0.	0.	0.	Flex Y
1	0.	0.	0.	0.	-3.	0.	Rigid ANC
15	0.	0.	0.	0.	0.	0.	Flex Y
15	0.	0.	0.	0.	0.	0.	Flex Z
35	0.	0.	0.	0.	0.	0.	Flex +Y
55	0.	0.	0.	0.	0.	0.	Flex Y
55	0.	0.	0.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex X
60	0.	0.	0.	0.	0.	0.	Flex Y
60	0.	0.	0.	0.	0.	0.	Flex X
85	0.	0.	0.	0.	0.	0.	Flex +Y
100	0.	0.	0.	0.	0.	0.	Flex Y
100	0.	0.	0.	0.	0.	0.	Flex X
100	0.	0.	0.	0.	0.	0.	Flex Z
110	0.	0.	0.	0.	0.	0.	Flex X w/gap
110	0.	0.	0.	0.	0.	0.	Flex Z w/gap
115	0.	0.	0.	0.	0.	0.	Flex +Y
125	0.	0.	0.	0.	0.	0.	Flex Y
125	0.	0.	0.	0.	0.	0.	Flex X
135	0.	0.	0.	0.	0.	0.	Flex Y
135	0.	0.	0.	0.	0.	0.	Flex X
150	0.	0.	0.	0.	2.	0.	Rigid ANC
1000	-3.	0.	-1.	0.	-29.	0.	Displ. Reaction
10600	0.	0.	-1.	0.	0.	0.	Displ. Reaction
11000	0.	0.	-1.	0.	0.	0.	Displ. Reaction
1150	3.	0.	2.	0.	16.	0.	Displ. Reaction



1 CAESAR II STRESS SUMMARY  
CASE 1 (EXP) DIS

FILE:WV38WZ  
DATE:MAR 18,1992

WVNS 6-55-4/2-038  
Z - SEISMIC WAVE MOTION

\*\*\*\* CODE STRESS CHECK PASSED

PIPING CODE: B31.3 (1987)

HIGHEST STRESSES: (lb./sq.in.)

CODE STRESS:	234.	@NODE 1080	ALLOWABLE:	25050.
BENDING STRESS:	234.	@NODE 1080		
TORSIONAL STRESS:	0.	@NODE 1035		
AXIAL STRESS:	1.	@NODE 1110		
3D MAXIMUM SHEAR:	234.	@NODE 1080		

STRESS OPTIMIZATION PARAMETERS:

CODE STRESS PERCENTAGES SHOWN BELOW REPRESENT THE NUMBER OF NODES  
IN THE SYSTEM THAT WERE WITHIN THE PERCENTAGE GIVEN OF THE HIGHEST  
CODE STRESS IN THE SYSTEM.

AVG. CODE STRESS 48.

-----/BETWEEN/---/BELOW/

CODE STRESS 90-100%	.96	99.04
CODE STRESS 80-90 %	.00	99.04
CODE STRESS 70-80 %	.00	99.04
CODE STRESS 60-70 %	.96	98.08
CODE STRESS 50-60 %	1.92	96.15
CODE STRESS 25-50 %	22.12	74.04
CODE STRESS 0-25 %	74.04	

PIPE ELEMENTS ANALYZED: 52

SAMPLED POINTS: 104

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38WZ

DATE:MAR 18,1992

WVNS 6-55-4/2-038

Z - SEISMIC WAVE MOTION

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
1000	2	0	1	0	26	0	1.00	1.00	97	25050
1010	-2	0	-1	0	-21	0	1.94	1.61	152	25050
1010	2	0	1	0	21	0	1.00	1.00	78	25050
1015	-2	0	-1	0	-20	0	1.00	1.00	74	25050
1015	2	0	0	0	20	0	1.00	1.00	74	25050
1020	-2	0	0	0	-18	0	1.94	1.61	132	25050
1020	2	0	0	0	18	0	1.00	1.00	68	25050
1025	-2	0	0	0	-13	0	1.00	1.00	48	25050
1025	2	0	0	0	13	0	1.00	1.00	48	25050
1030	-2	0	0	0	-2	0	1.00	1.00	10	25050
1030	2	0	0	0		0	1.00	1.00	10	25050
1035	-2	0	0	0		0	1.00	1.00	8	25050
1035	2	0	0	0	-2	0	1.00	1.00	8	25050
1040	-2	0	0	0	5	0	1.94	1.61	37	25050
1040	2	0	0	0	-5	0	1.00	1.00	19	25050
1050	-2	0	0	0	8	0	1.00	1.00	32	25050
1050	2	0	0	0	-8	0	1.00	1.00	32	25050
1055	-2	0	0	0	12	0	1.00	1.00	46	25050
1055	2	0	0	0	-12	0	1.00	1.00	46	25050
1060	-2	0	0	0	17	0	1.00	1.00	65	25050
1060	2	0	1	0	-17	0	1.00	1.00	65	25050
1065	-2	0	-1	0	19	0	1.00	1.00	72	25050
1065	2	0	1	0	-19	0	1.00	1.00	72	25050
1070	-2	0	-1	0	21	0	1.00	1.00	79	25050
1070	2	0	1	0	-21	0	1.00	1.00	79	25050
1080	-2	0	-1	0	23	0	2.71	2.71	233	25050
1080	2	0	1	0	-23	0	1.00	1.00	86	25050
1085	-2	0	-1	0	21	0	1.00	1.00	81	25050
1085	2	0	1	0	-21	0	1.00	1.00	81	25050
1090	-2	0	-1	0	20	0	1.00	1.00	77	25050
1090	2	0	1	0	-20	0	1.00	1.00	77	25050
1095	-2	0	-1	0	17	0	1.00	1.00	65	25050
1095	2	0	1	0	-17	0	1.00	1.00	65	25050
1100	-2	0	-1	0	5	0	1.00	1.00	18	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38WZ

DATE:MAR 18,1992

WVNS 6-55-4/2-038

Z - SEISMIC WAVE MOTION

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---					(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
1100	2	0	2	0	-5	0	1.00	1.00	18	25050
1105	-2	0	-2	0	-12	0	1.00	1.00	45	25050
1105	2	0	2	0	12	0	1.00	1.00	45	25050
1110	-2	0	-2	0	-13	0	2.71	2.71	135	25050
1110	2	0	2	0	13	0	1.00	1.00	50	25050
1115	-2	0	-2	0	-13	0	1.00	1.00	49	25050
1115	2	0	2	0	13	0	1.00	1.00	49	25050
1120	-2	0	-2	0	-12	0	1.00	1.00	48	25050
1120	2	0	2	0	12	0	1.00	1.00	48	25050
1125	-2	0	-2	0	-12	0	1.00	1.00	46	25050
1125	2	0	2	0	12	0	1.00	1.00	46	25050
1130	-2	0	-2	0	-11	0	1.00	1.00	43	25050
1130	2	0	2	0	11	0	1.00	1.00	43	25050
1135	-2	0	-2	0	-11	0	1.00	1.00	41	25050
1135	2	0	2	0	11	0	1.00	1.00	41	25050
1140	-2	0	-2	0	-11	0	1.94	1.61	84	25050
1140	2	0	2	0	11	0	1.00	1.00	43	25050
1150	-2	0	-2	0	-13	0	1.00	1.00	52	25050
1	0	0	0	0	2	0	1.00	1.00	61	25050
10	0	0	0	0	-2	0	1.72	1.44	89	25050
10	0	0	0	0	2	0	1.00	1.00	51	25050
15	0	0	0	0	-2	0	1.00	1.00	49	25050
15	0	0	0	0	2	0	1.00	1.00	49	25050
20	0	0	0	0	-2	0	1.72	1.44	77	25050
20	0	0	0	0	2	0	1.00	1.00	44	25050
25	0	0	0	0	-1	0	1.00	1.00	30	25050
25	0	0	0	0	1	0	1.00	1.00	30	25050
30	0	0	0	0	0	0	1.00	1.00	5	25050
30	0	0	0	0	0	0	1.00	1.00	5	25050
35	0	0	0	0	0	0	1.00	1.00	7	25050
35	0	0	0	0	0	0	1.00	1.00	7	25050
40	0	0	0	0	0	0	1.72	1.44	23	25050
40	0	0	0	0	0	0	1.00	1.00	13	25050
50	0	0	0	0	0	0	1.00	1.00	18	25050

1 CAESAR II FORCE/STRESS REPORT  
CASE 1 (EXP) DIS

FILE:WV38WZ

DATE:MAR 18,1992

WVNS 6-55-4/2-038

Z - SEISMIC WAVE MOTION

DATA POINT	----Forces(lb.)-----			--Moments(ft.lb.)---			SIFI	SIFO	(lb./sq.in.)	
	FX	FY	FZ	MX	MY	MZ			CODE	ALLOW.
50	0	0	0	0	0	0	1.00	1.00	18	25050
55	0	0	0	0	1	0	1.00	1.00	23	25050
55	0	0	0	0	-1	0	1.00	1.00	23	25050
60	0	0	0	0	1	0	1.00	1.00	32	25050
60	0	0	0	0	-1	0	1.00	1.00	32	25050
65	0	0	0	0	1	0	1.00	1.00	39	25050
65	0	0	0	0	-1	0	1.00	1.00	39	25050
70	0	0	0	0	2	0	1.00	1.00	46	25050
70	0	0	0	0	-2	0	1.00	1.00	46	25050
80	0	0	0	0	2	0	1.72	1.44	92	25050
80	0	0	0	0	-2	0	1.00	1.00	53	25050
85	0	0	0	0	2	0	1.00	1.00	50	25050
85	0	0	0	0	-2	0	1.00	1.00	50	25050
90	0	0	0	0	2	0	1.00	1.00	47	25050
90	0	0	0	0	-2	0	1.00	1.00	47	25050
95	0	0	0	0	1	0	1.00	1.00	39	25050
95	0	0	0	0	-1	0	1.00	1.00	39	25050
100	0	0	0	0	0	0	1.00	1.00	8	25050
100	0	0	0	0	0	0	1.00	1.00	8	25050
105	0	0	0	0	-1	0	1.00	1.00	28	25050
105	0	0	0	0	1	0	1.00	1.00	28	25050
110	0	0	0	0	-1	0	1.72	1.44	54	25050
110	0	0	0	0	1	0	1.00	1.00	31	25050
115	0	0	0	0	-1	0	1.00	1.00	30	25050
115	0	0	0	0	1	0	1.00	1.00	30	25050
120	0	0	0	0	-1	0	1.00	1.00	27	25050
120	0	0	0	0	1	0	1.00	1.00	27	25050
125	0	0	0	0	-1	0	1.00	1.00	23	25050
125	0	0	0	0	1	0	1.00	1.00	23	25050
130	0	0	0	0	-1	0	1.00	1.00	22	25050
130	0	0	0	0	1	0	1.00	1.00	22	25050
135	0	0	0	0	-1	0	1.00	1.00	21	25050
135	0	0	0	0	1	0	1.00	1.00	21	25050
140	0	0	0	0	-1	0	1.72	1.44	53	25050

1 CAESAR II FORCE/STRESS REPORT FILE:WV38WZ WVNS 6-55-4/2-038  
CASE 1 (EXP) DIS DATE:MAR 18,1992 Z - SEISMIC WAVE MOTION

DATA POINT	----Forces(lb.)----			--Moments(ft.lb.)---			(lb./sq.in.)			
	FX	FY	FZ	MX	MY	MZ	SIFI	SIFO	CODE	ALLOW.
140	0	0	0	0	1	0	1.00	1.00	30	25050
150	0	0	0	0	-1	0	1.00	1.00	38	25050