

**10 MWe Solar Thermal
Central Receiver Pilot Plant
Solar Facilities Design Integration**

**PSS FINAL DESIGN CALCULATIONS
BOOK 13 OF 26--RECEIVER FEEDWATER PIPING
CONSTRUCTION PACKAGE 9 (RADL ITEM 7-8)**

September 1980

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**STEARNS-ROGER ENGINEERING CORP
4500 CHERRY DRIVE
P.O. BOX 5888
DENVER, CO 80217**

**PREPARED FOR THE
U.S. DEPARTMENT OF ENERGY
SOLAR ENERGY
UNDER CONTRACT DE-AC-03-79SF10499**

PREFACE

This document is provided by McDonnell Douglas Astronautics Company (MDAC) in accordance with Department of Energy Contract Number DE-AC03-79SF10499, Reports and Deliverables List (RADL Item 7-8). The report was prepared by Stearns-Roger Engineering Corporation under MDAC Subcontract Number 78012035.

The Plant Support Subsystem Final Design Calculations (RADL Item 7-8) are arranged in a twenty-six book volume as shown on the master Table of Contents.

Book 13 of this document is provided in support of the Mechanical Equipment Installation Construction Package No. 9 and includes isometric drawings, seismic, weight, thermal and stress calculations for the receiver feedwater piping design.

Questions concerning this report should be directed to R.J. Perkins at (714) 896-3073.

MASTER TABLE OF CONTENTS FOR PSS FINAL
DESIGN CALCULATIONS (RADL ITEM 7-8)

ITEM	PAGE
BOOK 1 - SITE DEVELOPMENT AND PRELIMINARY EARTHWORK, CONSTRUCTION PACKAGE 1	
1	Drainage Calculations
	Culvert Sizing 1-4 of 4
	Drainage Structure 1 of 1
2	Horizontal Layout
	Curve Data 1 of 2
	Perimeter Road Stations 2 of 2
3	Quantities
	Structural Fill 1 of 4
	Base Course 2,3,4 of 4
BOOK 2 - WAREHOUSE, CONSTRUCTION PACKAGE 3	
1	Interrupting Rating 1,2,3
2	Lighting Calculation Sheet 1 of 1
3	Foundation 1 thru 8
BOOK 3 - STRUCTURAL STEEL AND BUILDINGS, CONSTRUCTION PACKAGE 5	
1	Raw/Service Water Pump Building Steel RPS-D-1 thru 11
2	Secondary Fire Pump Building Steel SPS-D-1 thru 13
3	Thermal Storage Control Building Steel TCS-D-1 thru 13
4	Thermal Storage Electrical Building Steel TES-D-1 thru 8

MASTER TABLE OF CONTENTS FOR PSS FINAL
DESIGN CALCULATIONS (RADL ITEM 7-8)

ITEM		PAGE
5	TSS Pipe Support Structural	PR-D-1 thru 117
6	TSS Pipe Support Structural Computer Output	PR-C-1 thru 272
7	Wind and Pyranometer Towers	WPT-D-1 thru 5
8	Wind and Pyranometer Towers Reference	WPT-R-1 thru 11

BOOK 4 - RECEIVER TOWER
STRUCTURAL, CONSTRUCTION
PACKAGE 5A (RADL ITEM 7-21)

Note: This document includes design calculation for the receiver tower steel (Construction Package 5A) which was previously submitted by MDAC letter A3-228-EP-RJP-46, dated 16 January 1980, and therefore, is not included in this submittal. Please transfer your copy to your RADL ITEM 7-8 file, marking it as BOOK 4 of 25.

BOOK 5 - COLLECTOR FIELD FOUNDATIONS, CONSTRUCTION PACKAGE 5

1	Computer Printout (Heliostat Foundations)	CO-C-47
2	Design Sheets	
	Heliostat	D-1 thru 12
	Miscellaneous Collector Field Foundations	D-13 thru 18

MASTER TABLE OF CONTENTS FOR PSS FINAL
DESIGN CALCULATIONS (RADL ITEM 7-8)

ITEM	PAGE
3	Reference Sheets
	Heliostat Loading
	Test Data From WCC
	STMPO Design Criteria
	BCS Camera Criteria
	Miscellaneous Foundation
	Input
	RADL 2-12
	Anchor Bolt Deflections and
	Stress
	R-1
	R-2 thru R-3
	R-4 thru R-7
	R-8 thru R-9
	R-10 thru R-13
	R-14 thru R-63
	R-64 thru R-81
4	MDAC Collector Field Design and Plant Power Calculation
	--
	BOOK 6 - THERMAL STORAGE AND PLANT SUPPORT SUBSYSTEM FOUNDA- TIONS, CONSTRUCTION PACKAGE 7
1	Thermal Storage Control Building Foundation
	TCF-D-1 thru 2
2	Thermal Storage Electrical Equipment Building Foundation
	TEF-D-1 thru 2
3	Raw/Service Water Pump Building Foundation
	RPF-D-1 thru 7
4	Secondary Fire Pump Building Foundation
	SPF-D-1 thru 7
5	Pipe Trench
	DT-D-1 thru 11
6	Drainage Trench
	DT-D-1 thru 3
7	Thermal Storage Subsystem (TSS) Equipment Foundations
	TSE-D-1 thru 19
8	Thermal Storage Subsystem (TSS) Equipment Foundation Reference
	TSE-R-1 thru 3

MASTER TABLE OF CONTENTS FOR PSS FINAL
DESIGN CALCULATIONS (RADL ITEM 7-8)

ITEM		PAGE
9	TSS Containment Foundation	TSC-D-1 thru 2
10	TSS Retaining Wall	TSW-D-1 thru 15
11	TSS Sump Structure	TSS-D-1 thru 10
12	TSS Tank Foundation	TST-D-1 thru 11
13	TSS Tank Foundation Reference	TST-R-1 thru 10
14	Blowdown Tank Foundation	BT-D-1 thru 3
15	Blowdown Tank Foundation Reference	BT-R-1
16	TSS Pipe Support Foundations	PRF-D-1 thru 62
17	TSS Pipe Support Foundations Computer Output	PRFC-1 thru 117
	BOOK 7 - RECEIVER TOWER FOUNDATION, CONSTRUCTION PACKAGE 7A	
1	Design Calculations	RF-D-1 thru 18
2	Reference Sheets	
	Trade Study	RF-R-1 thru 2
	Drilled Pier Alternate	RF-R-3 thru 6
	BOOK 8 - PIPING AND MECHANICAL EQUIPMENT, CONSTRUCTION PACKAGE 9	
P3-1	Steam Systems	--
	BOOK 9 - PIPING AND MECHANICAL EQUIPMENT CONSTRUCTION PACKAGE 9	
P3-2	Condensate Systems	
P3-6	Water Treatment	

MASTER TABLE OF CONTENTS FOR PSS FINAL
DESIGN CALCULATIONS (RADL ITEM 7-8)

ITEM		PAGE
P3-8	Instrument and Service Air	
P3-9	Fire Protection BOOK 10 - PIPING AND MECHANICAL EQUIPMENT, CONSTRUCTION PACKAGE 9	
P3-10	Liquid Waste and Drains	--
P3-11	Service Water	--
P3-13	Miscellaneous Subsystems	--
RS & TSS	Receiver and Thermal Storage Systems	--
	BOOK 11 - PIPING, CONSTRUCTION PACKAGE 9	
1	General Calculations	--
2	General Seismic Calculations	--
3	Equipment Loads	--
4	Lines AS-10, FW-10 and UG-1 Hand Calculations	--
	BOOK 12 - CONDENSATE PIPING, CONSTRUCTION PACKAGE 9	
Line CO-1	R.S. Flash Tank Drain (2"-CO- 1-FBA)	--
Line CO-3	TSS Heater Drain (4"-CO-3-KBA)	--
Line CO-4	TSS Heater Drain (4"-CO-4-KBA)	--
Line CO-5	TSS Flash Tank Drain EPGS (4"-CO-5-BBA)	--
Line CO-6	R.S. Panel Condensate Drain (3" & 1-1/2"-CO-6-BBA)	--

MASTER TABLE OF CONTENTS FOR PSS FINAL
DESIGN CALCULATIONS (RADL ITEM 7-8)

ITEM		PAGE
Line CO-15	TSS Flash Tank Drain to Pump (6"-CO-15-BBA)	--
<p style="margin: 0;">BOOK 13 - RECEIVER FEEDWATER PIPING, CONSTRUCTION PACKAGE 9</p>		
Line FW-1	Receiver Feedwater to Internal Anchor (4"-FW-2-MBA)	--
Line FW-2	Receiver Feedwater to Heater and Interface 2I (4"-FW-2-MBA & 2-1/2"- FW-9-MBA)	--
<p style="margin: 0;">BOOK 14 - MAIN STEAM PIPING, CONSTRUCTION PACKAGE 9</p>		
Line MS-1	Main Steam - Receiver to Internal Anchors (6"-MS-2, 3-QEB)	--
Line MS-2	Main Steam - Internal Anchor to Turbine (6"-MS-2-QEB)	--
<p style="margin: 0;">BOOK 15 - MAIN STEAM PIPING, CONSTRUCTION PACKAGE 9</p>		
Line MS-3	Main Steam - Desuperheater Branch (6"-MS-3-QEB)	--
Line MS-4	Main Steam - Internal Anchor to Condenser (10"-MS-7-FEA)	--
Line MS-5	Main Steam - TSS Exchanger Branch (8"-MS-4-KBA)	--
<p style="margin: 0;">BOOK 16 - STEAM PIPING, CONSTRUCTION PACKAGE 9</p>		
Line ST-5	Admission Steam (ST-5, 6 & 8-FBA)	--
Line ST-7	2"-ST-7-FBA	--

MASTER TABLE OF CONTENTS FOR PSS FINAL
DESIGN CALCULATIONS (RADL ITEM 7-8)

ITEM	PAGE
Line ST-16 2"-ST-16-FBA	--
	BOOK 17 - THERMAL OIL PIPING, CONSTRUCTION PACKAGE 9
Line TO-4 TSS Oil Charging System Feed (8"-TO-4-BBA)	--
Line TO-5 TSS Oil Charging System Feed (8"-TO-5-BBA)	--
Line TO-12 TSS Oil - Extraction System Feed (8"-TO-12-BBA)	--
	BOOK 18 - THERMAL OIL PIPING, CONSTRUCTION PACKAGE 9
Line TO-13 TSS Oil - Extraction System Feed (8"-TO-13-BBA)	--
Line TO-22 TSS Oil Charging System (TO-22, 23 & 24)	--
	BOOK 19 - THERMAL OIL PIPING, CONSTRUCTION PACKAGE 9
Line TO-10 TSU Oil Extraction and Charging (TO-3,9,10,11,21-BBA)	--
	BOOK 20 - THERMAL OIL PIPING, CONSTRUCTION PACKAGE 9
--	TSU Oil Extraction and Charging
	BOOK 21 - VENT LINE PIPING, CONSTRUCTION PACKAGE 9
Line VT-1 Receiver Flash Tank Vent Line (4", 2-1/2", 10"-VT-1, 12,11-KEB, FEA)	--

MASTER TABLE OF CONTENTS FOR PSS FINAL
DESIGN CALCULATIONS (RADL ITEM 7-8)

ITEM		PAGE
Line VT-4	TSS Flash Tank Vent (6"-VT-4-FBA)	--
	BOOK 22 - PSS CALORIA MAKEUP TANK, CONSTRUCTION PACKAGE 10	
1	Sizing of Vent	1 thru 4
SHT P25-4	Caloria Makeup Tank Drawing	--
	BOOK 23 - PSS FIELD ERECTED TANKS, CONSTRUCTION PACKAGE 10A	
SHT P25-1	Demineralized Water Tank Drawing	--
1	Mirror Wash Water Tank Sizing	1 thru 3
2	Resizing of Raw Water Storage Tank	1 thru 2
SHT P25-2	Raw Water Storage Tank Drawing	--
--	Reference Letters	--
Figure 1	Service Water Requirements, Daytime Operations	--
Figure 2	Preliminary Raw/Service Water System	--
3	Sizing Raw Water Service Tank Pumps and Piping	1 thru 8
	BOOK 24 - PLANT ELECTRICAL, CONSTRUCTION PACKAGE 11	

MASTER TABLE OF CONTENTS FOR PSS FINAL
DESIGN CALCULATIONS (RADL ITEM 7-8)

ITEM

PAGE

BOOK 25 - COLLECTOR FIELD
ELECTRICAL, CONSTRUCTION
PACKAGE 11A

Note: This document was previously submitted by MDAC Letter A3-228-EP-RJP-262, dated 7 March 1980 and therefore is not included in this submittal. Please transfer your copy to your RADL ITEM 7-8 file, marking it as BOOK 25 of 25.

BOOK-26-MDAC GENERAL ANALYSIS AND
BACKGROUND DATA

- 1 Plant Process and Preliminary Component Requirements
- 2 Receiver Subsystem Calculations
- 3 Thermal Storage Subsystems Calculations
- 4 Analysis of Plant Cost Reduction Options
- 5 Collector Field Design and Plant Power Calculations
- 6 Miscellaneous Plant Calculations

LINE FW-1 RECEIVER FEEDWATER TO INTERNAL ANCHOR

Stearns-Roger

PIPE STRESS ANALYSIS REPORT

FOR

10MWe SOLAR PILOT PLANT

C-21700

RECENER FEED WATER TO INTERNAL ANCHOR
PIPING SYSTEM
4"-FW-2-MBA

CONDITIONS ANALYZED / ANAL. I.D. NO.

THERMAL T-21700-FW-1-A-2
DEAD WEIGHT W-21700-FW-1-A-2
PRESSURE P-21700-FW-1-A-0
SEISMIC X-21700-FW-1-R-4

CODE REFERENCE: ANS I B31.1-1973
W/ APPENDA B.
(SUMMER 1979)

ANALYST G.H. MAY

DATE 7-25-80

TRIX-501-0105-1000

DIVISION USAGE					
MM	P	PP	SH	FI	SP

Stearns-Roger
INCORPORATED
ENGINEERING STANDARD

STANDARD NUMBER
EE16.01.2

APPROVALS
Des. Sect. _____
Sect. Supv. _____
Div. _____

PIPING ANALYSIS RESULTS

PAGE 1 OF 1
ISSUED 8-31-73
REVISED 4-15-74

Date MARCH 23, 1980

TO: T.E. OLSON
FROM: G.H. MAY, Piping Engineering Group
Client DEPT. OF ENERGY Project SOLAR I Job No. C-21700
Pipe Line Analyzed RECEIVER FEEDWATER / 4" FW-2-MBA, 2 1/2" FW-8-MBA
Reference Dwg. P13-4 A

This piping has been analyzed for the THERMAL, DEAD WEIGHT, PRESSURE & DESIGN BASIS EARTHQUAKE loading condition and is found to be:

- Satisfactory, as is.
- Satisfactory, with comments noted.
- Unsatisfactory - See Comments.

COMMENT (1) ALL PIPE STRESSES ARE SATISFACTORY.
(2) ALL RESTRAINT FORCES AND MOMENTS ARE REASONABLE.
(3) FOUR PAIRS OF SNUBBERS ARE REQUIRED.

RECOMMENDATION (1) USE THE REFERENCED ROUTING.
(2) REVISE THE ISOMETRIC AS SHOWN.
(3) FORCES AND MOMENTS MAY BE SENT TO SCE AS PRELIMINARY.

ATTACHS: PIPE STRESS SUMMARY REPORT (2), SUMMARY OF FORCES & MOMENTS

G.H. May
Signature

Copies to: Sender
Analysis Folder - Job File
Piping Engrg. Supervisor TCT
K.E. NOBLE W/ ISOMETRIC

DIVISION USAGE						Stearns-Roger INCORPORATED ENGINEERING STANDARD	STANDARD NUMBER
MM	P	PP	SH	FI	SP		EE16.01.8
APPROVALS						PIPE STRESS SUMMARY REPORT ANSI B31.1 - 1973 EDITION	PAGE <u>1</u> OF <u>1</u>
Des. Sect. <u>HY 2nd</u>							ISSUED 5/27/75 REVISED
Sect. Subv. <u>Hydro 2-0122</u>							
Div. _____							

10 MWE SOLAR PILOT PLANT
Job Name

RECEIVER FEEDWATER (HEATER TO PIPE RACK ANCHOR)
System/Pipe Line Name 4"-FW-2-MBA & 2 1/2"-FW-4-MBA

C-21700
Job No.

FW-02
Analysis No.

1. Loading Conditions Analyzed
- | | |
|-----------------------------|--------------------------------|
| Pressure <u>X</u> | Analysis Ident. Code |
| Weight <u>X</u> | <u>P-FW-02-A-0</u> |
| Thermal Expansion <u>X</u> | <u>W-FW-02-A-3</u> |
| Sustained Mech. Loads _____ | <u>T-FW-02-A-4</u> |
| Occasional Loads <u>X</u> | <u>X-FW-02-A-1</u> |
| | <u>DESIGN BASIS EARTHQUAKE</u> |

2. Stress Evaluation (Code Equations)
- Eq. (11) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{z} \leq 1.0 S_h$ 4027 psi \leq 15000 psi
- Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 400
- Eq. (12) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{z} + \frac{0.75 iM_B}{z} \leq K S_h$ 15915 psi \leq 18000 psi
- Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 400
- Eq. (13) $S_E = \frac{iM_C}{z} \leq S_A$ 5992 psi \leq 22500 psi
- Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 400
- Eq. (14) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{z} + \frac{iM_C}{z} \leq (S_h + S_A)$ 10019 psi \leq 37510 psi
- Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 400

3. Stress Evaluation (Local or Special)

<u>Loading</u>	<u>Analysis Ident. Code</u>	<u>Calculated Stress (psi)</u>	<u>Allowable Stress (psi)</u>
_____	_____	_____	_____
_____	_____	_____	_____

REMARKS:

(1) ALL PIPE STRESSES ARE LESS THAN THE ALLOWABLES.

[Signature]
Prepared By 2-13-80
Date

[Signature]
Approved By 2-13-80
Date

DIVISION USAGE					
MM	P	PP	SH	FI	SP

Stearns-Roger
INCORPORATED
ENGINEERING STANDARD

STANDARD NUMBER

EE16.01.3

APPROVALS
 Des. Sect. [Signature]
 Sect. Supv. [Signature]
 Div. _____

PIPE STRESS SUMMARY REPORT

ANSI B31.1 - 1973 EDITION

PAGE 1 OF 1

ISSUED 5/27/75

REVISED

10MW SOLAR PILOT PLANT - DOE

C-21700

Job Name

Job No.

RECEIVER FEEDWATER (RECEIVER TO PIPE RACK ANCHOR)

FW-01

System/Pipe Line Name 4" FW-2-MBA

Analysis No.

1. Loading Conditions Analyzed

Analysis Ident. Code

Pressure X
 Weight X
 Thermal Expansion X
 Sustained Mech. Loads _____
 Occasional Loads X

P-FW-01-A-0
W-FW-01-A-2
T-FW-01-A-2
X-FW-01-A-6
 DESIGN BASIS EARTHQUAKE

2. Stress Evaluation (Code Equations)

Eq. (11) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{Z} \leq 1.0 S_h$ 3887 psi \leq 15000 psi

PRESS = 2386 psi \Rightarrow SLP = 22.98 psi
 Temp = 440°F @ Pt. 150

Material: - ASTM A106 GR.B

Eq. (12) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{Z} + \frac{0.75 iM_B}{Z} \leq K S_h$ 17303 psi \leq 26400 psi
(.95y)

Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 80N

Eq. (13) $S_E = \frac{iM_C}{Z} \leq S_A$ 8308 psi \leq 22900 psi

Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 140M

Eq. (14) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{Z} + \frac{iM_C}{Z} \leq (S_h + S_A)$ 11522 psi \leq 37500 psi

Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 140M

3. Stress Evaluation (Local or Special)

Loading	Analysis Ident. Code	Calculated Stress (psi)	Allowable Stress (psi)
_____	_____	_____	_____

REMARKS:

1) ALL PIPE STRESSES ARE LESS THAN THE ALLOWABLES.

2) EARTHQUAKE IS RMS SUMMATION OF X, Y & Z SHOCK LOADINGS.

[Signature]
Prepared by

3-23-80
Date

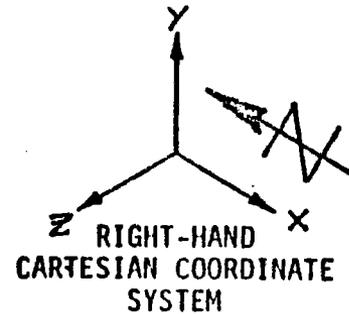
[Signature]
Approved By

3-23-80
Date

CUSTOMER: *DOE*
 PROJECT: *10MW SOLAR PILOT PLANT*
 JOB NO: *C-21700*
 BY: *GMM* DATE: *FEB. 14, 1980*
 REF. DWGS: *P13-A*
 ANALYSIS CODE: *T/W-FW-02-A-4/3*
X-FW-02-A-1

SUMMARY OF FORCES & MOMENTS
 ON SYSTEM TERMINAL EQUIPMENT
 (SYSTEM)

RECEIVER FEEDWATER HEATER TO PIPERACK ANCHOR
4" FW-2-MBA / 2 1/2" FW-9-MBA



THE REPORTED REACTIONS BASED ON A THERMAL
 EXPANSION ANALYSIS FROM ...*70*°F TO *110*°F
 USING E_c THE COLD MOD. OF ELASTICITY, AND
% COLD SPRING.

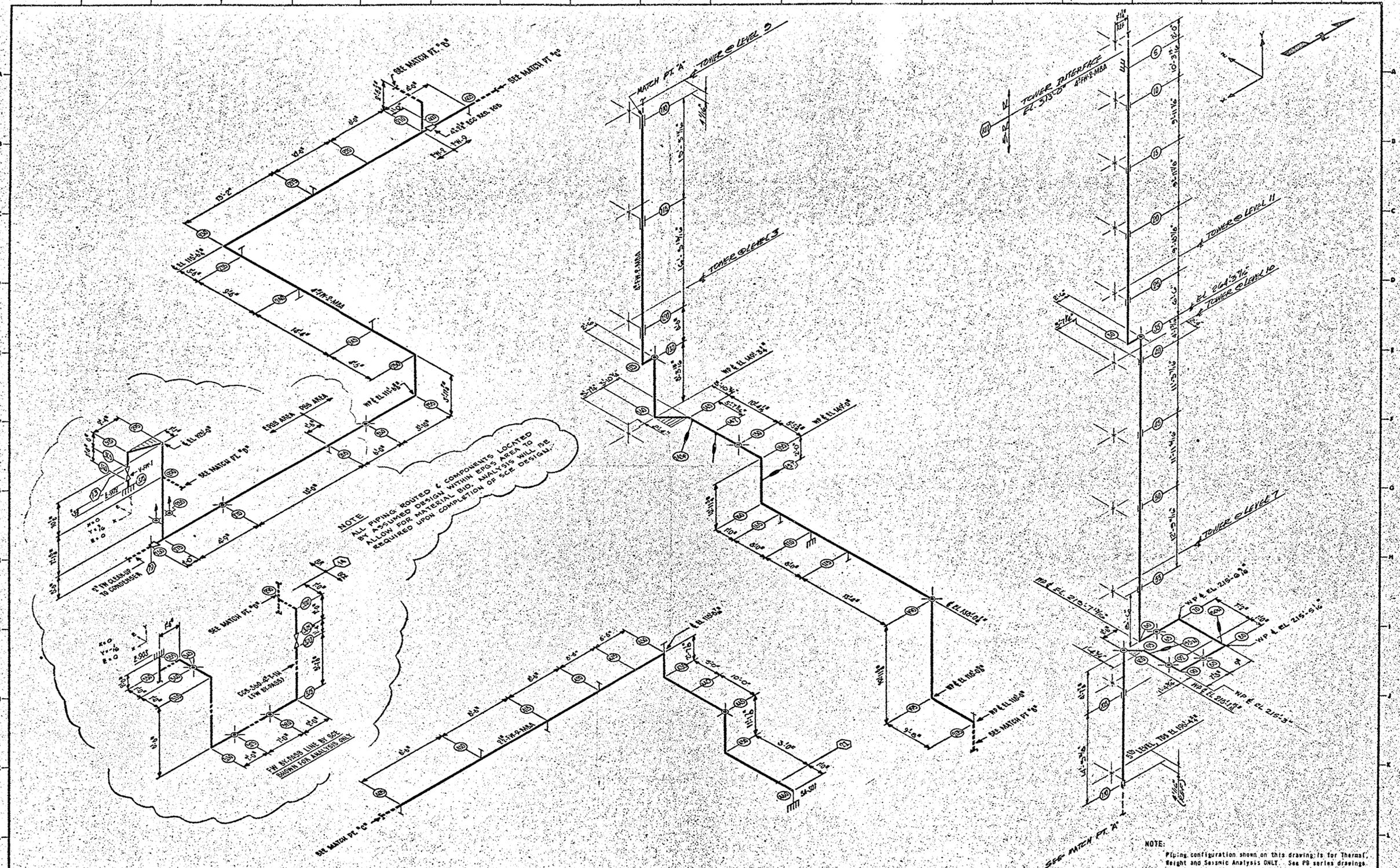
DIVISION USAGE				
MM	P	PP	SH	FI
				SP
X				
APPROVALS				
Des. Sect. <i>[Signature]</i>				
Sect. Supv. <i>[Signature]</i>				
Div. Mgr. <i>[Signature]</i>				

SUMMARY OF FORCES & MOMENTS
 PER. ANSI B31.1-1973 PWR. PIPING CODE

Stearns-Roger
 INCORPORATED
 ENGINEERING STANDARD

STANDARD NO. *EE 16.01.7*
 PAGE 1 OF 1
 ISSUED 2/28/74
 REVISED 4/18/75

EQUIPMENT CONNECTIONS	LOC. NO.	FORCES (LBS)				MOMENTS (FT.-LBS)				
		X	Y	Z	RESULTANT	X	Y	Z	RESULTANT	
HEATER OUTLET E-902	THERMAL	315	-150	-76	-71	182	436	-376	-529	782
	WEIGHT	315	-21	-292	-7	292	-185	32	-44	193
	SEISMIC	315	443	265	332	614	2442	1977	1277	3183
	TOTAL	315	614	633	410	973	2393	2321	1850	3813
HEATER INLET E-903	THERMAL	553	221	101	6	243	221	-382	461	638
	WEIGHT	553	22	9	5	25	-71	-3	-51	88
	SEISMIC	553	316	141	140	373	1273	667	1237	1896
	TOTAL	553	559	251	151	631	1423	1052	1647	2417
1'0" EAST OF INTERFACE 2I	THERMAL	160	-43	-14	-18	42	9	-389	371	538
	WEIGHT	160	-3	5	-1	6	-27	-30	-7	41
	SEISMIC	160	159	102	233	300	1052	808	1138	1747
	TOTAL	160	205	111	252	343	1079	1727	1502	2219



NOTE
 ALL PIPING ROUTED & COMPONENTS LOCATED
 AS ASSUMED DESIGN WITHIN EPDS AREA TO
 ALLOW FOR ITERATIONAL BID. ANALYSIS WILL BE
 REQUIRED UPON COMPLETION OF SCE DESIGN.

NOTE:
 Piping configuration shown on this drawing is for Thermal,
 Weight and Seismic Analysis ONLY. See P8 series drawings
 for piping erection.

NO.	REVISIONS	DATE	BY	CHKD	APPD	DOC NO.
1	UPDATED PER LATEST ANALYSIS DOCUMENTS					

NO.	REFERENCE DRAWINGS	REVISION NO.	REVISION DATE
1	RS TOWER PIPING PLANS & SECTIONS		
2	RS TOWER PIPING PLANS		
3	VARO PIPING 3D ONLY (1/10/00) PLANS		
4	EPDS AREA PLANS & SECTIONS		
5	EPDS LOWER PIPING PLAN (Rev. 1)		
6	EPDS UPPER PIPING PLAN (Rev. 1)		
7	LYCS SECOND FLOOR PLAN (Rev. 1)		

NO.	PRINT RECORD	DATE	BY	CHKD	APPD
1					

NO.	DESCRIPTION	DATE	BY	CHKD	APPD
1	DESIGNED				
2	CHECKED				
3	MECH. CL.				
4	ELECT. CL.				
5	FRAC. CR.				
6	INSTR. CE.				
7	APPROVED				
8	APPROVED				

NO.	DESCRIPTION	DATE	BY	CHKD	APPD
1	FOR APPROVAL				
2	FOR CONCT.				
3	BR. ORDS. NO.				
4	BR. ORDS. NO.				
5	BR. ORDS. NO.				
6	BR. ORDS. NO.				
7	BR. ORDS. NO.				
8	BR. ORDS. NO.				

DEPARTMENT OF ENERGY SAN FRANCISCO OPERATIONS OFFICE EL MONTE, CALIFORNIA 91731		SOLAR TEN MEGAWATT PROJECT OFFICE 9330 FLAIR DRIVE, SUITE 210 EL MONTE, CALIFORNIA 91731	
10 MW SOLAR PILOT PLANT - DAGGETT, CALIFORNIA			
SOLAR FACILITIES DESIGN INTEGRATOR ROCKWELL INTERNATIONAL 10000 WILSON BLVD ROCKFORD, IL 60087		TITLE ANALYSIS ISOMETRIC R. S. FEELWATER	
ANALYSIS ISOMETRIC (P13-4)		SHEET NO. 40P2005131922	
DATE 5-9-00		SHEET NO. 1 of 1	

BRANCH CONNECTION SYMBOLS		PIPE SUPPORT SYMBOLS		ANCHOR OR RESTRAINT NO.	DISPLACEMENT (COLD TO HOT) IN.			ANCHOR &/OR TERM. POINTS	COORDINATE										
					X	Y	Z		X	Y	Z								
	UNREINFORCED PIPE—PIPE INTERSECTION		CONSTANT SUPPORT	5	0.0	0.0	0.0	5 } FW-01	0'-0"	0'-0"	0'-0"								
	REINFORCED PIPE—PIPE INTERSECTION		VARIABLE SPRING SUPPORT	170				170 }	-6'-4 3/4"	-172'-2 5/8"	-28'-8"								
	A S A TEE		RIGID ROD OR STRUT	315		0.18													
	WELDOLET		HYDRAULIC SNUBBER	460		0.0		170 }	0'-0"	0'-0"	0'-0"								
	SWEEPOLET		RIGID GUIDE	555		-0.065		315 } FW-02	59'-1"	-15'-3 1/2"	-61'-8"								
			ANCHOR					460 }	-44'-6"	-36'-2 7/8"	-49'-0"								
								555 }	69'-3"	-13'-3 1/2"	-61'-9"								
MODELING SYMBOLS		PIPING SYMBOLS		ANALYZED CONDITIONS			VALVES & SPECIAL COMPONENTS												
	POINT OF INTEREST		ELBOW	OPERATING TEMP (°F)	DESIGN PRESSURE (PSIG)	CASE	VALVE OR SPEC. COMP. NO.	WGT. (LBS.)	STATUS EST. OR FINAL	REFERENCE & COMMENTS									
	DATA POINT NO.		BEND	440°	2310		V-FW-1	250 #	EST	WALWORTH 5262PS +25#									
	MASS POINT OR CENTER OF GRAVITY		VALVES (ASSUMED RIGID)				V-FW-2	250 #	EST	" " "									
	INTERFACE POINT		REDUCER OR INCREASER																
			EQUIPMENT NOZZLE																
NOTES:																			
1) DIMENSIONS ARE IN FEET AND INCHES UNLESS NOTED OTHERWISE.																			
2) ALL ELBOWS ARE A S A LONG RADIUS UNLESS NOTED OTHERWISE.																			
3) PIPE ANALYZED FROM COLD TO HOT.																			
4) THERMAL ANALYSIS TEMPERATURE RANGE IS FROM 70° F. TO OPERATING TEMPERATURE UNLESS NOTED OTHERWISE.																			
5) SCALE: NONE																			
6) THIS DATA AND ATTACHED DRAWINGS USED FOR ANALYSIS PURPOSES ONLY.																			
DATA POINTS		PIPE		LINE	PIPE SIZE (IN.)		WEIGHT LBS./LINEAR FT.			INS.									
FROM	TO	MATERIAL	SPEC.	O.D.	W.T.	PIPE	FLUID	INSULATION	THK.										
5	315/460/555	A106 Gr.B	MBA	4.50	.674	27.5	3.38	7.05	2 1/2"										
400	460		MBA	2.875	.522	13.1	1.14	3.09	2"										
NO.		REFERENCES		NO.		ANALYSIS CODES		NO.		REVISIONS		DATE		BY		CH'D		APP'D	
	P13-4 A		T/W-FW-01-A-2/2																
			T/W/X-FW-02-A-4/3/1																
PIPING ANALYSIS DATA (P13-4) Stearns-Roger <small>INCORPORATED</small> 10MW SOLAR PILOT PLANT DAGGETT, CALIF. <u>RS FEEDWATER</u> FOR ISOMETRIC P13-4 DRAWN: KEN DATE: 11/21/79 ANAL. BY GHM DATE: 11/28/79 CHECKED: KED DATE: 2-25-80 APP'D. BY <i>[Signature]</i> DATE: 2-26-80 JOB NO. C-21700 SYSTEM NO. FW-01, 02 SHEET 1 OF 1																			

DYNALLEX

STEARNS - ROGER CORP

PAGE 1

PROJECT - 10MW SOLAR PILOT PLANT - C-21700
JOB - RECEIVER FEEDWATER (T/W-FW-01-A-2/2)

DATE 2/12/80

INPUT DATA - (CARD IMAGES)

LINE NUMBER	TYP	LOC	FRI	TO	DELTA X	DELTA Y	DELTA Z	RADIUS	ADDITIONAL DATA	LINE NUMBER
1	HEU								STEARNS - ROGER CORP, 2712780, PROJ: 10MW 30	1
									LAR PILOT PLANT - C-2 1700, JOB RECEIVER FEED WATER (T/W-FW-01-A-2/ 2)	
2	GEI								APPLY H31.1-1973, EXA	2
3			3	10		-10-3-15/16			MAT=LCN, BU=4.50, WI=.674, UNIF=7.94, TEMP=440.	3
4				15		-9-11-7/8				4
5				20		-9-11-7/8				5
6				25		-9-10-7/8				6
7				30		-8-6		L		7
8				35	-2-6			L		8
9				40		-4-1-3/16				9
10				45		-11-3-7/16				10
11				50		-11-11-5/16				11
12				55		-12-9-11/16				12
13				60		-8-6		L		13
14				65	-6-1-5/8					14
15				70	-0-0			L		15
16				80			-8-2	L		16
17				85	0-9					17
18				90	7-3			L		18
19				92			1-0			19
20				95			5-9-1/4	L		20
21				100	1-4-1/2		1-4-3/4	L		21
22				105		-4-7-7/8				22
23				110		-10-5-3/8				23
24				115		-15-5-11/16				24
25				120		-16-5-13/16				25
26				125		-6-6		L		26
27				130	-2-6			L		27
28				140		-8-3-15/16		L		28
29				145	-3-10-3/4		-3-10-3/4	L		29
30				150			-10-4-1/16			30
31				155			-5-5-3/16	L		31

INPUT DATA - (CARD IMAGES)

LINE NUMBER	TYPE	LOC	PRM	DELTA X	DELTA Y	DELTA Z	RADIUS	ADDITIONAL DATA	LINE NUMBER
32	:	:	:	:160:	:-10-11-3/4	:	:	:	32
33	:	:	:	:165:	:	:-1-0	:	:	33
34	:	:	:	:170:	:	:-2-0	:	:	34
35	:ARC:	5:	:	:	:	:	:	:	35
36	:ARC:	170:	:	:	:	:	:	:	36
37	:RAD:	10:	:	:RIGID	:	:	:	:	37
38	:RAD:	15:	:	:RIGID	:	:	:	:	38
39	:RAD:	20:	:	:RIGID	:	:	:	:	39
40	:RAD:	25:	:	:RIGID	:	:	:	:	40
41	:RAD:	40:	:	:RIGID	:	:	:	:	41
42	:RAD:	45:	:	:RIGID	:	:	:	:	42
43	:RAD:	50:	:	:RIGID	:	:	:	:	43
44	:RAD:	55:	:	:RIGID	:	:	:	:	44
45	:RAD:	105:	:	:RIGID	:	:	:	:	45
46	:RAD:	110:	:	:RIGID	:	:	:	:	46
47	:RAD:	115:	:	:RIGID	:	:	:	:	47
48	:RAD:	120:	:	:RIGID	:	:	:	:	48
15 49	:RAD:	165:	:	:	:RIGID	:	:	:	49
50	:RAD:	10:	:	:	:	:RIGID	:	:	50
51	:RAD:	15:	:	:	:	:RIGID	:	:	51
52	:RAD:	20:	:	:	:	:RIGID	:	:	52
53	:RAD:	25:	:	:	:	:RIGID	:	:	53
54	:RAD:	40:	:	:	:	:RIGID	:	:	54
55	:RAD:	45:	:	:	:	:RIGID	:	:	55
56	:RAD:	50:	:	:	:	:RIGID	:	:	56
57	:RAD:	55:	:	:	:	:RIGID	:	:	57
58	:RAD:	105:	:	:	:	:RIGID	:	:	58
59	:RAD:	110:	:	:	:	:RIGID	:	:	59
60	:RAD:	115:	:	:	:	:RIGID	:	:	60
61	:RAD:	120:	:	:	:	:RIGID	:	:	61
62	:RGR:	:	:	:	:	:	:	:LOCATION(135N,85, :85,100N,130N,92,150), :USE TABLE 1	62
63	:CCC:	170:	:	:-6-4-3/4	:-172-2-5/8	:-28-8	:	:	63

DYNAFLEX

STEARNS - ROGER COMP

PAGE 3

PROJECT - 10MW SOLAR PILOT PLANT - C-21700
JOB - RECEIVER FEEDWATER (T/W-FW-01-A-272)

DATE 2/12/80

*
* EDITED PIPING SYSTEM DESCRIPTION *
*
*

EXPLANATORY NOTES

IN THE EDITED PIPING SYSTEM DESCRIPTION:

- (1) POINT LOCATION NUMBER SUFFIXES N, M AND F IDENTIFY THE NEAR POINT, THE MID POINT AND THE FAR POINT RESPECTIVELY OF A PIPING ELEMENT IN THE DIRECTION IN WHICH THE LINE IS TRAVERSED. FRACTIONAL NODE NUMBERS APPEARING IN THE FOLLOWING REPORTS IDENTIFY THOSE NODES AT WHICH THE PROGRAM HAS INTRODUCED EVENLY SPACED LUMP POINTS AND ARE DETERMINED FROM THE MAXIMUM LUMP SPACING CRITERIA ENTERED BY THE USER. IF FRACTIONAL NODE NUMBERS ARE ASSIGNED TO MORE THAN ONE ELEMENT ORIGINATING AT THE SAME BRANCH POINT, A LETTER WILL PRECEDE THE FRACTIONAL PORTION OF THE NUMBER TO UNIQUELY IDENTIFY EACH POINT (E.G. 2.A1). LETTERS ARE ASSIGNED TO ELEMENTS ALPHABETICALLY IN THE ORDER OF THEIR APPEARANCE IN THE INPUT DATA.
- (2) AMBIENT TEMPERATURE IS ASSUMED TO BE 70 DEGREES FAHRENHEIT.
- (3) THE MAXIMUM ALLOWABLE DIFFERENCE IN LOOP CLOSURE CALCULATIONS IS ASSUMED TO BE .25 INCHES.
- (4) THE MAXIMUM ALLOWABLE DIFFERENCE BETWEEN THE CALCULATED AND INPUT COORDINATES OF USER DESIGNATED CHECK POINTS IS ASSUMED TO BE .25 INCHES.
- (8) IN ORDER TO MAKE IT POSSIBLE IN CERTAIN SITUATIONS TO PERFORM INDEPENDENT WEIGHT AND THERMAL ANALYSES IN THE SAFE RUN AND APPLY THE CODE STRESS CALCULATIONS CORRECTLY, THE PROGRAM MAKES CERTAIN ASSUMPTIONS. IF THE INPUT DATA SPECIFIES IMPOSED MOVEMENTS ON ARCHES (AMC) OR DISPLACEMENTS OR ROTATIONS ON RIGID RESTRAINTS (RAD,RAK) THESE ARE ASSUMED BY THE PROGRAM TO BE THERMAL EFFECTS AND INCLUDED ONLY IN THOSE LOADING CASES WHICH INCLUDE THERMAL. ALTERNATELY, IF THE INPUT DATA SPECIFIES FORCES AND MOMENTS (FOR,MOM) OR IMPOSED DISPLACEMENTS OR ROTATIONS ON FLEXIBLE RESTRAINTS (RAD,RAK) THESE ARE ASSUMED TO BE WEIGHT EFFECTS AND INCLUDED ONLY IN THOSE LOADING CASES WHICH INCLUDE WEIGHT. IF THESE ASSUMPTIONS ARE INVALID FOR A PARTICULAR SITUATION, THE USER CAN ACCURATELY MODEL THE MOST GENERAL SITUATION BY USING THE AUXILIARY SUPPORT MOVEMENTS (ASH) AND THE AUXILIARY CONCENTRATED LOADS (ACL) FEATURE OF THE PROGRAM AS AN ALTERNATE METHOD OF SPECIFYING THESE EFFECTS.
- (9) A POINT IDENTIFIED AS A TENTATIVE HANGER LOCATION IS ASSUMED TO BE FREE TO MOVE IN THE VERTICAL DIRECTION FOR THE INITIAL THERMAL LOADING CASE AND FULLY RESTRAINED IN THE VERTICAL DIRECTION FOR THE INITIAL WEIGHT LOADING CASE.
- (15) THE TABLE OF CONTENTS APPEARS AT THE END OF THIS REPORT.

GENERAL DATA

COORDINATES OF ALL POINTS OF THE SYSTEM ARE WITH RESPECT TO POINT 5, WHICH IS THE ORIGIN

HANGER DESIGN DATA:

THE MAXIMUM RIGID SUPPORT DISPLACEMENT CRITERION = .10 INCHES.
 VARIABLE SPRING HANGERS SELECTED FROM TABLE 010

MATERIALS USED (TEMPERATURE DEPENDENT PROPERTIES ARE SHOWN AT POINT OF TEMPERATURE CHANGE)

LCS - LOW CARBON STEEL
 YOUNGS. MODULUS AT AMBIENT TEMPERATURE = 27,900,000. PSI
 POISSONS RATIO = .30
 DENSITY = 490. POUNDS PER CUBIC FOOT

LOADING CONDITIONS ANALYZED

FREE THERMAL
 RESTRAINED WEIGHT

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (DEG) (FAHR)	DIST. LOADS (LBS PER FT)	
			X	Y	Z							PRESS (PSI)	WT. UNIF
ANCHOR		5	0.00	0.00	0.00								
17	STRAIGHT					10.33		4.500	.074	LCS	440	27.6	7.9
	(
	(* THERMAL EXPANSION OF LCS BETWEEN AMBIENT AND 440.												
	(DEGREES FAHRENHEIT IS 3.07 INCHES PER 100 FEET												
	(
	(* A UNIFORM DISTRIBUTED LOAD OF 7.9# PLF IS ACTING												
	(IN THE +Y DIRECTION.												
	(
	>= 10		0.00	10.33	0.00								

* NOTES PERTAINING TO POINT 10 APPEAR ON THE FOLLOWING PAGE

DYNALFX

EDITED PIPELINE SYSTEM DESCRIPTION (CONTINUED)

PAGE 5

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (FARR)	DIST. LOADS (LBS PER FT)		
			X	Y	Z							WT.	UNIT	
		>= 10	0.00	-10.33	0.00				0.500	.674	LCS	440.	27.6	7.9
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 10												
		(IN DIRECTION Z												
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 10												
		(IN DIRECTION X												
	STRAIGHT - (						9.99							
		>= 15	0.00	-20.32	0.00									
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 15												
		(IN DIRECTION Z												
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 15												
		(IN DIRECTION X												
	STRAIGHT - (						9.99							
18		>= 20	0.00	-30.31	0.00									
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 20												
		(IN DIRECTION Z												
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 20												
		(IN DIRECTION X												
	STRAIGHT - (						9.91							
		>= 25	0.00	-40.21	0.00									

* NOTES PERTAINING TO POINT 25 APPEAR ON THE FOLLOWING PAGE

POINT TYPE	ELEMENT DESIGNATION	POINT NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (DEG)	DIST. LOADS (LBS PER FT)		
			X	Y	Z							ST.	UNIF	
		> 25	0.00	-40.21	0.00				4.500	.674	LCS	440	27.6	7.9
		(
			* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 25											
			IN DIRECTION Z											
			* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 25											
			IN DIRECTION X											
	STRAIGHT	(				6.00								
		>	30N	0.00	-46.21	0.00								
		(
			* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 30N											
			IN DIRECTION Z											
			* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 30N											
			IN DIRECTION X											
	BEND	(				.50	.79	90.000						
		>	30F	-0.50	-46.71	0.00								
		(
	STRAIGHT	(				1.50								
		>	35N	-2.00	-46.71	0.00								
		(
			* TENTATIVE HANGER AT POINT 35N - SEE NOTE (9) ABOVE.											
			HANGER LENGTH NOT SPECIFIED.											
19														
	BEND	(				.50	.79	90.000						
		>	35F	-2.50	-47.21	0.00								
		(
	STRAIGHT	(				3.60								
		>	40	-2.40	-50.81	0.00								
		(
			* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 40											
			IN DIRECTION X											
			* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 40											
			IN DIRECTION Z											
	STRAIGHT	(				11.29								
		>	45	-2.50	-62.10	0.00								

* NOTES PERTAINING TO POINT 45 APPEAR ON THE FOLLOWING PAGE

DYNALLEX

UNITED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 7

DIST. LOADS
(LBS PER FT)

POINT TYPE	ELEMENT DESIGNATION	POINT NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (FAHR)	PRESS PIPE		
			X	Y	Z							(PSI)	WT. UNIT	
		>= 45	-2.50	-62.10	0.00				4.500	.674	LCS	440	27.6	7.9
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 45												
		(IN DIRECTION X												
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 45												
		(IN DIRECTION Z												
	STRAIGHT - (						11.94							
		>= 50	-2.50	-74.04	0.00									
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 50												
		(IN DIRECTION Z												
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 50												
		(IN DIRECTION X												
	STRAIGHT - (						12.81							
20		>= 55	-2.50	-86.85	0.00									
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 55												
		(IN DIRECTION Z												
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 55												
		(IN DIRECTION X												
	STRAIGHT - (						8.00							
		>= 60P	-2.50	-94.85	0.00									
	BEND - (	60M	-2.65	-95.20	0.00	.50	.79	90.000						
		>= 60P	-3.00	-95.35	0.00									
	STRAIGHT - (						5.65							
		>= 65	-0.65	-95.35	0.00									

* NOTES PERTAINING TO POINT 65 APPEAR ON THE FOLLOWING PAGE

DIST. LOADS
(LBS PER FT)

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (DEG)	PRESS (PSI)	DIST. LOADS (LBS PER FT)	
			X	Y	Z								WT.	UNIF
		>= 65	-8.65	-95.35	0.00				4.500	.674	LCS: 440.		27.6	7.9
		(
		(	* TENTATIVE HANGER AT POINT 65 - SEE NOTE (9) ABOVE.											
		(	HANGER LENGTH NOT SPECIFIED.											
	STRAIGHT	(					.25							
		>= 70D	-8.90	-95.35	0.00									
		(
	BEND	(	70E	-9.25	-95.35	-0.15	.50	.79	90.000					
		(
	STRAIGHT	(	>= 70F	-9.40	-95.35	-0.50		7.17						
		>= 80H	-9.40	-95.35	-7.67									
		(
	BEND	(	80M	-9.25	-95.35	-8.02	.50	.79	90.000					
		(
	STRAIGHT	(	>= 80F	-8.90	-95.35	-8.17		.25						
		>= 85	-8.65	-95.35	-8.17									
		(
		(	* TENTATIVE HANGER AT POINT 85 - SEE NOTE (9) ABOVE.											
		(	HANGER LENGTH NOT SPECIFIED.											
	STRAIGHT	(					6.75							
		>= 90G	-1.90	-95.35	-8.17									
		(
	BEND	(	90M	-1.50	-95.35	-8.02	.50	.79	90.000					
		(
	STRAIGHT	(	>= 90F	-1.40	-95.35	-7.67		.50						
		>= 92	-1.40	-95.35	-7.17									
		(
		(	* TENTATIVE HANGER AT POINT 92 - SEE NOTE (9) ABOVE.											
		(	HANGER LENGTH NOT SPECIFIED.											
	STRAIGHT	(					5.56							
		>= 95R	-1.00	-95.35	-1.80									
		(
	BEND	(	95E	-1.36	-95.35	-1.41	.50	.39	45.000					
		(
		>= 95F	-1.25	-95.35	-1.25									

21

DYNAPLEX

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 9

POINT TYPE	ELEMENT RESTRICTION	POINT LOC.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE WALL		TEMP		DIST. LOADS (LBS PER FT)	
			X	Y	Z				DIAMETER (IN)	THICK (IN)	MATL	(FAHM)	(PSI)	WT.	DNIF
		>= 95F	-1.25	-95.35	-1.25				4.500	.674	LCS	440	27.5	7.9
STRAIGHT	(	>=100N	-.45	-95.35	-.35		1.27		:	:	:	:	:	:
	(	* TENTATIVE HANGER AT POINT 100N - SEE NOTE (9) ABOVE.												
	(	* HANGER LENGTH NOT SPECIFIED.												
	(
	(
BEND	(	= 100N	-.10	-95.50	-.10	.50	.79	90.000	:	:	:	:	:	:
	(
STRAIGHT	(	>=100F	.00	-95.85	.00		4.16		:	:	:	:	:	:
	(	>=105	.00	-100.01	.00				:	:	:	:	:	:
	(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 105												
	(	IN DIRECTION X												
	(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 105												
	(	IN DIRECTION Z												
22	STRAIGHT	(					14.45		:	:	:	:	:	:
	(	>=110	.00	-114.45	.00				:	:	:	:	:	:
	(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 110												
	(	IN DIRECTION X												
	(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 110												
	(	IN DIRECTION Z												
STRAIGHT	(						15.47		:	:	:	:	:	:
	(	>=115	.00	-127.93	.00				:	:	:	:	:	:

* NOTES PERTAINING TO POINT 115 APPEAR ON THE FOLLOWING PAGE

DIST. LOADS
(LBS PER FT)

POINT TYPE	ELEMENT DESIGNATION	POINT LOC.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (FAHR)	PRESS PIPE		
			X	Y	Z							(PSI)	WT. UNIT	
		>=115	.00	-129.93	.00				4.500	.674	LCS	440.1	27.6	7.9
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 115											
		(	IN DIRECTION X											
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 115											
		(	IN DIRECTION Z											
	STRAIGHT	-(					16.48							
		>=120	.00	-146.41	.00									
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 120											
		(	IN DIRECTION X											
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 120											
		(	IN DIRECTION Z											
	STRAIGHT	-(					6.00							
23		>=125N	.00	-152.41	.00									
	BEND	-(	125N	-.15	-152.77	.00	.50	.79	90.000					
		>=125F	-.50	-152.91	.00									
	STRAIGHT	-(					1.50							
		>=130N	-2.00	-152.91	.00									
		(	* TENTATIVE HANGER AT POINT 130N - SEE NOTE (9) ABOVE.											
		(	HANGER LENGTH NOT SPECIFIED.											
		(
		(
	BEND	-(	130N	-2.35	-153.08	.00	.50	.79	90.000					
		>=130F	-2.50	-154.41	.00									
	STRAIGHT	-(					7.33							
		>=140N	-2.50	-160.74	.00									
		(
	BEND	-(	140N	-2.60	-161.09	-.10	.50	.79	90.000					

DYNAFLEX

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 11

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (DEG)	DIST. LOADS (LBS PER FT)		
			X	Y	Z							PRESS (PSI)	PIPE WT. UNIF	
	BEND	140M	-2.60	-161.09	-1.10	.50	.79	90.000	4.900	.674	LCS	440.	27.6	7.9
		>140F	-2.85	-161.24	-1.35									
	STRAIGHT						4.80							
		>145N	-6.25	-161.24	-3.75									
	BEND	145M	-6.36	-161.24	-3.91	.50	.39	45.000						
		>145F	-6.40	-161.24	-4.10									
	STRAIGHT						10.13							
		>150	-6.40	-161.24	-14.23									
			(* TENTATIVE HANGER AT POINT 150 - SEE NOTE (9) ABOVE.											
			HANGER LENGTH NOT SPECIFIED.											
	STRAIGHT						4.93							
		>155N	-6.40	-161.24	-19.17									
24	BEND	155M	-6.40	-161.39	-19.52	.50	.79	90.000						
		>155F	-6.40	-161.74	-19.67									
	STRAIGHT						9.98							
		>160N	-6.40	-171.72	-19.67									
	BEND	160M	-6.40	-172.07	-19.81	.50	.79	90.000						
		>160F	-6.40	-172.22	-20.17									
	STRAIGHT						.50							
		>165	-6.40	-172.22	-20.67									
			(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 165											
			IN DIRECTION Y											
	STRAIGHT						8.00							
ANCHR		--170	-6.40	-172.22	-20.67									

* NOTES PERTAINING TO POINT 170 APPEAR ON THE FOLLOWING PAGE

DYNAFLEX

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 12

DIST. LOADS
(LBS PER FT)

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (FAHR)	PRESS PIPE	
			X	Y	Z							WT.	UNIF
ANCHR		--170	-6.46	-172.22	-28.67				4.500	.670	LCS: 440.	27.6	7.9
* CONTROL COORDINATES OF POINT 170, IN FEET :													
Z = -6.46, Y = -172.22, X = -28.67													
RESULTANT DIFFERENCE IS ZERO													

DYNAFLEX

LOADING - FREE THERMAL

PAGE 13

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)				
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT	
ANCHORS:									
5	2.	462.	-0.	462.	2.	52.	6.	52.	
170	-141.	-42.	-468.	490.	112.	-1318.	759.	1525.	
RESTRAINTS:									
10	0.	0.	2.	2.	0.	0.	0.	0.	
26	10	-7.	0.	0.	7.	0.	0.	0.	
15	0.	0.	-7.	7.	0.	0.	0.	0.	
15	24.	0.	0.	24.	0.	0.	0.	0.	
20	0.	0.	28.	28.	0.	0.	0.	0.	
20	-91.	0.	0.	91.	0.	0.	0.	0.	
25	0.	0.	-53.	53.	0.	0.	0.	0.	
25	264.	0.	0.	264.	0.	0.	0.	0.	
40	-224.	0.	0.	224.	0.	0.	0.	0.	
40	0.	0.	54.	54.	0.	0.	0.	0.	

DYNAREX

LOADING = FREE THERMAL

PAGE 14

FORCES AND MOMENTS OF ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM
ON THE ANCHORS AND RESTRAINTS.

LDC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
45	17.	0.	0.	17.	0.	0.	0.	0.
45	0.	0.	-49.	49.	0.	0.	0.	0.
50	0.	0.	101.	101.	0.	0.	0.	0.
50	91.	0.	0.	91.	0.	0.	0.	0.
55	0.	0.	-15.	15.	0.	0.	0.	0.
55	-93.	0.	0.	93.	0.	0.	0.	0.
105	-135.	0.	0.	135.	0.	0.	0.	0.
27 105	0.	0.	-206.	206.	0.	0.	0.	0.
110	185.	0.	0.	185.	0.	0.	0.	0.
110	0.	0.	229.	229.	0.	0.	0.	0.
115	-34.	0.	0.	34.	0.	0.	0.	0.
115	0.	0.	-267.	267.	0.	0.	0.	0.
120	141.	0.	0.	141.	0.	0.	0.	0.
120	0.	0.	652.	652.	0.	0.	0.	0.
165	0.	-419.	0.	419.	0.	0.	0.	0.

 * INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *

THE MAXIMUM STRESS OF 8308. OCCURS AT POINT 140M

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE ANSI B31.1 - 1977 PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (**) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE HEADING BELOW) ARE AUTOMATICALLY CALCULATED AND APPLIED AT BENDS, ELBOWS, MITERS AND ADMISSIBLE TYPES OF TEES (AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE MODULUS IS USED FOR THE BRANCH LEG AT REDUCED OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK. THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

28

LOADING - STRESS-THERMAL

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT FLEM TYPE	LIG. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)			SIF	SECTION MODULUS (IN ³)	EXPANSION STRESS - PSI	
		AXIAL	SHEAR	RESULTANT	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING				
ANCHP	5	462.	2.	52.	52.	6.	2.	1.00	1.00	6.79	92.
STR - (		462.	5.	52.	52.	11.	3.	1.00	1.00	6.79	94.
STR - (	15	462.	20.	52.	52.	40.	12.	1.00	1.00	6.79	118.
STR - (	20	462.	75.	52.	52.	149.	45.	1.00	1.00	6.79	240.
STR - (	25	462.	195.	52.	52.	362.	171.	1.00	1.00	6.79	1042.
STR - (	30	462.	195.	52.	52.	593.	17.	1.00	1.00	6.79	1052.
BEND - (	30	462.	193.	20.	593.	60.	1.00	1.00	1.00	6.79	1054.
STR - (	35	193.	463.	55.	458.	66.	1.00	1.00	1.00	6.79	821.
STR - (	35	193.	463.	55.	234.	115.	1.00	1.00	1.00	6.79	464.
BEND - (	35	162.	193.	62.	369.	115.	1.00	1.00	1.00	6.79	691.
STR - (	35	462.	195.	130.	368.	48.	1.00	1.00	1.00	6.79	695.
STR - (	40	462.	195.	130.	325.	161.	1.00	1.00	1.00	6.79	680.
STR - (	45	462.	30.	130.	28.	94.	1.00	1.00	1.00	6.79	288.
STR - (	50	462.	50.	130.	197.	218.	1.00	1.00	1.00	6.79	565.
STR - (	55	462.	62.	130.	130.	749.	1.00	1.00	1.00	6.79	1936.
STR - (	60	462.	62.	130.	665.	1232.	1.00	1.00	1.00	6.79	2484.
BEND - (	60	315.	393.	972.	591.	800.	1.00	1.00	1.00	6.79	2458.
STR - (	60	16.	465.	1262.	426.	100.	1.00	1.00	1.00	6.79	2360.
STR - (	65	16.	465.	1262.	2180.	241.	1.00	1.00	1.00	6.79	4470.
STR - (	70	16.	465.	1202.	256.	2295.	1.00	1.00	1.00	6.79	4649.
BEND - (	70	32.	465.	2563.	240.	893.	1.00	1.00	1.00	6.79	4853.
STR - (	70	60.	462.	2528.	294.	1031.	1.00	1.00	1.00	6.79	4847.

DYNAL FLEX

LOADING - FREE THERMAL

PAGE 17

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	EXPANSION STRESS PSI	
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE			
	STR - (	>= 7CF	60.	462.	2526.	294.	1031.	1.00	1.00	6.79	4847.
	(	>= 8CF	60.	462.	2526.	406.	2276.	1.00	1.00	6.79	6049.
	BEND - (	8CF	54.	463.	3463.	402.	13.	1.00	1.00	6.79	6159.
	(	>= 8GF	16.	465.	2507.	383.	2295.	1.00	1.00	6.79	6042.
	STR - (	>= 8S	16.	465.	2507.	2180.	356.	1.00	1.00	6.79	5904.
	(	>= 9GN	16.	465.	2507.	39.	936.	1.00	1.00	6.79	4727.
	BEND - (	9GN	32.	465.	2502.	63.	946.	1.00	1.00	6.79	4727.
	(	>= 9OF	60.	462.	1166.	77.	2276.	1.00	1.00	6.79	4520.
	STR - (	>= 92	60.	462.	1166.	2045.	85.	1.00	1.00	6.79	4162.
	(	>= 95N	60.	462.	1166.	522.	172.	1.00	1.00	6.79	2278.
30	BEND - (	95N	50.	463.	660.	177.	1017.	1.00	1.00	6.79	2374.
	(	>= 95F	32.	465.	388.	1357.	186.	1.00	1.00	6.79	2515.
	STR - (	>= 100N	32.	465.	388.	1942.	254.	1.00	1.00	6.79	3527.
	(BEND - (100N	304.	353.	462.	2110.	75.	1.00	1.00	6.79	3018.
	(	>= 100F	462.	62.	281.	1803.	1292.	1.00	1.00	6.79	3950.
	STR - (	>= 105	462.	210.	281.	1738.	1543.	1.00	1.00	6.79	4136.
	(	>= 110	462.	90.	281.	440.	559.	1.00	1.00	6.79	1352.
	STR - (	>= 115	462.	90.	281.	85.	728.	1.00	1.00	6.79	1387.
	(	>= 120	462.	184.	281.	85.	2305.	1.00	1.00	6.79	4106.
	STR - (	>= 125N	462.	408.	281.	928.	501.	1.00	1.00	6.79	1928.
	(BEND - (125N	424.	520.	621.	910.	321.	1.00	1.00	6.79	2027.
	(	>= 125F	141.	657.	735.	767.	47.	1.00	1.00	6.79	1878.

 * INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES *

EXPLANATORY NOTES

THE FORCES AND MOMENTS AT ANY POINT SHOWN BELOW REPRESENT THE ACTION OF THE FAR END OF THE BRANCH ACTING ON THE NEAR END OF THE BRANCH.

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
ANCHOR		-- 5	2.	462.	-0.	2.	52.	6.
	STRAIGHT = (	>- 10	-5.	462.	2.	-3.	52.	-11.
	STRAIGHT = (	>- 15	19.	462.	-6.	12.	52.	40.
	STRAIGHT = (	>- 20	-72.	462.	22.	-45.	52.	-149.
	STRAIGHT = (	>- 25	193.	462.	-31.	171.	52.	562.
32	STRAIGHT = (	>- 30H	193.	462.	-31.	-17.	52.	-593.
	BEND = (	30H	193.	462.	-31.	-28.	57.	-593.
	STRAIGHT = (	>- 30F	193.	462.	-31.	-33.	68.	-458.
	STRAIGHT = (	>- 35H	193.	462.	-31.	-33.	115.	234.
	BEND = (	35H	193.	462.	-31.	-37.	126.	369.
	STRAIGHT = (	>- 35F	193.	462.	-31.	-46.	130.	368.
	STRAIGHT = (	>- 40	193.	462.	-31.	-161.	130.	-325.
	STRAIGHT = (	>- 45	-14.	462.	-26.	94.	130.	28.
	STRAIGHT = (	>- 50	-14.	462.	-26.	-216.	130.	197.
	STRAIGHT = (	>- 55	-16.	462.	60.	749.	130.	-789.
	STRAIGHT = (	>- 60H	-16.	462.	60.	1232.	130.	-665.
	BEND = (	60H	-16.	462.	60.	1253.	121.	-591.
	STRAIGHT = (	>- 60F	-16.	462.	60.	1262.	100.	-426.

DYNAFLEX

LOADING - FREE THERMAL

PAGE 20

INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
	STRAIGHT - (	>- 60F	-16.	462.	60.	1262.	100.	-426.
	STRAIGHT - (	>- 65	-16.	462.	60.	1262.	-241.	2180.
	STRAIGHT - (	>- 70F	-16.	462.	60.	1262.	-256.	2295.
	BEND - (	70B	-16.	462.	60.	1195.	-280.	2458.
	STRAIGHT - (	>- 76F	-16.	462.	60.	1031.	-294.	2526.
	STRAIGHT - (	>- 80B	-16.	462.	60.	-2276.	-406.	2526.
	BEND - (	80B	-16.	462.	60.	-2439.	-402.	2458.
	STRAIGHT - (	>- 86F	-16.	462.	60.	-2507.	-383.	2295.
	STRAIGHT - (	>- 85	-16.	462.	60.	-2507.	-368.	2180.
	STRAIGHT - (	>- 90B	-16.	462.	60.	-2507.	39.	-936.
8	BEND - (	90B	-16.	462.	60.	-2439.	63.	-1099.
	STRAIGHT - (	>- 90F	-16.	462.	60.	-2276.	77.	-1166.
	STRAIGHT - (	>- 92	-16.	462.	60.	-2045.	85.	-1166.
	STRAIGHT - (	>- 95B	-16.	462.	60.	522.	172.	-1166.
	BEND - (	95B	-16.	462.	60.	611.	177.	-1184.
	STRAIGHT - (	>- 95F	-16.	462.	60.	686.	186.	-1234.
	STRAIGHT - (	>- 100B	-16.	462.	60.	1099.	254.	-1647.
	BEND - (	100B	-16.	462.	60.	1223.	273.	-1760.
	STRAIGHT - (	>- 100F	-16.	462.	60.	1292.	281.	-1803.
	STRAIGHT - (	>- 105	-151.	462.	-146.	1543.	281.	-1738.
	STRAIGHT - (	>- 110	34.	462.	83.	-559.	281.	440.
	STRAIGHT - (	>- 115	34.	462.	83.	728.	281.	-85.
	STRAIGHT - (	>- 120	0.	462.	-184.	-2305.	281.	-85.

DYNAFLEX

LOADING - FREE THERMAL

PAGE 21

INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES (CONTINUED)

JOINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
		>- 120	0.	462.	-184.	-2305.	281.	-85.
	STRAIGHT - (	>- 125N	141.	462.	468.	501.	281.	-928.
	BEND - (	125N	141.	462.	468.	666.	213.	-910.
		>- 125F	141.	462.	468.	735.	47.	-767.
	STRAIGHT - (	>- 130N	141.	462.	468.	735.	-654.	-75.
	BEND - (	130N	141.	462.	468.	803.	-620.	68.
		>- 130F	141.	462.	468.	968.	-888.	85.
	STRAIGHT - (	>- 140N	141.	462.	468.	4396.	-888.	-944.
	BEND - (	140N	141.	462.	468.	4513.	-922.	-946.
		>- 140F	141.	462.	468.	4466.	-1004.	-851.
34	STRAIGHT - (	>- 145N	141.	462.	468.	2899.	-2115.	716.
	BEND - (	145N	141.	462.	468.	2824.	-2143.	766.
		>- 145F	141.	462.	468.	2736.	-2134.	783.
	STRAIGHT - (	>- 150	141.	462.	468.	-1940.	-710.	783.
		>- 155N	141.	462.	468.	-4216.	-17.	783.
	BEND - (	155N	141.	462.	468.	-4311.	33.	763.
		>- 155F	141.	462.	468.	-4213.	53.	713.
	STRAIGHT - (	>- 160N	141.	462.	468.	454.	53.	-689.
	BEND - (	160N	141.	462.	468.	552.	74.	-739.
		>- 160F	141.	462.	468.	458.	124.	-759.
	STRAIGHT - (	>- 165	141.	42.	468.	227.	194.	-759.
	STRAIGHT - (	-- 170	141.	42.	468.	-112.	1318.	-759.

ANCHOR

DYNAPLEX

LOADING - STRESS THERMAL

PAGE 22

* DISPLACEMENTS AND ROTATIONS *

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
ANCHOR	STRAIGHT -(	5	.000	.000	.000	.000	.000	.000
	>-	10	.000	-.317	.000	-.000	.014	-.001
	STRAIGHT -(
	>-	15	.000	-.623	.000	.001	.027	.002
	STRAIGHT -(
	>-	20	.000	-.929	.000	-.003	.040	-.008
	STRAIGHT -(
	>-	25	.000	-1.233	.000	.009	.053	.031
	STRAIGHT -(
	>-	30N	.053	-1.417	.020	.018	.060	.029
	(
	BEND -(	30N	.050	-1.428	.019	.018	.061	.023
	(
	>-	30P	.040	-1.434	.015	.018	.062	.017
35	STRAIGHT -(
	>-	35N	.008	-1.438	.004	.017	.064	.013
	(
	BEND -(	35N	.017	-1.444	.009	.016	.066	.017
	(
	>-	35P	.020	-1.455	.010	.016	.067	.021
	STRAIGHT -(
	>-	40	.000	-1.585	.000	.008	.079	.023
	STRAIGHT -(
	>-	45	.000	-1.911	.000	.001	.116	-.010
	STRAIGHT -(
	>-	50	.000	-2.278	.000	-.013	.155	.016
	STRAIGHT -(
	>-	55	.000	-2.670	.000	.053	.197	-.057
	STRAIGHT -(
	>-	60N	-.193	-2.915	-.207	.206	.223	-.170
	(
	BEND -(	60N	-.210	-2.921	-.210	.220	.224	-.177
	(
	>-	60P	-.226	-2.912	-.206	.233	.224	-.183
	STRAIGHT -(
	>-	65	-.400	-2.724	.059	.412	.217	-.087
	STRAIGHT -(
	>-	70N	-.407	-2.719	.070	.420	.215	-.076

DYNAPLEX

LOADING - FREE THERMAL

PAGE 23

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	>-	70A	-.407	-2.719	.070	.420	.215	-.076
	BEND - (	70A	-.425	-2.702	.081	.431	.212	-.050
	>-	70F	-.445	-2.668	.077	.443	.209	-.025
	STRAIGHT - (
	>-	80A	-.724	-2.010	-.143	.356	.161	.430
	BEND - (	80A	-.732	-1.971	-.159	.331	.156	.454
	>-	80F	-.725	-1.926	-.175	.307	.152	.479
	STRAIGHT - (
	>-	85	-.718	-1.901	-.182	.292	.150	.490
	STRAIGHT - (
	>-	90A	-.511	-1.102	-.373	-.134	.128	.571
	BEND - (	90A	-.496	-1.055	-.378	-.159	.129	.561
	>-	90F	-.482	-1.025	-.371	-.184	.130	.551
	STRAIGHT - (
96	>-	92	-.460	-1.005	-.355	-.205	.130	.536
	STRAIGHT - (
	>-	95A	-.309	-.690	-.185	-.287	.144	.373
	BEND - (	95A	-.302	-.676	-.180	-.284	.145	.367
	>-	95F	-.294	-.658	-.178	-.280	.146	.360
	STRAIGHT - (
	>-	100A	-.238	-.543	-.179	-.260	.152	.323
	BEND - (	100A	-.213	-.517	-.171	-.246	.154	.304
	>-	100F	-.165	-.516	-.154	-.232	.157	.284
	STRAIGHT - (
	>-	105	-.000	-.644	-.000	-.118	.187	.142
	STRAIGHT - (
	>-	110	.000	-1.087	.000	.020	.289	-.040
	STRAIGHT - (
	>-	115	-.000	-1.561	-.000	.045	.398	.013
	STRAIGHT - (
	>-	120	.000	-2.067	.000	-.207	.515	-.013
	STRAIGHT - (
	>-	125A	-.643	-2.250	.360	-.311	.557	-.072
	BEND - (	125A	-.654	-2.259	.400	-.305	.559	-.083

DYNAFLEX

LOADING - STRESS THERMAL

PAGE 24

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	ELEM. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	BEND - (	125M	-.054	-2.259	.400	-.305	.559	-.083
	>-	125F	-.067	-2.257	.451	-.298	.561	-.092
	STRAIGHT - (
	>-	130M	-.113	-2.225	.627	-.270	.552	-.105
	BEND - (	130M	-.127	-2.222	.675	-.262	.543	-.105
	>-	130F	-.139	-2.229	.711	-.252	.534	-.104
	STRAIGHT - (
	>-	140M	-.326	-2.454	.869	.128	.370	-.164
	BEND - (	140M	-.350	-2.458	.863	.179	.360	-.175
	>-	140F	-.301	-2.442	.867	.228	.348	-.188
	STRAIGHT - (
	>-	145M	-.688	-2.004	.966	.621	.203	-.144
	BEND - (	145M	-.698	-1.980	.965	.636	.191	-.141
37	>-	145F	-.707	-1.953	.961	.652	.179	-.137
	STRAIGHT - (
	>-	150	-.741	-.324	.650	.730	-.100	.062
	STRAIGHT - (
	>-	155M	-.615	.297	.499	.436	-.134	.160
	BEND - (	155M	-.600	.323	.476	.387	-.135	.168
	>-	155F	-.583	.324	.445	.339	-.134	.176
	STRAIGHT - (
	>-	160M	-.166	.018	.274	-.024	-.121	.178
	BEND - (	160M	-.149	.007	.271	-.018	-.120	.170
	>-	160F	-.135	.001	.261	-.012	-.119	.162
	STRAIGHT - (
	>-	165	-.123	-.000	.245	-.009	-.117	.153
	STRAIGHT - (
ANCHOR	--	170	-.000	-.000	-.000	.000	-.000	.000



DYNAPLEX

LOADING = RESTRAINED WEIGHT (TUNIF)

PAGE 25

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM
 ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)				
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT	
ANCHORS:									
5	-0.	-1290.	0.	1290.	-0.	-3.	-1.	3.	
170	7.	-118.	16.	120.	127.	101.	57.	172.	
RESTRAINTS:									
10	0.	0.	-0.	0.	0.	0.	0.	0.	
10	1.	0.	0.	1.	0.	0.	0.	0.	
15	0.	0.	0.	0.	0.	0.	0.	0.	
15	-2.	0.	0.	2.	0.	0.	0.	0.	
20	0.	0.	-2.	2.	0.	0.	0.	0.	
20	9.	0.	0.	9.	0.	0.	0.	0.	
25	0.	0.	3.	3.	0.	0.	0.	0.	
25	-15.	0.	0.	15.	0.	0.	0.	0.	
35N	0.	-2246.	0.	2246.	0.	0.	0.	0.	
40	-2.	0.	0.	2.	0.	0.	0.	0.	

DYNAPLEX

LOADING - RESTRAINED WEIGHT (YLRIP)

PAGE 26

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)				
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT	
RESTRAINTS (CONTINUED) -									
40	0.	0.	-3.	3.	0.	0.	0.	0.	
45	15.	0.	0.	13.	0.	0.	0.	0.	
45	0.	0.	3.	3.	0.	0.	0.	0.	
50	0.	0.	-6.	6.	0.	0.	0.	0.	
50	-7.	0.	0.	7.	0.	0.	0.	0.	
55	0.	0.	8.	8.	0.	0.	0.	0.	
55	12.	0.	0.	12.	0.	0.	0.	0.	
40 65	0.	-288.	0.	288.	0.	0.	0.	0.	
85	0.	-293.	0.	293.	0.	0.	0.	0.	
92	0.	-222.	0.	222.	0.	0.	0.	0.	
100N	0.	-1917.	0.	1917.	0.	0.	0.	0.	
105	11.	0.	0.	11.	0.	0.	0.	0.	
105	0.	0.	5.	5.	0.	0.	0.	0.	
110	-26.	0.	0.	26.	0.	0.	0.	0.	
110	0.	0.	-12.	12.	0.	0.	0.	0.	
115	15.	0.	0.	15.	0.	0.	0.	0.	

DYNAFLEX

LOADING - RESTRAINED HEIGHT (WORK)

PAGE 27

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
115	0.	0.	8.	8.	0.	0.	0.	0.
120	-16.	0.	0.	16.	0.	0.	0.	0.
120	0.	0.	-21.	21.	0.	0.	0.	0.
130	0.	-951.	0.	951.	0.	0.	0.	0.
150	0.	-599.	0.	599.	0.	0.	0.	0.
165	0.	-479.	0.	479.	0.	0.	0.	0.

DYNALLEX

LOADING = RESTRAINED WEIGHT (UNIT)

PAGE 20

 * INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *

THE MAXIMUM STRESS OF 1569. OCCURS AT POINT 150

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE ANSI B31.1 - 1977 PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (**) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE HEADING BELOW) ARE AUTOMATICALLY CALCULATED AND APPLIED AT BENDS, ELBOWS, MITERS AND ADMISSIBLE TYPES OF TEES (AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE MODULUS IS USED FOR THE BRANCH LEG AT REDUCED OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK. THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

42

DYNAFLEX

LOADING - PRESTRAINED WEIGHT (+CRIF)

PAGE 29

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS (PSI)
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
ANCHR		5	1290.	0.	3.	1.	0.	1.00	1.00	6.79	5.
	STR -(
		10	923.	1.	3.	1.	0.	1.00	1.00	6.79	6.
	STR -(
		15	569.	2.	3.	4.	1.	1.00	1.00	6.79	9.
	STR -(
		20	214.	8.	3.	15.	3.	1.00	1.00	6.79	28.
	STR -(
		25	138.	8.	3.	38.	10.	1.00	1.00	6.79	105.
	STR -(
		30N	351.	8.	3.	12.	1.	1.00	1.00	6.79	22.
	(
	BEND -(	30M	252.	263.	1.	43.	3.	1.00	1.00	6.79	77.
	(
		30F	8.	379.	2.	176.	4.	1.00	1.00	6.79	311.
	STR -(
		35N	8.	1818.	2.	784.	6.	1.00	1.00	6.79	1385.
	(
	BEND -(	35M	1279.	1288.	3.	146.	7.	1.00	1.00	6.79	258.
	(
		35F	1786.	8.	7.	115.	3.	1.00	1.00	6.79	203.
	STR -(
		40	1659.	10.	7.	87.	9.	1.00	1.00	6.79	155.
	STR -(
		45	1258.	4.	7.	29.	6.	1.00	1.00	6.79	47.
	STR -(
		50	834.	4.	7.	15.	14.	1.00	1.00	6.79	39.
	STR -(
		55	379.	9.	7.	37.	48.	1.00	1.00	6.79	107.
	STR -(
		60N	95.	9.	7.	27.	22.	1.00	1.00	6.79	63.
	(
	BEND -(	60M	52.	85.	20.	42.	9.	1.00	1.00	6.79	84.
	(
		60F	8.	67.	20.	70.	9.	1.00	1.00	6.79	129.
	STR -(
		65	8.	133.	20.	117.	27.	1.00	1.00	6.79	215.
	STR -(
		70N	8.	146.	20.	79.	28.	1.00	1.00	6.79	153.
	(
	BEND -(	70F	8.	132.	21.	20.	21.	1.00	1.00	6.79	73.
	(
		70F	3.	118.	11.	44.	26.	1.00	1.00	6.79	92.

48

DYNALLEX

LOADING = RESTRAINED WEIGHT (YUNIF)

PAGE 30

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELÉM TYPE TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI	
		AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE			
STR - (	>= 7CF	3.	118.	11.	44.	26.	1.00	1.00	6.79	92.
(	>= 80N	3.	137.	11.	31.	23.	1.00	1.00	6.79	71.
BEND - (	80N	3.	151.	45.	35.	59.	1.00	1.00	6.79	144.
(	>= 80F	8.	164.	96.	65.	37.	1.00	1.00	6.79	216.
STR - (	>= 85	8.	120.	96.	108.	38.	1.00	1.00	6.79	264.
STR - (	>= 90N	8.	120.	96.	106.	60.	1.00	1.00	6.79	273.
(BEND - (90N	8.	133.	161.	60.	52.	1.00	1.00	6.79	316.
(	>= 97F	3.	148.	170.	27.	57.	1.00	1.00	6.79	321.
STR - (	>= 92	3.	57.	170.	51.	53.	1.00	1.00	6.79	328.
STR - (	>= 95N	3.	141.	170.	284.	9.	1.00	1.00	6.79	585.
(BEND - (95N	8.	148.	43.	8.	355.	1.00	1.00	6.79	632.
(	>= 95F	8.	155.	102.	7.	374.	1.00	1.00	6.79	684.
STR - (	>= 100N	8.	200.	102.	598.	2.	1.00	1.00	6.79	1072.
(BEND - (100N	1210.	1199.	71.	6.	72.	1.00	1.00	6.79	179.
(	>= 100F	1689.	9.	1.	249.	107.	1.00	1.00	6.79	478.
STR - (	>= 105	1542.	21.	1.	215.	94.	1.00	1.00	6.79	415.
STR - (	>= 110	1027.	7.	1.	62.	28.	1.00	1.00	6.79	121.
STR - (	>= 115	479.	10.	1.	41.	21.	1.00	1.00	6.79	81.
STR - (	>= 120	106.	18.	1.	100.	57.	1.00	1.00	6.79	203.
STR - (	>= 125N	319.	18.	1.	57.	42.	1.00	1.00	6.79	124.
(BEND - (125N	230.	241.	32.	6.	36.	1.00	1.00	6.79	85.
(	>= 125F	7.	347.	50.	116.	9.	1.00	1.00	6.79	223.

DYNAFLEX

LOADING - PRESTRAINED WEIGHT (KUNIP)

PAGE 31

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	STR - (	>= 125F	7.	347.	50.	116.	9.	1.00	1.00	6.79	223.
		>= 130N	7.	551.	50.	676.	34.	1.00	1.00	6.79	1199.
	BEND - (	130M	385.	375.	9.	485.	65.	1.00	1.00	6.79	864.
		>= 130F	523.	18.	42.	409.	58.	1.00	1.00	6.79	734.
	STR - (	>= 140F	262.	18.	42.	462.	179.	1.00	1.00	6.79	879.
	BEND - (	140M	188.	164.	170.	422.	110.	1.00	1.00	6.79	828.
		>= 140F	17.	235.	197.	340.	45.	1.00	1.00	6.79	698.
	STR - (	>= 145N	17.	64.	197.	77.	377.	1.00	1.00	6.79	764.
	BEND - (	145M	18.	57.	35.	77.	435.	1.00	1.00	6.79	784.
45	STR - (	>= 145F	16.	51.	136.	426.	76.	1.00	1.00	6.79	801.
		>= 150	16.	290.	136.	869.	3.	1.00	1.00	6.79	1589.
	STR - (	>= 155M	16.	115.	136.	106.	32.	1.00	1.00	6.79	312.
	BEND - (	155M	83.	60.	120.	144.	71.	1.00	1.00	6.79	354.
		>= 155F	87.	16.	36.	132.	152.	1.00	1.00	6.79	362.
	STR - (	>= 160N	268.	18.	36.	60.	12.	1.00	1.00	6.79	126.
	BEND - (	160M	187.	211.	67.	59.	15.	1.00	1.00	6.79	159.
		>= 160F	16.	298.	57.	163.	40.	1.00	1.00	6.79	313.
	STR - (	>= 165	16.	166.	57.	315.	43.	1.00	1.00	6.79	571.
ANCHR	STR - (	= 170	16.	119.	57.	127.	101.	1.00	1.00	6.79	304.

DYNAFLEX

LOADING = UNRESTRAINED WEIGHT (UNIP)

PAGE 32

 * INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES *

EXPLANATORY NOTES

THE FORCES AND MOMENTS AT ANY POINT SHOWN BELOW REPRESENT THE ACTION OF THE FAR END OF THE BRANCH ACTING ON THE NEAR END OF THE BRANCH.

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
ANCHOR		-- 5	-0.	-1290.	0.	-0.	-3.	-1.
	STRAIGHT - (	>- 10	1.	-923.	-0.	0.	-3.	1.
	STRAIGHT - (	>- 15	-2.	-569.	0.	-1.	-3.	-4.
	STRAIGHT - (	>- 20	7.	-214.	-1.	3.	-3.	15.
	STRAIGHT - (	>- 25	7.	138.	-1.	-10.	-3.	-58.
46	STRAIGHT - (	>- 30M	-8.	351.	2.	1.	-3.	-12.
	BEND - (	30M	-8.	365.	2.	2.	-3.	43.
	STRAIGHT - (	>- 30F	-8.	379.	2.	2.	-4.	176.
	STRAIGHT - (	>- 35M	-8.	-1814.	2.	2.	-6.	784.
	BEND - (	35M	-8.	-1800.	2.	2.	-7.	146.
	STRAIGHT - (	>- 35F	-8.	-1786.	2.	3.	-7.	-115.
	STRAIGHT - (	>- 40	-10.	-1659.	-1.	9.	-7.	-87.
	STRAIGHT - (	>- 45	5.	-1258.	2.	-6.	-7.	25.
	STRAIGHT - (	>- 50	3.	-834.	2.	14.	-7.	-15.
	STRAIGHT - (	>- 55	8.	-379.	3.	-48.	-7.	37.
	STRAIGHT - (	>- 60M	6.	-95.	3.	-22.	-7.	-27.
	BEND - (	60M	6.	-81.	3.	-21.	-8.	-42.
	STRAIGHT - (	>- 60F	6.	-67.	3.	-20.	-9.	-70.

DYNAFLEX

LOADING = RESTRAINED WEIGHT (TONIF)

PAGE 33

INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES (CONTINUED)

PRINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
		>- 60F	8.	-67.	3.	-20.	-9.	-70.
	STRAIGHT - (	>- 65	8.	133.	3.	-20.	-27.	117.
	STRAIGHT - (	>- 70N	8.	-146.	3.	-20.	-28.	79.
	BEND - (	70N	8.	-132.	3.	-0.	-28.	30.
		>- 70F	8.	-118.	3.	44.	-26.	11.
	STRAIGHT - (	>- 80N	8.	137.	3.	-23.	31.	11.
	BEND - (	80N	8.	150.	3.	-73.	35.	-10.
		>- 80F	8.	164.	3.	-96.	37.	-66.
	STRAIGHT - (	>- 85	8.	-120.	3.	-96.	38.	-108.
	STRAIGHT - (	>- 90N	8.	119.	3.	-96.	60.	-106.
47	BEND - (	90N	8.	133.	3.	-77.	60.	-150.
		>- 90F	8.	147.	3.	-27.	57.	-170.
	STRAIGHT - (	>- 92	8.	-57.	3.	51.	53.	-170.
	STRAIGHT - (	>- 95N	8.	141.	3.	284.	9.	-170.
	BEND - (	95N	8.	148.	3.	312.	8.	-176.
		>- 95F	8.	155.	3.	336.	7.	-192.
	STRAIGHT - (	>- 100N	8.	200.	3.	495.	2.	-351.
	BEND - (	100N	8.	-1703.	3.	68.	1.	76.
		>- 100F	8.	-1689.	3.	-107.	1.	249.
	STRAIGHT - (	>- 105	19.	-1542.	8.	-94.	1.	215.
	STRAIGHT - (	>- 110	-7.	-1029.	-3.	28.	1.	-62.
	STRAIGHT - (	>- 115	9.	-479.	5.	-21.	1.	41.
	STRAIGHT - (	>- 120	-7.	106.	-16.	57.	1.	-100.

DYNAPLEX

LOADING = RESTRAINED WEIGHT (YDRIF)

PAGE 35

 * DISPLACEMENTS AND ROTATIONS *

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
ANCHOR	STRAIGHT -(	5	-.000	-.000	.000	-.000	-.000	-.000
	>=	10	.000	-.001	-.000	.000	-.001	.000
	STRAIGHT -(
	>=	15	-.000	-.001	.000	-.000	-.001	-.000
	STRAIGHT -(
	>=	20	.000	-.001	-.000	.000	-.002	.001
	STRAIGHT -(
	>=	25	-.000	-.001	.000	-.001	-.003	-.003
	STRAIGHT -(
	>=	30M	-.007	-.001	.001	-.001	-.003	-.007
	(
	BEND -(	30M	-.008	-.001	.001	-.001	-.003	-.007
	(
	>=	30F	-.008	-.000	.001	-.001	-.003	-.006
49	STRAIGHT -(
	>=	35M	-.008	-.000	-.000	-.001	-.004	.008
	(
	BEND -(	35M	-.008	-.001	-.000	-.001	-.004	.013
	(
	>=	35F	-.007	-.001	-.001	-.001	-.004	.012
	STRAIGHT -(
	>=	40	-.000	-.002	-.000	-.000	-.004	.005
	STRAIGHT -(
	>=	45	.000	-.003	.000	-.000	-.007	-.001
	STRAIGHT -(
	>=	50	-.000	-.003	-.000	.001	-.009	-.000
	STRAIGHT -(
	>=	55	.000	-.004	.000	-.003	-.011	-.002
	STRAIGHT -(
	>=	60M	.006	-.004	.011	-.009	-.013	.003
	(
	BEND -(	60M	.006	-.004	.011	-.009	-.013	.003
	(
	>=	60F	.006	-.004	.010	-.009	-.013	.002
	STRAIGHT -(
	>=	65	.006	-.000	-.006	-.012	-.015	-.006
	STRAIGHT -(
	>=	70M	.006	.000	-.006	-.012	-.015	-.005

DYNAFLEX

LOADING - RESTRAINED WEIGHT (YOUNG)

PAGE 36

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		>- 70H	.006	.000	-.006	-.012	-.015	-.005
	BEND -(	70H	.007	.000	-.007	-.012	-.015	-.005
		>- 70F	.008	-.001	-.008	-.012	-.015	-.004
	STRAIGHT -(	70F	.008	-.001	-.008	-.012	-.015	-.004
		>- 80H	.032	-.001	-.008	.010	-.015	-.002
	BEND -(	80H	.033	.000	-.008	.010	-.015	-.002
		>- 80F	.033	.000	-.006	.009	-.014	-.003
	STRAIGHT -(	80F	.033	.000	-.006	.009	-.014	-.003
		>- 85	.033	-.000	-.006	.008	-.014	-.003
	STRAIGHT -(	85	.033	-.000	-.006	.008	-.014	-.003
		>- 90H	.033	-.002	.010	-.008	-.008	.001
	BEND -(	90H	.033	-.002	.011	-.009	-.007	-.001
		>- 90F	.033	-.001	.011	-.009	-.006	-.003
	STRAIGHT -(	90F	.033	-.001	.011	-.009	-.006	-.003
50		>- 92	.032	-.000	.011	-.009	-.006	-.005
	STRAIGHT -(	92	.032	-.000	.011	-.009	-.006	-.005
		>- 95H	.028	.008	.011	-.001	-.003	-.028
	BEND -(	95H	.028	.008	.011	.001	-.002	-.029
		>- 95F	.027	.008	.011	.002	-.002	-.030
	STRAIGHT -(	95F	.027	.008	.011	.002	-.002	-.030
		>- 100H	.027	-.000	.011	.013	-.002	-.036
	BEND -(	100H	.026	-.003	.011	.016	-.002	-.038
		>- 100F	.023	-.004	.010	.015	-.002	-.036
	STRAIGHT -(	100F	.023	-.004	.010	.015	-.002	-.036
		>- 105	.000	-.004	.000	.007	-.002	-.017
	STRAIGHT -(	105	.000	-.004	.000	.007	-.002	-.017
		>- 110	-.000	-.005	-.000	-.002	-.002	.004
	STRAIGHT -(	110	-.000	-.005	-.000	-.002	-.002	.004
		>- 115	.000	-.006	.000	-.001	-.002	.001
	STRAIGHT -(	115	.000	-.006	.000	-.001	-.002	.001
		>- 120	-.000	-.006	-.000	.005	-.001	-.008
	STRAIGHT -(	120	-.000	-.006	-.000	.005	-.001	-.008
		>- 125H	-.017	-.006	-.008	.006	-.001	-.018
	BEND -(	125H	-.018	-.006	-.008	.005	-.001	-.018

DYNAFLEX

LOADING - RESTRAINED WEIGHT (UNIF)

PAGE 37

DISPLACEMENTS AND ROTATIONS (CONTINUED)

JOINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	BEND - (	125H	-.018	-.006	-.008	.005	-.001	-.018
	>-	125F	-.019	-.004	-.009	.005	-.001	-.017
	STRAIGHT - (
	>-	130H	-.019	-.000	-.009	.003	-.000	-.006
	BEND - (	130H	-.019	.000	-.009	.002	.000	.000
	>-	130F	-.019	.000	-.009	.002	.001	.005
	STRAIGHT - (
	>-	140H	.036	-.000	-.001	-.015	.008	.067
	BEND - (	140H	.041	-.002	.000	-.017	.009	.072
	>-	140F	.043	-.007	.001	-.019	.009	.077
	STRAIGHT - (
	>-	145H	.035	-.077	.010	.004	.015	.088
	BEND - (	145H	.034	-.078	.010	.006	.015	.087
51	>-	145F	.033	-.079	.010	.008	.016	.086
	STRAIGHT - (
	>-	150	-.010	-.000	.010	.023	.023	.052
	STRAIGHT - (
	>-	155H	-.034	-.001	.010	-.008	.022	.035
	BEND - (	155H	-.035	-.001	.010	-.006	.022	.033
	>-	155F	-.033	-.002	.011	-.005	.021	.032
	STRAIGHT - (
	>-	160H	.012	-.002	.001	.009	.012	.013
	BEND - (	160H	.012	-.001	.000	.008	.012	.013
	>-	160F	.012	-.001	.000	.007	.012	.012
	STRAIGHT - (
	>-	165	.011	-.000	.000	.005	.011	.011
	STRAIGHT - (
ANCHOR	--	170	.000	-.000	.000	.000	.000	.000

HANGER DESIGN DATA
-----EXPLANATORY NOTES:

- (1) ALL MOVEMENTS SHOWN BELOW REFER TO THE INITIAL EXPANSION LOADING CASE WHEREIN TENTATIVE HANGER LOCATIONS HAVE NOT BEEN VERTICALLY RESTRAINED AND ALL WEIGHT EFFECTS HAVE BEEN SUPPRESSED.
- (2) THE WEIGHT REACTIONS SHOWN BELOW REFER TO THE WEIGHT LOADING CASE WHEREIN TENTATIVE HANGER LOCATIONS HAVE BEEN RIGIDLY RESTRAINED IN THE VERTICAL DIRECTION AND ALL THERMAL EFFECTS INCLUDING IMPOSED ANCHOR MOVEMENTS HAVE BEEN SUPPRESSED.
- (3) IN THE FOLLOWING TABLE VSH DENOTES A VARIABLE SPRING HANGER AND CSH DENOTES A CONSTANT SUPPORT HANGER.
- (4) THE SUPPORT LOADS IN THE INSTALLED CONDITION HAVE BEEN CALCULATED TO PRODUCE THE CORRECT WEIGHT BALANCE IN THE OPERATING CONDITION.
- (5) IF THE FREE VERTICAL MOVEMENT EXCEEDS THE MAXIMUM RIGID SUPPORT DISPLACEMENT CRITERION OF .10 IN , A VARIABLE SPRING IS SELECTED. IF A VARIABLE SPRING HANGER CANNOT BE FOUND WHICH SATISFIES BOTH THE LOAD VARIATION CRITERION SELECTED BY THE USER AND THE WORKING RANGE OF THE SPRINGS LISTED IN SPRING TABLE (1) OF THE USER'S MANUAL, A CONSTANT SUPPORT HANGER IS RECOMMENDED.
- (6) THE NOMINAL ROD DIAMETER FOR RIGID HANGERS IS TAKEN FROM ANSI B31.1 - 1977 TABLE 121.2.2(A), (CARRYING CAPACITIES OF THREADED ASTM A 107 HOT ROLLED CARBON STEEL) ASSUMING A ROD TEMPERATURE OF 650 DEGREES FAHRENHEIT. A MINIMUM 1/2 IN. DIAMETER ROD WILL BE SELECTED FOR ALL PIPE WHICH IS NOMINALLY 2-1/2 IN. OR LARGER.
- (8) THE SO-CALLED THEORETICAL SPRING INSTALLATION LOAD SHOWN BELOW PRESUPPOSES THAT THE HANGER LOCATION IS RESTRAINED AGAINST VERTICAL MOVEMENT WHILE THE SPRING IS SET TO THE COLD LOAD.

DYNALLEX

PAGE 39

HANGER DESIGN DATA TABLE

HANGER LOC. NO.	SUPPORT LOAD (POUNDS)	FREE VERTICAL MOVEMENT (INCHES)	HORIZONTAL MOVEMENT (INCHES)		TYPE	PRELIMINARY HANGER SELECTION SPECIFICATION	SWING	
			X	Z			LENGTH (FEET)	ANGLE (DEG)
35N	2246.	-1.44	-.01	.00	VSH	1 - MIDDLE RANGE SPRING. SPRING RATE = 450 LBS/IN THEORETICAL SPRING INSTALLATION LOAD = 1599 LBS SPRING LOAD IN THE OPERATING CONDITION = 2246 LBS	N/A	N/A
65	288.	-2.72	-.40	.06	VSH	2 - LONG RANGE SPRINGS. SPRING RATE = 14 LBS/IN THEORETICAL INSTALLATION LOAD PER SPRING = 107 LBS LOAD PER SPRING IN THE OPERATING CONDITION = 144 LBS	N/A	N/A
85	293.	-1.90	-.72	-.18	VSH	1 - LONG RANGE SPRING. SPRING RATE = 32 LBS/IN THEORETICAL SPRING INSTALLATION LOAD = 234 LBS SPRING LOAD IN THE OPERATING CONDITION = 293 LBS	N/A	N/A
92	222.	-1.00	-.47	-.36	VSH	1 - MIDDLE RANGE SPRING. SPRING RATE = 47 LBS/IN THEORETICAL SPRING INSTALLATION LOAD = 175 LBS SPRING LOAD IN THE OPERATING CONDITION = 222 LBS	N/A	N/A
100N	1917.	-.54	-.24	-.18	VSH	1 - SHORT RANGE SPRING. SPRING RATE = 680 LBS/IN THEORETICAL SPRING INSTALLATION LOAD = 1548 LBS SPRING LOAD IN THE OPERATING CONDITION = 1917 LBS	N/A	N/A
130N	931.	-2.23	-.11	.63	VSH	1 - LONG RANGE SPRING. SPRING RATE = 100 LBS/IN THEORETICAL SPRING INSTALLATION LOAD = 726 LBS SPRING LOAD IN THE OPERATING CONDITION = 931 LBS	N/A	N/A
150	599.	-.52	-.74	.65	VSH	1 - SHORT RANGE SPRING. SPRING RATE = 224 LBS/IN THEORETICAL SPRING INSTALLATION LOAD = 527 LBS SPRING LOAD IN THE OPERATING CONDITION = 599 LBS	N/A	N/A

DYNAPLEX

PAGE 40

 *
 * STATIC SOLUTION ACCURACY CHECKS *
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EACH BASIC STATIC SOLUTION COMPRISING EACH LOAD OR LOADING COMBINATION
 SPECIFIED IN THIS RUN HAS BEEN SUBJECTED TO EQUILIBRIUM AND
 COMPATIBILITY CHECKS FOR ALL POINTS IN THE SYSTEM;

LOADING = FREE THERMAL

STATIC EQUILIBRIUM AND COMPATIBILITY HAVE BEEN SATISFIED FOR THIS
 BASIC STATIC SOLUTION AT ALL POINTS IN THE SYSTEM.

LOADING = RESTRAINED WEIGHT (+UNIF)

STATIC EQUILIBRIUM AND COMPATIBILITY HAVE BEEN SATISFIED FOR THIS
 BASIC STATIC SOLUTION AT ALL POINTS IN THE SYSTEM.

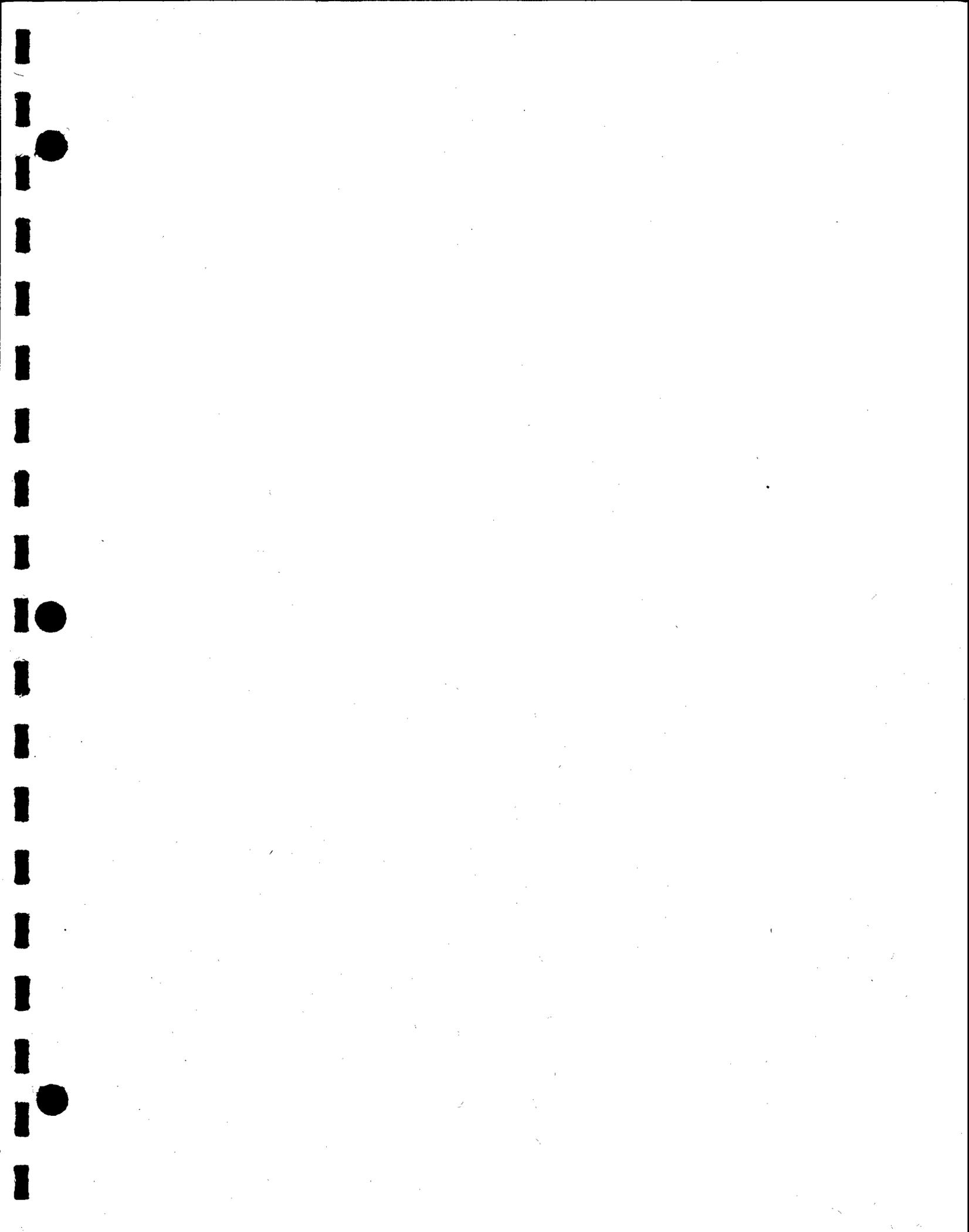
54

DYNAFLEX

TABLE OF CONTENTS

INPUT DATA - (CARD IMAGES)	1
EDITED PIPING SYSTEM DESCRIPTION	3
LOADING - 0FREE0 THERMAL	
FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS	13
INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS	15
INTERNAL FORCES AND MOMENTS ORIENTED TO X-Y AND Z AXES	19
DISPLACEMENTS AND ROTATIONS	22
LOADING - 0RESTRAINED0 WEIGHT (+UNIF)	
FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS	25
INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS	28
INTERNAL FORCES AND MOMENTS ORIENTED TO X-Y AND Z AXES	32
DISPLACEMENTS AND ROTATIONS	35
HANGER DESIGN DATA TABLE	38
STATIC SOLUTION ACCURACY CHECKS	40

55



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FOREWORD

THE FOLLOWING REPORT WAS GENERATED BY THE DYNAFLEX PIPING ANALYSIS PROGRAM. THE PROGRAM ACCOMMODATES THE WIDEST RANGE OF PRACTICAL SITUATIONS ENCOUNTERED IN MODERN PIPING SYSTEMS INCLUDING DYNAMIC AS WELL AS THERMAL, WEIGHT AND PRESSURE EFFECTS.

FOR FURTHER INFORMATION OR PROMPT ASSISTANCE IN USING THE DYNAFLEX PROGRAM, PLEASE CONTACT YOUR LOCAL COMPUTER CENTER REPRESENTATIVE OR:

ENGINEERING SERVICES MANAGER
AUTUM COMPUTING CORPORATION
1 BETRO PLAZA
505 THORNALL STREET
EDISON, N.J. 08817

THE STRESS FORMULATION OF
ARSI B31.1 - 1977
INCLUDING THE LATEST MANDATORY UPDATES
HAS BEEN APPLIED IN THIS ANALYSIS

THE TABLE OF CONTENTS APPEARS AT THE END OF THIS REPORT.

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DYNAFLEX

STEARNS - ROGER CORP

RUN NO. 7

PAGE 1

PROJECT - 10MW SOLAR PILOT PLANT - C-21700
JOB - RECEIVER FEEDWATER (X-FW-01-C-0)

RUN NO. 7

DATE 3/20/80

INPUT DATA - (CARD IMAGES)

LINE NUMBER	STYP	LOC	FRH	TD	DELTA X	DELTA Y	DELTA Z	RADIUS	ADDITIONAL DATA	LINE NUMBER
1	SHED								STEARNS - ROGER CORP, 3/20/80, PROJ. 10MW SO LAR PILOT PLANT - C-2 1700, JOB RECEIVER FEED WATER (X-FW-01-C-0), RUN NO. 7	1
2	GFN								APPLY H31.1-1973, EXA	2
3			5	10		-10-5-15/16			PAT=LCS, OB=4.50, R1=.674, DR16=7.94, TEMP=440.	3
4				15		-9-11-7/8				4
5				20		-9-11-7/8				5
6				25		-9-10-7/8				6
7				30		-6-0		1L		7
8				35	-2-6			1L		8
9				40		-4-1-5/16				9
10				45		-11-5-7/16				10
11				50		-11-11-5/16				11
12				55		-12-9-11/16				12
13				60		-8-0		1L		13
14				65	-6-1-5/4					14
15				70	-0-9			1L		15
16				80			-4-2	1L		16
17				85	0-9					17
18				90	7-5			1L		18
19				92				1-0		19
20				95				5-9-1/4	1L	20
21				100	1-4-5/8			1-4-3/4	1L	21
22				105		-4-7-7/8				22
23				110		-11-5-3/8				23
24				115		-15-5-11/16				24
25				120		-10-5-15/16				25
26				125		-6-0		1L		26
27				130	-2-6			1L		27
28				140		-8-5-15/16				28
29				145	-3-10-3/4			-5-10-3/4	1L	29
30				147				-5-7-1/16		30
31				150				-4-0		31

58

INPUT DATA - (CARD IMAGES)

LINE NUMBER	TYP	LOC	FR	TO	DELTA X	DELTA Y	DELTA Z	RADIUS	ADDITIONAL DATA	LINE NUMBER
32	:	:	:	155	:	:	-5-5-3/16	L	:	32
33	:	:	:	157	:	-2-0	:	:	:	33
34	:	:	:	160	:	-8-11-3/4	:	L	:	34
35	:	:	:	165	:	:	-1-0	:	:	35
36	:	:	:	170	:	:	-8-0	:	:	36
37	ANC	5	:	:	:	:	:	:	:	37
38	ANC	170	:	:	:	:	:	:	:	38
39	RAD	10	:	:	RIGID	:	:	:	:	39
40	RAD	15	:	:	RIGID	:	:	:	:	40
41	RAD	20	:	:	RIGID	:	:	:	:	41
42	RAD	25	:	:	RIGID	:	:	:	:	42
43	RAD	40	:	:	RIGID	:	:	:	:	43
44	RAD	45	:	:	RIGID	:	:	:	:	44
45	RAD	50	:	:	RIGID	:	:	:	:	45
46	RAD	55	:	:	RIGID	:	:	:	:	46
47	RAD	105	:	:	RIGID	:	:	:	:	47
48	RAD	110	:	:	RIGID	:	:	:	:	48
49	RAD	115	:	:	RIGID	:	:	:	:	49
50	RAD	120	:	:	RIGID	:	:	:	:	50
51	RAD	165	:	:	RIGID	:	:	:	:	51
52	RAD	10	:	:	:	RIGID	:	:	:	52
53	RAD	15	:	:	:	RIGID	:	:	:	53
54	RAD	20	:	:	:	RIGID	:	:	:	54
55	RAD	25	:	:	:	RIGID	:	:	:	55
56	RAD	40	:	:	:	RIGID	:	:	:	56
57	RAD	45	:	:	:	RIGID	:	:	:	57
58	RAD	50	:	:	:	RIGID	:	:	:	58
59	RAD	55	:	:	:	RIGID	:	:	:	59
60	RAD	105	:	:	:	RIGID	:	:	:	60
61	RAD	110	:	:	:	RIGID	:	:	:	61
62	RAD	115	:	:	:	RIGID	:	:	:	62
63	RAD	120	:	:	:	RIGID	:	:	:	63
64	CCC	170	:	-6-4-3/4	-172-2-5/8	-28-8	:	:	:	64
65	RAD	80	N	:	RIGID	:	:	:	:	65
66	RAD	80	N	:	RIGID	:	:	:	:	66
67	RAD	80	N	:	:	RIGID	:	:	:	67
68	RAD	95	N	:	RIGID	:	:	:	:	68
69	RAD	95	N	:	:	RIGID	:	:	:	69
70	RAD	95	N	:	:	RIGID	:	:	:	70
71	RAD	145	F	:	RIGID	:	:	:	:	71
72	RAD	145	F	:	:	RIGID	:	:	:	72

INPUT DATA - (CARD IMAGES)

LINE NUMBER	TYP	LOC	FRM	TO	DELTA X	DELTA Y	DELTA Z	RADIUS	ADDITIONAL DATA	LINE NUMBER
73	RAD	145	F				RIGID			73
74	RAD	157			RIGID					74
75	RAD	157					RIGID			75
76	DYL								SPEC 1(FREQ/G,,25/.45 ,,.625/1.72,1.75/5.62, 3.50/5.19,5.0/5.14, 2.0/3.66, 10.0/3.34,12.67/2.72, 18.0/5.87,20.66/5.77, 23.3/4.0,30.0/2.28, 40.0/1.52), SPEC 2(FREQ/G,,25/.22 ,,4.5/5.81,8.0/1.56, 10.0/1.77,11.3/1.34, 14.0/2.03,18.0/1.22, 30.0/.72), SHOCK 1(X/1. SPEC 1), SHOCK 2(Z/1. SPEC 1), SHOCK 3(Y/1. SPEC 2), SHOCK 4(X/1. SPEC 1, Z/1. SPEC 1,Y/1. SPEC 2),LOG,1.92	76
77	DMU								CUMP POINTS(AUTOMATIC ,,MAX SPACING=5=0 ,,EXCLUDE ALL N NODES) ,,NODE CUTOFF=40, FREQUENCY CUTOFF=33	77
78	OUT								SHOCK 1,SHOCK 2,SHOCK 3,SHOCK 4	78

09

DYNAFLEX

STEARNS - ROGER CORP

RUN NO. 7 PAGE 4

PROJECT - 10KW SOLAR PILOT PLANT - C-21700
 JOB - RECEIVER FEEDWATER (X-FW-01-C-4)

RUN NO. 7

DATE 3/20/80

 *
 * EDITED PIPING SYSTEM DESCRIPTION *

 *

EXPLANATORY NOTES

IN THE EDITED PIPING SYSTEM DESCRIPTION:

- (1) POINT LOCATION NUMBER SUFFIXES N, M AND F IDENTIFY THE NEAR POINT, THE MID POINT AND THE FAR POINT RESPECTIVELY OF A PIPING ELEMENT IN THE DIRECTION IN WHICH THE LINE IS TRAVERSED. FRACTIONAL NODE NUMBERS APPEARING IN THE FOLLOWING REPORTS IDENTIFY THOSE NODES AT WHICH THE PROGRAM HAS INTRODUCED EVENLY SPACED LOOP POINTS AND ARE DETERMINED FROM THE MAXIMUM LOOP SPACING CRITERIA ENTERED BY THE USER. IF FRACTIONAL NODE NUMBERS ARE ASSIGNED TO MORE THAN ONE ELEMENT ORIGINATING AT THE SAME BRANCH POINT, A LETTER WILL PRECEDE THE FRACTIONAL PORTION OF THE NUMBER TO UNIQUELY IDENTIFY EACH POINT (E.G. 2.A1). LETTERS ARE ASSIGNED TO ELEMENTS ALPHABETICALLY IN THE ORDER OF THEIR APPEARANCE IN THE INPUT DATA.
- (2) AMBIENT TEMPERATURE IS ASSUMED TO BE 70 DEGREES FAHRENHEIT.
- (3) THE MAXIMUM ALLOWABLE DIFFERENCE IN LOOP CLOSURE CALCULATIONS IS ASSUMED TO BE .25 INCHES.
- (4) THE MAXIMUM ALLOWABLE DIFFERENCE BETWEEN THE CALCULATED AND INPUT COORDINATES OF USER DESIGNATED CHECK POINTS IS ASSUMED TO BE .25 INCHES.
- (8) IN ORDER TO MAKE IT POSSIBLE IN CERTAIN SITUATIONS TO PERFORM INDEPENDENT WEIGHT AND THERMAL ANALYSES IN THE SAME RUN AND APPLY THE CODE STRESS CALCULATIONS CORRECTLY, THE PROGRAM MAKES CERTAIN ASSUMPTIONS. IF THE INPUT DATA SPECIFIES IMPOSED MOVEMENTS ON ANCHORS (ANC) OR DISPLACEMENTS OR ROTATIONS ON RIGID RESTRAINTS (RAD,RAK) THESE ARE ASSUMED BY THE PROGRAM TO BE THERMAL EFFECTS AND INCLUDED ONLY IN THOSE LOADING CASES WHICH INCLUDE THERMAL. ALTERNATELY, IF THE INPUT DATA SPECIFIES FORCES AND MOMENTS (FOR,MOM) OR IMPOSED DISPLACEMENTS OR ROTATIONS ON FLEXIBLE RESTRAINTS (RAD,RAK) THESE ARE ASSUMED TO BE WEIGHT EFFECTS AND INCLUDED ONLY IN THOSE LOADING CASES WHICH INCLUDE WEIGHT. IF THESE ASSUMPTIONS ARE INVALID FOR A PARTICULAR SITUATION, THE USER CAN ACCURATELY MODEL THE MOST GENERAL SITUATION BY USING THE AUXILIARY SUPPORT MOVEMENTS (ASM) AND THE AUXILIARY CONCENTRATED LOADS (ACL) FEATURE OF THE PROGRAM AS AN ALTERNATE METHOD OF SPECIFYING THESE EFFECTS.
- (15) THE TABLE OF CONTENTS APPEARS AT THE END OF THIS REPORT.

GENERAL DATA

COORDINATES OF ALL POINTS OF THE SYSTEM ARE WITH RESPECT TO POINT 5, WHICH IS THE ORIGIN

DYNAFLEX

ENTIRE PIPING SYSTEM DESCRIPTION (CONTINUED)

RUN NO. 7

PAGE 5

MATERIALS USED (TEMPERATURE DEPENDENT PROPERTIES ARE SHOWN AT POINT OF TEMPERATURE CHANGE)

LCS - LOW CARBON STEEL

YOUNG'S MODULUS AT AMBIENT TEMPERATURE = 27,900,000. PSI

POISSON'S RATIO = .30

DENSITY = 490. POUNDS PER CUBIC FOOT

SHOCK AND SPECTRUM DATA

MODE CUTOFF SET AT 40

FREQUENCY CUTOFF SET AT 33.00 CPS

SPECTRUM 1		SPECTRUM 2	
(LOGARITHMIC INTERPOLATION)		(LOGARITHMIC INTERPOLATION)	
FREQUENCY	G	FREQUENCY	G
---CPS---	-----	---CPS---	-----
.25	.45	.25	.22
.63	1.72	4.50	5.81
1.75	5.82	8.00	1.56
3.50	5.19	10.00	1.77
5.00	5.14	11.30	1.34
8.00	3.66	14.00	2.03
10.00	3.34	18.00	1.22
12.67	2.72	30.00	.72
18.00	5.87		
20.66	5.77		
23.30	4.00		
30.00	2.28		
40.00	1.52		

62

SHOCK SPECIFICATIONS

SHOCK 1 CONSISTS OF :

100.00 PERCENT OF SPECTRUM 1 IN THE X DIRECTION.

THE GLOBAL COMPONENTS OF THIS SHOCK ARE ASSUMED TO ACT INDEPENDENTLY

THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE ARE COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD.

CLOSELY SPACED MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

DYNAFLEX

EDITED PIPE SYSTEM DESCRIPTION (CONTINUED)

RUN NO. 7 PAGE 6

SHOCK 2 CONSISTS OF :
100.00 PERCENT OF SPECTRUM 1 IN THE Z DIRECTION.

THE GLOBAL COMPONENTS OF THIS SHOCK ARE ASSUMED TO ACT INDEPENDENTLY

THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE ARE COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD. CLOSELY SPACED MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

SHOCK 3 CONSISTS OF :
100.00 PERCENT OF SPECTRUM 2 IN THE Y DIRECTION.

THE GLOBAL COMPONENTS OF THIS SHOCK ARE ASSUMED TO ACT INDEPENDENTLY

THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE ARE COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD. CLOSELY SPACED MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

SHOCK 4 CONSISTS OF :
100.00 PERCENT OF SPECTRUM 1 IN THE X DIRECTION AND
100.00 PERCENT OF SPECTRUM 2 IN THE Y DIRECTION AND
100.00 PERCENT OF SPECTRUM 1 IN THE Z DIRECTION.

THE GLOBAL COMPONENTS OF THIS SHOCK ARE ASSUMED TO ACT INDEPENDENTLY

THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE ARE COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD. CLOSELY SPACED MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

8

LOADING CONDITIONS ANALYZED

SHOCK 1
SHOCK 2
SHOCK 3
SHOCK 4

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE WALL		TEMP (DEG)	DIST. LOADS (LBS PER FT)	
			X	Y	Z				DIAMETER (IN)	THICK (IN)		MATL (FARR)	PRESS (PSI)	PIPE FT. UNIF
ANCHR	--	5	0.00	0.00	0.00				:	:	:	:	:

* NOTES PERTAINING TO POINT 5 APPEAR ON THE FOLLOWING PAGE

														DIST. LOADS (LBS PER FT)	

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	MATE	TEMP (DEG) (FAHR)	PRESS PIPE		
			X	Y	Z								WT.	UNIF	
ANCHR		5	0.00	0.00	0.00										
STRAIGHT	-(					3.44		4.500	.674	LCS	440.	27.6	7.9
* INTERNAL EXPANSION OF LCS BETWEEN AMBIENT AND 440. DEGREES FAHRENHEIT IS 3.07 INCHES PER 100 FEET * A UNIFORM DISTRIBUTED LOAD OF 7.94 PLF IS ACTING IN THE -Y DIRECTION.															
STRAIGHT	-(	5.1	0.00	-3.44	0.00		3.44							
STRAIGHT	-(	5.2	0.00	-6.89	0.00		3.44							
	-(	10	0.00	-10.33	0.00									
* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 10 IN DIRECTION X * RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 10 IN DIRECTION Z															
STRAIGHT	-(						4.99						
STRAIGHT	-(	10.1	0.00	-15.32	0.00		4.99							
	-(	15	0.00	-20.32	0.00									
* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 15 IN DIRECTION Z * RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 15 IN DIRECTION Y															
STRAIGHT	-(						4.99						
STRAIGHT	-(	15.1	0.00	-25.31	0.00		4.99							
	-(	20	0.00	-30.31	0.00									

* NOTES PERTAINING TO POINT 20 APPEAR ON THE FOLLOWING PAGE

DYNAFLEX

PIPED SYSTEM DESCRIPTION (CONTINUED)

RUN NO. 7 PAGE 8

POINT TYPE	ELEMENT OR SIGNATURE NO.	POINT LOC.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	MAYL	TEMP (FAHR)	DIST. LOADS (LBS PER FT)	
			X	Y	Z								WT.	UNIT
		>= 20	0.00	-30.31	0.00				4.500	.674	LC3	440.	27.63	7.93
		(
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 20											
		(	IN DIRECTION X											
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 20											
		(	IN DIRECTION Z											
	STRAIGHT	(				4.95								
		>= 20.1	0.00	-35.26	0.00		4.95							
	STRAIGHT	(
		>= 25	0.00	-40.21	0.00									
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 25											
		(	IN DIRECTION X											
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 25											
		(	IN DIRECTION Z											
OB	STRAIGHT	(				3.00								
		>= 25.1	0.00	-43.21	0.00		3.00							
	STRAIGHT	(
		>= 30N	0.00	-46.21	0.00									
	BEND	(	30F	-15	-46.57	0.00	.50	.79	90.000					
		>= 30F	-15	-46.71	0.00									
	STRAIGHT	(				1.50								
		>= 35N	-2.00	-46.71	0.00									
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 35											
	BEND	(	35N	-2.35	-46.86	0.00	.50	.79	90.000					
		>= 35F	-2.50	-47.21	0.00									
	STRAIGHT	(				3.60								
		>= 40	-2.50	-50.21	0.00									

* ARTS PERTAINING TO POINT 40 APPEAR ON THE FOLLOWING PAGE

DYNAFLEX

EDITED PIPELINE SYSTEM DESCRIPTION (LONG) (DEG)

RUN NO. 7

PAGE 10

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (FAHR)	DIST. LOADS (LBS PER FT)	
			X	Y	Z							WT.	UNIT
								4.500	.670	LC9	440	27.6	7.9
STRAIGHT	-	>= 50.1	-2.50	-78.31	0.00		4.27						
STRAIGHT	-	>= 50.2	-2.50	-82.58	0.00		4.27						
		>= 55	-2.50	-86.85	0.00								
		* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 55 IN DIRECTION Y											
		* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 55 IN DIRECTION X											
STRAIGHT	-						4.00						
STRAIGHT	-	>= 55.1	-2.50	-90.85	0.00		4.00						
		>= 60N	-2.50	-94.85	0.00								
BEND	-	60N	-2.65	-95.20	0.00	.50	.79	90.000					
STRAIGHT	-	>= 60F	-3.00	-95.35	0.00		2.82						
STRAIGHT	-	>= 60F.1	-5.82	-95.35	0.00		2.82						
STRAIGHT	-	>= 65	-8.65	-95.35	0.00		.25						
		>= 70N	-8.90	-95.35	0.00								
BEND	-	70N	-9.25	-95.35	-0.15	.50	.79	90.000					
STRAIGHT	-	>= 70F	-9.40	-95.35	-0.50		3.58						
STRAIGHT	-	>= 70F.1	-9.40	-95.35	-4.04		3.58						
		>= 80N	-9.40	-95.35	-7.67								

* NOTES PERTAINING TO POINT 601 APPEAR ON THE FOLLOWING PAGE

POINT DESIGNATION	LOC.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE WALL		TEMP (DEG)	PRESS (PSI)	PIPE WT. UNIF	DIST. LOADS (LBS PER FT)
		X	Y	Z				DIAMETER (IN)	THICK (IN)				
>= 90N		-9.00	-95.35	-7.67				4.500	.674	400		27.6	7.9
(		* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 80N											
(		IN DIRECTION Z											
(		* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 80N											
(		IN DIRECTION X											
(		* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 80N											
(		IN DIRECTION Y											
(
(
(
BEND -	80N	-9.25	-95.35	-8.02	.50	.79	90.000						
(
>= 80F		-8.90	-95.35	-8.17		.25							
(
STRAIGHT -	85	-8.65	-95.35	-8.17		3.38							
(
STRAIGHT -	85.1	-8.27	-95.35	-8.17		3.38							
(
>= 90N		-1.90	-95.35	-8.17									
(
BEND -	90N	-1.54	-95.35	-8.02	.50	.79	90.000						
(
>= 90F		-1.40	-95.35	-7.67									
(
STRAIGHT -	92	-1.40	-95.35	-7.17		.50							
(
STRAIGHT -	92.1	-1.40	-95.35	-8.31		2.78							
(
STRAIGHT -	94N	-1.40	-95.35	-1.60		2.78							
(

* NOTES PERTAINING TO POINT 951 APPEAR ON THE FOLLOWING PAGE

DYNAFLEX

COILED PIPELINE SYSTEM DESCRIPTION (CONTINUED)

JOB NO. 7 PAGE 12

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (FAHR)	DISTR. LOADS (LBS PER FT)		
			X	Y	Z							WT.	UNIT	
		>- 95N	-1.40	-95.35	-1.60				4.500	.674	LC8	440.1	27.6	7.9
		(
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 95N												
		(IN DIRECTION Y												
		(
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 95N												
		(IN DIRECTION X												
		(
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 95N												
		(IN DIRECTION Z												
		(
		(
	BEND	(95N	-1.36	-95.35	-1.41	.50	.39	45.000						
		(
	STRAIGHT	(>- 95F	-1.25	-95.35	-1.25		1.27							
		(
		(>-100R	-.35	-95.35	-.35									
		(
	BEND	(100M	-.10	-95.50	-.10	.50	.79	90.000						
		(
	STRAIGHT	(>-100F	.00	-95.45	.00		4.16							
		(
		(>-105	.00	-100.61	.00									
		(
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 105												
		(IN DIRECTION Z												
		(
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 105												
		(IN DIRECTION X												
		(
	STRAIGHT	(					4.82							
		(
	STRAIGHT	(>-105.1	.00	-104.92	.00		4.82							
		(
	STRAIGHT	(>-105.2	.00	-104.64	.00		4.82							
		(
	STRAIGHT	(>-110	.00	-110.45	.00									

* NOTES PERTAINING TO POINT 110 APPEAR ON THE FOLLOWING PAGE

DYNAFLEX

EDITED PIPE SYSTEM DESCRIPTION (CONTINUED)

RUN NO. 7

PAGE 14

DIST. LOADS
(LBS PER FT)

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (DEG) MATERIAL	PRESS PIPE	
			X	Y	Z							(PSI)	WT. (LBS/FT)
		>120	.00	-146.41	.00			4.500	.674	LC8	440.	27.6	7.9
	STRAIGHT					3.00							
		>120.1	.00	-149.41	.00								
	STRAIGHT					3.00							
		>125N	.00	-152.41	.00								
	BEND	125N	-.15	-152.77	.00	.50	.79	90.000					
		>125F	-.50	-152.91	.00								
	STRAIGHT					1.50							
		>130N	-2.00	-152.91	.00								
71	BEND	130N	-2.35	-153.06	.00	.50	.79	90.000					
		>130F	-2.50	-153.41	.00								
	STRAIGHT					3.66							
		>130F.1	-2.50	-157.08	.00								
	STRAIGHT					3.66							
		>140N	-2.50	-160.74	.00								
	BEND	140N	-2.60	-161.09	-.10	.50	.79	90.000					
		>140F	-2.85	-161.24	-.35								
	STRAIGHT					4.80							
		>145N	-6.25	-161.24	-3.75								
	BEND	145N	-6.36	-161.24	-3.91	.50	.39	45.000					
		>145F	-6.40	-161.24	-4.10								

* NOTES PERTAINING TO POINT 145F APPEAR ON THE FOLLOWING PAGE

DYNAFLEX

FILTERED PIPING SYSTEM DESCRIPTION (CONTINUED)

RUN NO. 7

PAGE 15

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	MATERIAL	TEMP (FAHR)	DIST. LOADS (LBS PER FT)	
			X	Y	Z								WT.	UNIF
		>-145F	-6.40	-161.24	-4.10				4.500	.674	LC88	440.	27.63	7.93
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 145F												
		(IN DIRECTION Z												
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 145F												
		(IN DIRECTION X												
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 145F												
		(IN DIRECTION Y												
	STRAIGHT -						2.69							
		>-145F.1	-6.40	-161.24	-6.79									
	STRAIGHT -						2.69							
		>-147	-6.40	-161.24	-9.08									
	STRAIGHT -						4.75							
		>-150	-6.40	-161.24	-14.23									
	STRAIGHT -						4.93							
		>-155N	-6.40	-161.24	-19.17									
	BEND -	155N	-6.40	-161.39	-19.52	.50	.79	90.000						
		>-155F	-6.40	-161.74	-19.67									
	STRAIGHT -						1.50							
		>-157	-6.40	-163.24	-19.67									
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 157												
		(IN DIRECTION X												
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 157												
		(IN DIRECTION Z												
	STRAIGHT -						4.24							
		>-157.1	-6.40	-167.08	-19.67									
	STRAIGHT -						4.24							
		>-160N	-6.40	-171.72	-19.67									
	HEAD -	160N	-6.40	-172.07	-19.91	.50	.79	90.000						

DYNAFLEX

ENTERED PIPING SYSTEM DESCRIPTION (CONTINUED)

RUN NO. 7 PAGE 16

POINT TYPE	ELEMENT DESIGNATION NO.	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	MATERIAL	TEMP (FAHR)	DIST. LOADS (LBS PER FT)	
			X	Y	Z								WT.	UNIT
	BEND - (	160M	-6.40	-172.07	-19.81	.50	.79	90.000	4.500	.674	LC9	440.	27.5	7.9
	(
	>-160F		-6.40	-172.22	-20.17									
	STRAIGHT - (						.50							
	(
	>-165		-6.40	-172.22	-20.67									
	(
	(		* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 165											
	(		IN DIRECTION Y											
	(
	STRAIGHT - (						4.00							
	(
	>-165.1		-6.40	-172.22	-24.67									
	STRAIGHT - (						4.00							
	(
	ANCHR	--170	-6.40	-172.22	-28.67									
			* CONTROL COORDINATES OF POINT 170, IN FEET :											
			X = -6.40, Y = -172.22, Z = -28.67											
			RESULTANT DIFFERENCE IS ZERO											

73

DYNAFLEX

PAGE 17

 * LUMPED DYNAMIC MODEL *

EXPLANATORY NOTES:

-
- (1) THE MASS OF THE SYSTEM IS LUMPED AT THE POINTS SHOWN BELOW. FRACTIONAL LOCATION NUMBERS, IF ANY, RESULT FROM ADDITIONAL MASS POINTS LOCATED BY THE PROGRAM BASED ON THE MAXIMUM LUMP SPACING CRITERION GIVEN IN THE INPUT DATA.
 - (2) THE MASS AT A POINT IS A COMBINATION OF DISTRIBUTED MASS LUMPED IN A LINEAR FASHION PLUS ANY ADDITIONAL CONCENTRATED MASS INPUT BY THE USER (SHOWN IN PARENTHESES).
 - (3) ROTATIONAL DEGREES OF FREEDOM ARE NOT INCLUDED IN THE MODEL UNLESS SPECIFICALLY ADDED BY THE USER. ALL THREE DISPLACEMENT DEGREES OF FREEDOM ARE AUTOMATICALLY DELETED AT ANCHORS. THE DEGREE OF FREEDOM ASSOCIATED WITH A RIGID RESTRAINT OR SHORNER ORIENTED IN THE X, Y OR Z DIRECTION IS ALSO DELETED.

DISPLACEMENT FREEDOM

ROTATIONAL FREEDOM

LOC. NO.	WEIGHT (POUNDS)	DIRECTION			MOMENT OF INERTIA (LB - IN X IN)		
					X	Y	Z
					-----	-----	-----
74 5	61.				0.	0.	0.
5.1	122.	X	Y	Z	0.	0.	0.
5.2	122.	X	Y	Z	0.	0.	0.
10	150.		Y		0.	0.	0.
10.1	177.	X	Y	Z	0.	0.	0.
15	177.		Y		0.	0.	0.
15.1	177.	X	Y	Z	0.	0.	0.
20	177.		Y		0.	0.	0.
20.1	176.	X	Y	Z	0.	0.	0.
25	141.		Y		0.	0.	0.
25.1	137.	X	Y	Z	0.	0.	0.
30N	67.	X	Y	Z	0.	0.	0.
30F	41.	X	Y	Z	0.	0.	0.

DYNAFLEX

LUMPED DYNAMIC MODEL (CONTINUED)

PAGE 18

LOC. NO.	DISPLACEMENT FREEDOM			ROTATIONAL FREEDOM			
	WEIGHT (POUNDS)	DIRECTION			MOMENT OF INERTIA (LB - IN X IN)		
		X	Y	Z	X	Y	Z
35N	41.	X	Y	Z	0.	0.	0.
35F	78.	X	Y	Z	0.	0.	0.
40	131.		Y		0.	0.	0.
40.1	134.	X	Y	Z	0.	0.	0.
40.2	134.	X	Y	Z	0.	0.	0.
45	137.		Y		0.	0.	0.
45.1	141.	X	Y	Z	0.	0.	0.
45.2	141.	X	Y	Z	0.	0.	0.
50	146.		Y		0.	0.	0.
75 50.1	152.	X	Y	Z	0.	0.	0.
50.2	152.	X	Y	Z	0.	0.	0.
55	187.		Y		0.	0.	0.
55.1	142.	X	Y	Z	0.	0.	0.
60N	85.	X	Y	Z	0.	0.	0.
60F	64.	X	Y	Z	0.	0.	0.
60F.1	100.	X	Y	Z	0.	0.	0.
65	55.	X	Y	Z	0.	0.	0.
70N	18.	X	Y	Z	0.	0.	0.
70F	78.	X	Y	Z	0.	0.	0.
70F.1	127.	X	Y	Z	0.	0.	0.
80N	78.				0.	0.	0.
80F	18.	X	Y	Z	0.	0.	0.
85	64.	X	Y	Z	0.	0.	0.

DISPLACEMENT FREEDOM

ROTATIONAL FREEDOM

WEIGHT
(POUNDS)

DIRECTION

MOMENT OF INERTIA (LH = IN X IN)

LOC.
NO.

X

Y

Z

85.1

120.

X

Y

Z

0.

0.

0.

90N

74.

X

Y

Z

0.

0.

0.

90F

23.

X

Y

Z

0.

0.

0.

92

58.

X

Y

Z

0.

0.

0.

92.1

99.

X

Y

Z

0.

0.

0.

95N

56.

0.

0.

0.

95F

29.

X

Y

Z

0.

0.

0.

100N

36.

X

Y

Z

0.

0.

0.

100F

88.

X

Y

Z

0.

0.

0.

76

105

159.

Y

0.

0.

0.

105.1

171.

X

Y

Z

0.

0.

0.

105.2

171.

X

Y

Z

0.

0.

0.

110

154.

Y

0.

0.

0.

110.1

137.

X

Y

Z

0.

0.

0.

110.2

137.

X

Y

Z

0.

0.

0.

110.3

137.

X

Y

Z

0.

0.

0.

115

142.

Y

0.

0.

0.

115.1

146.

X

Y

Z

0.

0.

0.

115.2

146.

X

Y

Z

0.

0.

0.

115.3

146.

X

Y

Z

0.

0.

0.

120

126.

Y

0.

0.

0.

120.1

107.

X

Y

Z

0.

0.

0.

125H

67.

X

Y

Z

0.

0.

0.

DYNAFLEX

LUMPED DYNAMIC MODEL (CONTINUED)

PAGE 20

LOC. NO.	DISPLACEMENT FREEDOM			ROTATIONAL FREEDOM			
	HEIGHT (POUNDS)	DIRECTION			MOMENT OF INERTIA (LB - IN X IN)		
		X	Y	Z	X	Y	Z
125F	41.	X	Y	Z	0.	0.	0.
130H	41.	X	Y	Z	0.	0.	0.
130F	79.	X	Y	Z	0.	0.	0.
130F.1	130.	X	Y	Z	0.	0.	0.
140H	79.	X	Y	Z	0.	0.	0.
140F	99.	X	Y	Z	0.	0.	0.
145H	92.	X	Y	Z	0.	0.	0.
145F	55.				0.	0.	0.
145F.1	96.	X	Y	Z	0.	0.	0.
147	132.	X	Y	Z	0.	0.	0.
150	172.	X	Y	Z	0.	0.	0.
155H	102.	X	Y	Z	0.	0.	0.
155F	41.	X	Y	Z	0.	0.	0.
157	102.		Y		0.	0.	0.
157.1	151.	X	Y	Z	0.	0.	0.
160H	89.	X	Y	Z	0.	0.	0.
160F	23.	X	Y	Z	0.	0.	0.
165	80.	Y		Z	0.	0.	0.
165.1	142.	X	Y	Z	0.	0.	0.
170	71.				0.	0.	0.

NUMBER OF DYNAMIC DEGREES OF FREEDOM = 195, TOTAL MASS OF SYSTEM = 8404. POUNDS

FREQUENCIES, PERIODS OF VIBRATION AND MASS PARTICIPATION FACTORS

MODE NO.	FREQUENCY (CPS)	PERIOD (SECONDS)	MASS PARTICIPATION FACTORS		
			X	Y	Z
1	5.17830	.19311	.74657325	.51256064	.39416299
2	6.45706	.15022	.34342242	.14442754	.54646965
3	8.23345	.12146	.58060758	.77651542	.32265821
4	8.52147	.11735	.62705362	.13697044	.13015302
5	10.64243	.09396	.32924710	.03321440	.09666171
6	11.18921	.08937	.34438945	.64275631	.08227447
7	11.27024	.08873	.30794272	.25635123	.15657131
8	11.56003	.08650	.61411644	.32626198	.60947330
9	12.76340	.07835	.33077715	2.91016231	.25528464
10	13.62437	.07357	.73414412	.17021049	.35438232
11	14.25265	.07016	.23101033	.53906644	.22977636
12	15.14326	.06608	.18891080	1.15529608	.20291082
13	16.55496	.06039	1.14442551	.87741292	.12263253
14	17.20740	.05811	.33158029	.74753224	.52334344
15	17.73639	.05634	.01727411	.00008751	.47795115
16	17.79378	.05620	.35351461	.60028032	.72500015
17	19.25326	.05194	.09031832	.71582376	.13682544
18	19.39019	.05157	.11542283	.37301059	.08372532
19	19.44228	.05143	.05343408	.04793267	.32889752
20	22.20402	.04504	.97494907	.03302250	1.12582115
21	22.91818	.04363	.59244761	.42435129	.09747919
22	23.11797	.04326	1.29434473	.29505435	.49370650
23	23.92297	.04160	.05400575	.03130309	.42537972
24	29.17548	.03524	.20300462	.05754400	.61210283
25	28.45399	.03514	.27273417	.14946220	.01366034
26	28.44448	.03467	.50548264	.21123924	.10427763
27	29.03044	.03445	.00046410	.00104414	.13324291
28	30.10578	.03322	.42716049	.23110717	.01045231
29	31.29545	.03145	.01296024	.01018449	.74884942

78

NOTES

SECTION 3.7.2 OF THE U.S. NUCLEAR REGULATORY COMMISSION STANDARD REVIEW PLAN DATED JUNE, 1975 STATES THAT AN ADEQUATE NUMBER OF DEGREES OF FREEDOM IN DYNAMIC MODELING MAY BE TAKEN EQUAL TO TWICE THE NUMBER OF MODES WITH FREQUENCIES LESS THAN 33 CPS.

FOR THIS ANALYSIS THE RATIO OF DYNAMIC DEGREES OF FREEDOM TO FREQUENCIES LESS THAN 33 CPS = 6.72

THE GOLD ELASTIC MODULUS WAS USED IN CALCULATING THE NATURAL FREQUENCIES OF THE SYSTEM

DYNAFLEX

MORE ORTHOGONALITY CHECK

ON DIAGONAL TERMS: MAX. = 1.00000 MIN. = 1.00000

OFF DIAGONAL TERMS: MAX. = 2.52024 X 10⁻¹³ MIN. = -2.73473 X 10⁻¹³

GENERAL NOTES FOR THIS LOADING:

- (1) THE SPECIFICATIONS FOR THE SHOCK LOAD INCLUDING SPECTRUM INTERPOLATION RULES APPEAR IN THE EDITED PIPING SYSTEM DESCRIPTION.
- (2) THE GLOBAL COMPONENTS OF THE SHOCK HAVE BEEN ASSUMED TO ACT INDEPENDENTLY
- (3) THE ABSOLUTE VALUE OF THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE HAVE BEEN COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD. MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

FORCES (POUNDS)

MOMENTS (FOOT-POUNDS)

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)				
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT	
ANCHORS:									
5	83.	1623.	2.	1625.	7.	154.	239.	284.	
8	170	806.	122.	10.	815.	317.	5300.	825.	5420.
RESTRAINTS:									
10	98.	0.	0.	98.	0.	0.	0.	0.	
10	0.	0.	8.	8.	0.	0.	0.	0.	
15	0.	0.	26.	26.	0.	0.	0.	0.	
15	74.	0.	0.	74.	0.	0.	0.	0.	

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 24

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
20	190.	0.	0.	190.	0.	0.	0.	0.
20	0.	0.	94.	94.	0.	0.	0.	0.
25	560.	0.	0.	560.	0.	0.	0.	0.
25	0.	0.	184.	184.	0.	0.	0.	0.
40	578.	0.	0.	578.	0.	0.	0.	0.
40	0.	0.	175.	175.	0.	0.	0.	0.
45	482.	0.	0.	482.	0.	0.	0.	0.
45	0.	0.	262.	262.	0.	0.	0.	0.
50	0.	0.	635.	635.	0.	0.	0.	0.
50	666.	0.	0.	666.	0.	0.	0.	0.

18

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

FORCES (POUNDS)

MOMENTS (FOOT-POUNDS)

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED)								
55	0.	0.	994.	994.	0.	0.	0.	0.
55	966.	0.	0.	966.	0.	0.	0.	0.
80N	0.	0.	933.	933.	0.	0.	0.	0.
80N	1388.	0.	0.	1388.	0.	0.	0.	0.
80N	0.	424.	0.	424.	0.	0.	0.	0.
95N	0.	1657.	0.	1657.	0.	0.	0.	0.
95N	1131.	0.	0.	1131.	0.	0.	0.	0.
95N	0.	0.	1188.	1188.	0.	0.	0.	0.
105	0.	0.	2006.	2006.	0.	0.	0.	0.
105	1652.	0.	0.	1652.	0.	0.	0.	0.

82

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 26

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
110	1797.	0.	0.	1797.	0.	0.	0.	0.
110	0.	0.	1793.	1793.	0.	0.	0.	0.
115	0.	0.	1261.	1261.	0.	0.	0.	0.
115	1598.	0.	0.	1598.	0.	0.	0.	0.
120	989.	0.	0.	989.	0.	0.	0.	0.
120	0.	0.	850.	850.	0.	0.	0.	0.
145F	0.	0.	1797.	1797.	0.	0.	0.	0.
145F	1475.	0.	0.	1475.	0.	0.	0.	0.
145F	0.	1072.	0.	1072.	0.	0.	0.	0.
157	860.	0.	0.	860.	0.	0.	0.	0.

DYNAFLEX

LOADING = SHOCK LOADING NO. 1

PAGE 27

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

FORCES (POUNDS)

MOMENTS (FOOT-POUNDS)

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) =								
157	0.	0.	1396.	1396.	0.	0.	0.	0.
165	0.	1037.	0.	1037.	0.	0.	0.	0.

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 28

* INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *

THE MAXIMUM STRESS OF 10,450. OCCURS AT POINT 808

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE ANSI B31.1 - 1977 PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (**) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE HEADING BELOW) ARE AUTOMATICALLY CALCULATED AND APPLIED AT BENDS, ELBOWS, FITES AND ADMISSIBLE TYPES OF TEES (AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE MODULUS IS USED FOR THE BRANCH LEG AT REDUCED OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK. THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 29

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELF TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS (PSI)
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF-PLANE		
ANCHR		5	1623.	83.	154.	239.	7.	1.00	1.00	6.79	502.
STR	- (
	>-	5.1	1622.	46.	154.	46.	0.	1.00	1.00	6.79	284.
STR	- (
	>-	5.2	1622.	46.	154.	203.	7.	1.00	1.00	6.79	451.
STR	- (
	>-	10	1621.	17.	154.	153.	13.	1.00	1.00	6.79	384.
STR	- (
	>-	10.1	1619.	112.	154.	407.	18.	1.00	1.00	6.79	770.
STR	- (
	>-	15	1610.	103.	154.	114.	43.	1.00	1.00	6.79	347.
STR	- (
	>-	15.1	1610.	103.	154.	448.	63.	1.00	1.00	6.79	844.
STR	- (
	>-	20	1596.	175.	154.	292.	152.	1.00	1.00	6.79	642.
STR	- (
	>-	20.1	1596.	175.	154.	543.	223.	1.00	1.00	6.79	1073.
STR	- (
	>-	25	1579.	499.	154.	757.	547.	1.00	1.00	6.79	1673.
STR	- (
	>-	25.1	1579.	499.	154.	723.	202.	1.00	1.00	6.79	1354.
STR	- (
	>-	30N	1573.	436.	154.	1981.	147.	1.00	1.00	6.79	3520.
HEND	- (
	>-	30M	1401.	822.	80.	1906.	226.	1.00	1.00	6.79	3394.
STR	- (
	>-	30F	439.	1564.	183.	1477.	195.	1.00	1.00	6.79	2651.
STR	- (
	>-	35N	482.	1541.	183.	1583.	311.	1.00	1.00	6.79	2525.
HEND	- (
	>-	35M	1408.	792.	144.	1779.	362.	1.00	1.00	6.79	3217.
STR	- (
	>-	35F	1539.	489.	351.	1814.	215.	1.00	1.00	6.79	3246.
STR	- (
	>-	40	1411.	159.	351.	609.	499.	1.00	1.00	6.79	1522.
STR	- (
	>-	40.1	1330.	170.	351.	743.	245.	1.00	1.00	6.79	1515.
STR	- (
	>-	40.2	1330.	170.	351.	442.	240.	1.00	1.00	6.79	1083.
STR	- (
	>-	45	1164.	324.	351.	809.	502.	1.00	1.00	6.79	1786.
STR	- (
	>-	45.1	1085.	237.	351.	450.	252.	1.00	1.00	6.79	1102.

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 30

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	FLEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
			AXIAL	RESISTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN-PLANE	OUT-OF-PLANE		
	STR - (	>- 45.1	1085.	237.	351.	450.	292.	1.00	1.00	6.79	1102.
	STR - (	>- 45.2	1085.	237.	351.	954.	818.	1.00	1.00	6.79	2306.
	STR - (	>- 50	926.	743.	351.	1306.	1325.	1.00	1.00	6.79	3344.
	STR - (	>- 50.1	926.	743.	351.	1105.	847.	1.00	1.00	6.79	2536.
	STR - (	>- 50.2	889.	592.	351.	2530.	2688.	1.00	1.00	6.79	6551.
	STR - (	>- 55	719.	889.	351.	3884.	4187.	1.00	1.00	6.79	10108.
	STR - (	>- 55.1	719.	889.	351.	2421.	1840.	1.00	1.00	6.79	5408.
	BEND - (	>- 60N	671.	627.	351.	2622.	967.	1.00	1.00	6.79	4976.
	BEND - (	>- 60N	573.	478.	694.	2606.	745.	1.00	1.00	6.79	4983.
87	STR - (	>- 60F	290.	693.	937.	2430.	451.	1.00	1.00	6.79	4669.
	STR - (	>- 60F.1	284.	672.	937.	1146.	907.	1.00	1.00	6.79	3066.
	STR - (	>- 65	568.	479.	937.	1325.	1715.	1.00	1.00	6.79	4171.
	STR - (	>- 70N	568.	479.	937.	1362.	1799.	1.00	1.00	6.79	4317.
	BEND - (	>- 70N	555.	517.	1147.	1867.	1252.	1.00	1.00	6.79	4459.
	STR - (	>- 70F	380.	656.	1424.	1807.	1000.	1.00	1.00	6.79	4432.
	STR - (	>- 70F.1	380.	483.	1424.	937.	2611.	1.00	1.00	6.79	5509.
	BEND - (	>- 80N	402.	615.	1424.	5642.	1079.	1.00	1.00	6.79	10454.
	BEND - (	>- 80N	389.	1022.	496.	5358.	1661.	1.00	1.00	6.79	9947.
	STR - (	>- 80F	546.	951.	979.	1390.	4977.	1.00	1.00	6.79	9291.
	STR - (	>- 85	546.	951.	979.	1377.	4752.	1.00	1.00	6.79	8910.
	STR - (	>- 85.1	539.	950.	979.	1442.	1708.	1.00	1.00	6.79	4353.
	STR - (	>- 90N	544.	943.	979.	1318.	1485.	1.00	1.00	6.79	3911.

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 31

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)		SIF		SECTION MODULUS (IN ³)	LONG (TUDINAL) STRESS (PSI)	
		AXIAL	SHEAR	TORSION	IN-PLANE BENDING	OUT-OF- PLANE	PLATE			
>-	90N	500.	903.	979.	1310.	1485.	1.00	1.00	6.79	3911.
(	90M	1005.	493.	1157.	1737.	1076.	1.00	1.00	6.79	4147.
>-	90F	931.	649.	1211.	1018.	1699.	1.00	1.00	6.79	4101.
(	92	931.	740.	1211.	1072.	1465.	1.00	1.00	6.79	3855.
>-	92.1	931.	819.	1211.	1961.	846.	1.00	1.00	6.79	4338.
(	95N	1335.	1438.	1211.	1840.	3503.	1.00	1.00	6.79	7345.
>-	95M	1300.	1048.	2363.	1770.	2907.	1.00	1.00	6.79	7319.
(	95F	1041.	1498.	3290.	1607.	1874.	1.00	1.00	6.79	7267.
>-	100N	1042.	1493.	3290.	3056.	472.	1.00	1.00	6.79	7976.
(	100M	1032.	1174.	2226.	3349.	2291.	1.00	1.00	6.79	8228.
>-	100F	1562.	1068.	232.	1573.	4113.	1.00	1.00	6.79	7790.
(	105	1562.	1068.	232.	2556.	2560.	1.00	1.00	6.79	6404.
>-	105.1	1440.	1416.	232.	2384.	2238.	1.00	1.00	6.79	5792.
(	105.2	1310.	222.	232.	2305.	2075.	1.00	1.00	6.79	5494.
>-	110	1048.	1234.	232.	3147.	3149.	1.00	1.00	6.79	7875.
(	110.1	970.	713.	232.	1392.	1021.	1.00	1.00	6.79	3077.
>-	110.2	970.	713.	232.	2445.	2205.	1.00	1.00	6.79	5926.
(	110.3	876.	560.	232.	1253.	1357.	1.00	1.00	6.79	3286.
>-	115	724.	945.	232.	2961.	2305.	1.00	1.00	6.79	6642.
(	115.1	724.	945.	232.	949.	1055.	1.00	1.00	6.79	2529.
>-	115.2	673.	602.	232.	2207.	1775.	1.00	1.00	6.79	5021.
(	115.3	645.	363.	232.	1016.	1366.	1.00	1.00	6.79	3899.

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 32

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
		>- 115.3	645.	363.	232.	1416.	1366.	1.00	1.00	6.79	3449.
	STR - (
		>- 120	650.	452.	232.	2109.	1695.	1.00	1.00	6.79	4798.
	STR - (
		>- 120.1	681.	564.	232.	1353.	1035.	1.00	1.00	6.79	3037.
	STR - (
		>- 125N	681.	564.	232.	1251.	1387.	1.00	1.00	6.79	3326.
	BEND - (
		125N	531.	704.	1116.	1245.	1002.	1.00	1.00	6.79	3444.
	STR - (
		>- 125F	208.	809.	1530.	1187.	205.	1.00	1.00	6.79	3480.
	STR - (
		>- 130N	208.	809.	1530.	1364.	664.	1.00	1.00	6.79	3807.
	BEND - (
		130N	519.	554.	925.	1511.	1449.	1.00	1.00	6.79	4043.
	STR - (
		>- 130F	673.	317.	789.	1582.	1577.	1.00	1.00	6.79	4185.
	STR - (
		>- 130F.1	589.	321.	789.	1273.	898.	1.00	1.00	6.79	3084.
	STR - (
		>- 140N	415.	683.	789.	1401.	595.	1.00	1.00	6.79	3028.
	BEND - (
		140N	649.	478.	611.	1520.	656.	1.00	1.00	6.79	3116.
	STR - (
		>- 140F	526.	832.	616.	1457.	758.	1.00	1.00	6.79	3098.
	STR - (
		>- 145N	535.	830.	616.	3263.	1135.	1.00	1.00	6.79	6199.
	BEND - (
		145N	425.	798.	523.	3395.	1289.	1.00	1.00	6.79	6482.
	STR - (
		>- 145F	1465.	1166.	676.	1258.	3518.	1.00	1.00	6.79	6708.
	STR - (
		>- 145F.1	1465.	1166.	676.	1128.	1762.	1.00	1.00	6.79	3883.
	STR - (
		>- 147	1465.	901.	676.	2326.	1952.	1.00	1.00	6.79	5495.
	STR - (
		>- 150	1463.	345.	676.	1658.	2749.	1.00	1.00	6.79	5795.
	STR - (
		>- 155N	1456.	1134.	676.	2466.	816.	1.00	1.00	6.79	4741.
	BEND - (
		155N	1644.	834.	1010.	2560.	394.	1.00	1.00	6.79	4957.
	STR - (
		>- 155F	869.	1428.	1044.	2172.	490.	1.00	1.00	6.79	4344.

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 33

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELPH TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
STR - (	>-	155F	849.	1628.	1044.	2172.	490.	1.00	1.00	6.79	4304.
STR - (	>-	157	894.	315.	1044.	1225.	23.	1.00	1.00	6.79	2844.
STP - (	>-	157.1	894.	315.	1044.	1232.	282.	1.00	1.00	6.79	2896.
	>-	160N	934.	354.	1044.	355.	980.	1.00	1.00	6.79	2606.
HEND - (		160N	668.	743.	490.	221.	1224.	1.00	1.00	6.79	2363.
STR - (	>-	160F	10.	1024.	825.	107.	875.	1.00	1.00	6.79	2193.
STR - (	>-	165	10.	1028.	825.	576.	684.	1.00	1.00	6.79	2144.
STR - (	>-	165.1	10.	815.	825.	172.	2141.	1.00	1.00	6.79	4064.
ANOMP	--	170	10.	815.	825.	317.	5348.	1.00	1.00	6.79	4575.

8

DYNAFLEX

LOADING = SHOCK LOADING NO. 1

PAGE 34

 * DISPLACEMENTS AND ROTATIONS *

EXPLANATORY NOTES:

VALUES IN PARENTHESES ARE ACCELERATIONS (IN PER SECOND SQUARED)

DISPLACEMENTS (INCHES)

ROTATIONS (DEGREES) ABOUT

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
ANCHOR		5	.000	.000	.000	.000	.000	.000
	STRAIGHT -(		(.0)	(.0)	(.0)			
	>-	5.1	.004	.000	.000	.000	.013	.006
	STRAIGHT -(		(117.4)	(2.4)	(.7)			
	>-	5.2	.006	.001	.000	.000	.027	.002
	STRAIGHT -(		(193.4)	(5.2)	(1.3)			
	>-	10	.000	.001	.000	.001	.040	.014
	STRAIGHT -(		(.0)	(7.7)	(.0)			
	>-	10.1	.013	.001	.001	.000	.059	.002
	STRAIGHT -(		(414.9)	(11.4)	(4.2)			
	>-	15	.000	.002	.000	.003	.079	.020
	STRAIGHT -(		(.0)	(15.1)	(.0)			
	>-	15.1	.015	.002	.003	.002	.098	.003
	STRAIGHT -(		(425.0)	(18.4)	(11.6)			
	>-	20	.000	.003	.000	.009	.117	.024
	STRAIGHT -(		(.0)	(22.4)	(.0)			
	>-	20.1	.021	.003	.011	.005	.137	.008
	STRAIGHT -(		(354.7)	(25.9)	(33.9)			
	>-	25	.000	.003	.000	.031	.156	.051
	STRAIGHT -(		(.0)	(29.4)	(.0)			
	>-	25.1	.037	.004	.028	.053	.167	.052
	STRAIGHT -(		(484.0)	(31.5)	(76.6)			
	>-	30H	.053	.004	.063	.055	.179	.045
	(		(461.3)	(33.5)	(165.7)			
	BEND -(	30M	.052	.004	.061	.054	.181	.064
	(		(492.1)	(35.0)	(161.1)			
	>-	30F	.052	.011	.049	.052	.183	.082
	STRAIGHT -(		(403.3)	(40.6)	(132.1)			
	>-	35N	.052	.040	.012	.047	.190	.089
	(		(402.4)	(256.4)	(139.3)			
	BEND -(	35M	.050	.046	.024	.045	.194	.078

16

LOADING - SHOCK LOADING NO. 1

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
HEAD - (		35H	.050 (892.6)	.046 (255.2)	.024 (169.5)	.045	.194	.078
>-		35F	.046 (849.9)	.048 (259.1)	.026 (169.5)	.044	.197	.069
STRAIGHT - (		40	.000 (.0)	.049 (261.0)	.000 (.0)	.023	.228	.057
STRAIGHT - (		40.1	.029 (555.9)	.049 (262.9)	.009 (137.0)	.009	.261	.016
STRAIGHT - (		40.2	.023 (480.7)	.049 (264.6)	.009 (129.8)	.009	.294	.026
STRAIGHT - (		45	.000 (.0)	.049 (266.2)	.000 (.0)	.022	.326	.033
STRAIGHT - (		45.1	.031 (462.9)	.050 (267.7)	.026 (141.3)	.031	.361	.036
STRAIGHT - (		45.2	.043 (530.7)	.050 (269.0)	.038 (156.2)	.010	.396	.017
STRAIGHT - (		50	.000 (.0)	.050 (270.2)	.000 (.0)	.090	.431	.093
STRAIGHT - (		50.1	.102 (460.0)	.050 (271.2)	.103 (262.3)	.110	.469	.104
STRAIGHT - (		50.2	.140 (402.1)	.050 (272.0)	.148 (325.3)	.036	.506	.046
STRAIGHT - (		55	.000 (.0)	.051 (272.6)	.000 (.0)	.318	.584	.291
STRAIGHT - (		55.1	.386 (529.9)	.051 (273.0)	.375 (452.5)	.544	.579	.513
STRAIGHT - (		60N	.029 (1038.5)	.051 (273.2)	.867 (1359.6)	.610	.614	.644
HEAD - (		60M	.076 (1041.2)	.061 (275.2)	.493 (1383.4)	.610	.618	.661
STRAIGHT - (		60F	.696 (1042.1)	.101 (287.7)	.866 (1326.1)	.610	.622	.676
STRAIGHT - (		60F.1	.896 (1092.1)	.507 (656.9)	.442 (694.3)	.614	.646	.712
STRAIGHT - (		65	.096 (1092.0)	.021 (1202.4)	.104 (130.1)	.623	.663	.684
STRAIGHT - (		70N	.096 (1094.0)	.057 (1251.8)	.070 (85.6)	.628	.664	.678
HEAD - (		70M	.076 (1072.2)	.097 (1297.9)	.020 (24.6)	.626	.665	.665
STRAIGHT - (		70F	.027 (1022.9)	.061 (1267.5)	.060 (.7)	.630	.664	.653
STRAIGHT - (		70F.1	.347 (441.7)	.484 (667.3)	.000 (.4)	.644	.643	.549
STRAIGHT - (		80H	.000 (.0)	.000 (.0)	.000 (.0)	.636	.304	.459

8

DYNAFLEX

LOADING = SNACK LOADING NO. 1

PAGE 36

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	>- 80N		.000	.000	.000	.636	.304	.459
	(		(.0)	(.0)	(.0)			
	BEND - (80N		.020	.060	.008	.630	.241	.449
	(		(32.4)	(85.8)	(13.0)			
	>- 80F		.027	.111	.023	.628	.183	.439
	STRAIGHT - (		(83.8)	(165.9)	(39.3)			
	>- 85		.027	.138	.032	.621	.159	.434
	STRAIGHT - (		(83.8)	(205.6)	(55.3)			
	>- 85.1		.027	.013	.058	.581	.052	.357
	STRAIGHT - (		(84.1)	(760.8)	(136.4)			
	>- 90N		.027	.431	.006	.551	.062	.269
	(		(84.5)	(1250.8)	(29.3)			
	BEND - (90N		.028	.634	.002	.549	.046	.255
	(		(51.0)	(1265.5)	(9.3)			
	>- 90F		.031	.601	.000	.546	.031	.244
	STRAIGHT - (		(69.3)	(1207.7)	(.5)			
	>- 92		.033	.544	.000	.541	.024	.230
	STRAIGHT - (		(98.5)	(1098.8)	(.4)			
	>- 92.1		.025	.288	.000	.479	.038	.156
8	STRAIGHT - (		(212.9)	(501.0)	(.2)			
	>- 95N		.000	.000	.000	.345	.064	.101
	(		(.0)	(.0)	(.0)			
	BEND - (95N		.003	.013	.001	.327	.071	.099
	(		(35.2)	(31.7)	(7.1)			
	>- 95F		.005	.023	.002	.309	.078	.098
	STRAIGHT - (		(68.2)	(68.5)	(29.2)			
	>- 100N		.022	.069	.019	.194	.099	.069
	(		(285.8)	(275.4)	(245.9)			
	BEND - (100N		.027	.078	.022	.153	.103	.056
	(		(349.5)	(319.2)	(310.3)			
	>- 100F		.029	.041	.022	.106	.104	.044
	STRAIGHT - (		(379.0)	(332.0)	(328.8)			
	>- 105		.000	.081	.000	.092	.108	.101
	STRAIGHT - (		(.0)	(334.5)	(.0)			
	>- 105.1		.144	.042	.130	.098	.116	.108
	STRAIGHT - (		(2808.7)	(337.3)	(2336.5)			
	>- 105.2		.145	.042	.128	.102	.129	.109
	STRAIGHT - (		(2245.8)	(339.8)	(2166.2)			
	>- 110		.000	.082	.000	.108	.150	.134
	STRAIGHT - (		(.0)	(341.8)	(.0)			
	>- 110.1		.168	.042	.041	.121	.169	.125
	STRAIGHT - (		(1304.6)	(345.1)	(1080.8)			
	>- 110.2		.157	.082	.149	.025	.189	.042
	STRAIGHT - (		(2325.0)	(344.1)	(2155.3)			
	>- 110.3		.160	.082	.104	.116	.210	.126

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 37

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		>- 110.3	.100	.082	.108	.116	.210	.126
	STRAIGHT - (		(1496.1)	(344.8)	(1491.1)			
		>- 115	.000	.083	.000	.119	.231	.107
	STRAIGHT - (		(.0)	(345.3)	(.0)			
		>- 115.1	.101	.083	.095	.107	.253	.127
	STRAIGHT - (		(487.8)	(345.5)	(678.9)			
		>- 115.2	.169	.083	.149	.040	.276	.036
	STRAIGHT - (		(1783.9)	(345.4)	(1310.4)			
		>- 115.3	.121	.083	.110	.102	.299	.121
	STRAIGHT - (		(1270.1)	(344.9)	(1028.9)			
		>- 120	.000	.083	.000	.142	.322	.139
	STRAIGHT - (		(.0)	(344.2)	(.0)			
		>- 120.1	.086	.083	.092	.152	.339	.142
	STRAIGHT - (		(437.0)	(343.5)	(573.8)			
		>- 125N	.169	.083	.181	.140	.356	.142
	(		(716.7)	(342.6)	(963.9)			
	HEND - (	125N	.177	.083	.186	.136	.358	.140
	(		(747.3)	(327.4)	(937.0)			
		>- 125F	.181	.083	.181	.133	.359	.138
	STRAIGHT - (		(758.8)	(307.6)	(865.1)			
		>- 130N	.181	.099	.191	.133	.356	.125
	(		(759.0)	(467.9)	(1540.7)			
	HEND - (	130N	.183	.104	.201	.139	.352	.117
	(		(764.1)	(552.7)	(1769.9)			
		>- 130F	.188	.106	.202	.148	.348	.108
	STRAIGHT - (		(786.8)	(545.2)	(1810.4)			
		>- 130F.1	.217	.106	.165	.199	.323	.111
	STRAIGHT - (		(905.6)	(506.9)	(862.8)			
		>- 140N	.210	.106	.216	.188	.314	.146
	(		(940.1)	(588.0)	(983.4)			
	HEND - (	140N	.226	.103	.216	.178	.314	.150
	(		(1004.2)	(569.4)	(1000.4)			
		>- 140F	.211	.096	.203	.169	.313	.155
	STRAIGHT - (		(545.9)	(530.1)	(934.3)			
		>- 145N	.016	.009	.007	.159	.219	.181
	(		(41.9)	(86.2)	(17.4)			
	HEND - (	145N	.008	.006	.002	.163	.212	.181
	(		(23.1)	(54.1)	(4.6)			
		>- 145F	.000	.000	.000	.147	.205	.181
	STRAIGHT - (		(.0)	(.0)	(.0)			
		>- 145F.1	.107	.007	.000	.160	.183	.184
	STRAIGHT - (		(596.0)	(1050.6)	(2.4)			
		>- 147	.192	.165	.000	.073	.133	.199
	STRAIGHT - (		(1414.4)	(1422.7)	(4.7)			
		>- 150	.222	.140	.001	.111	.096	.246

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 39

GENERAL NOTES FOR THIS LOADING:

- (1) THE SPECIFICATIONS FOR THE SHOCK LOAD INCLUDING SPECTRUM INTERPOLATION RULES APPEAR IN THE EDITED PIPING SYSTEM DESCRIPTION.
- (2) THE GLOBAL COMPONENTS OF THE SHOCK HAVE BEEN ASSUMED TO ACT INDEPENDENTLY
- (3) THE ABSOLUTE VALUE OF THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE HAVE BEEN COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD. MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

FORCES (POUNDS)

MOMENTS (FOOT-POUNDS)

LINC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
ANCHORS:								
5	0.	875.	30.	876.	89.	271.	24.	287.
8	247.	108.	0.	270.	279.	1582.	252.	1626.
RESTRAINTS:								
10	15.	0.	0.	15.	0.	0.	0.	0.
10	0.	0.	56.	56.	0.	0.	0.	0.
15	0.	0.	120.	120.	0.	0.	0.	0.
15	31.	0.	0.	31.	0.	0.	0.	0.

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 40

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
20	85.	0.	0.	85.	0.	0.	0.	0.
20	0.	0.	315.	315.	0.	0.	0.	0.
25	309.	0.	0.	309.	0.	0.	0.	0.
25	0.	0.	585.	585.	0.	0.	0.	0.
40	212.	0.	0.	212.	0.	0.	0.	0.
40	0.	0.	339.	339.	0.	0.	0.	0.
45	158.	0.	0.	158.	0.	0.	0.	0.
97	0.	0.	393.	393.	0.	0.	0.	0.
50	0.	0.	556.	556.	0.	0.	0.	0.
50	309.	0.	0.	309.	0.	0.	0.	0.

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 41

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

FORCES (POUNDS)

MOMENTS (FOOT-POUNDS)

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED)								
55	0.	0.	671.	671.	0.	0.	0.	0.
55	482.	0.	0.	482.	0.	0.	0.	0.
80H	0.	0.	630.	630.	0.	0.	0.	0.
80N	851.	0.	0.	851.	0.	0.	0.	0.
80N	0.	229.	0.	229.	0.	0.	0.	0.
95N	0.	962.	0.	962.	0.	0.	0.	0.
95N	956.	0.	0.	956.	0.	0.	0.	0.
95N	0.	0.	886.	886.	0.	0.	0.	0.
105	0.	0.	1782.	1782.	0.	0.	0.	0.
105	1492.	0.	0.	1492.	0.	0.	0.	0.

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 42

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

FORCES (POUNDS)

MOMENTS (FOOT-POUNDS)

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
110	1640.	0.	0.	1640.	0.	0.	0.	0.
110	0.	0.	1709.	1709.	0.	0.	0.	0.
115	0.	0.	1494.	1494.	0.	0.	0.	0.
115	1419.	0.	0.	1419.	0.	0.	0.	0.
120	987.	0.	0.	987.	0.	0.	0.	0.
120	0.	0.	1145.	1145.	0.	0.	0.	0.
145F	0.	0.	1527.	1527.	0.	0.	0.	0.
145F	541.	0.	0.	541.	0.	0.	0.	0.
145F	0.	858.	0.	858.	0.	0.	0.	0.
157	459.	0.	0.	459.	0.	0.	0.	0.

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 43

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

FORCES (POUNDS)

MOMENTS (FOOT-POUNDS)

LDC. NO.

X Y Z RESULTANT

X Y Z RESULTANT

RESTRAINTS (CONTINUED) -

LDC. NO.	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
157	0.	0.	1188.	1188.	0.	0.	0.	0.
165	0.	906.	0.	906.	0.	0.	0.	0.

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DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 44

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*****
* INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *
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THE MAXIMUM STRESS OF 7350. OCCURS AT POINT 110

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE ANSI B31.1 - 1977 PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (**) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE HEADING BELOW) ARE AUTOMATICALLY CALCULATED AND APPLIED AT BENDS, ELBOWS, MITERS AND ADMISSIBLE TYPES OF TEES (AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE MODULUS IS USED FOR THE BRANCH LFG AT REDUCED OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK. THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

101

DYNAFLEX

LOADING - SMOCK LOADING NO. 2

PAGE 45

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	FLTH TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
ANCHR	STR - (	5	875.	31.	271.	24.	49.	1.00	1.00	6.79	506.
	STR - (	5.1	875.	20.	271.	4.	14.	1.00	1.00	6.79	480.
	STR - (	5.2	875.	9.	271.	21.	79.	1.00	1.00	6.79	501.
	STR - (	10	875.	9.	271.	24.	90.	1.00	1.00	6.79	507.
	STR - (	10.1	872.	27.	271.	48.	175.	1.00	1.00	6.79	577.
	STR - (	15	869.	115.	271.	48.	189.	1.00	1.00	6.79	591.
	STR - (	15.1	869.	115.	271.	98.	371.	1.00	1.00	6.79	830.
	STR - (	20	862.	296.	271.	134.	490.	1.00	1.00	6.79	1018.
	STR - (	20.1	858.	94.	271.	241.	931.	1.00	1.00	6.79	1765.
102	STR - (	25	854.	574.	271.	409.	1318.	1.00	1.00	6.79	2485.
	STR - (	25.1	854.	574.	271.	408.	298.	1.00	1.00	6.79	1013.
	STR - (	30N	850.	357.	271.	1120.	1039.	1.00	1.00	6.79	2740.
	BEND - (	30N	755.	460.	615.	1076.	873.	1.00	1.00	6.79	2679.
	STR - (	30F	218.	876.	1034.	627.	244.	1.00	1.00	6.79	2379.
	STR - (	35N	218.	876.	1034.	614.	217.	1.00	1.00	6.79	2159.
	BEND - (	45N	739.	508.	913.	842.	650.	1.00	1.00	6.79	2365.
	STR - (	35F	931.	337.	311.	878.	926.	1.00	1.00	6.79	2320.
	STR - (	40	802.	410.	311.	174.	490.	1.00	1.00	6.79	1069.
	STR - (	40.1	753.	216.	311.	351.	843.	1.00	1.00	6.79	1705.
	STR - (	40.2	703.	128.	311.	325.	730.	1.00	1.00	6.79	1521.
	STR - (	45	605.	323.	311.	277.	631.	1.00	1.00	6.79	1336.
	STR - (	45.1	605.	323.	311.	335.	804.	1.00	1.00	6.79	1634.

DYNAFLEX

LOADING - SHECK LOADING NO. 2

PAGE 46

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	STR - (	>- 45.1	605.	323.	311.	335.	604.	1.00	1.00	6.79	1634.
	STR - (	>- 45.2	555.	146.	311.	523.	899.	1.00	1.00	6.79	1917.
	STR - (	>- 50	463.	472.	311.	639.	988.	1.00	1.00	6.79	2150.
	STR - (	>- 50.1	463.	472.	311.	549.	923.	1.00	1.00	6.79	1975.
	STR - (	>- 50.2	420.	331.	311.	1324.	1640.	1.00	1.00	6.79	3766.
	STR - (	>- 55	357.	504.	311.	2039.	2393.	1.00	1.00	6.79	5568.
	STR - (	>- 55.1	357.	504.	311.	1279.	1048.	1.00	1.00	6.79	2972.
	STR - (	>- 60H	340.	341.	311.	1346.	566.	1.00	1.00	6.79	2637.
	BEND - (	60H	282.	276.	419.	1329.	467.	1.00	1.00	6.79	2595.
103	STR - (	>- 60F	132.	374.	531.	1233.	332.	1.00	1.00	6.79	2443.
	STR - (	>- 60F.1	191.	403.	531.	558.	715.	1.00	1.00	6.79	1857.
	STR - (	>- 65	350.	376.	531.	702.	1548.	1.00	1.00	6.79	3147.
	STR - (	>- 70N	350.	376.	531.	725.	1629.	1.00	1.00	6.79	3287.
	BEND - (	70H	444.	245.	615.	1706.	688.	1.00	1.00	6.79	3426.
	STR - (	>- 70F	342.	398.	762.	1644.	548.	1.00	1.00	6.79	3375.
	STR - (	>- 70F.1	342.	615.	762.	462.	1453.	1.00	1.00	6.79	3011.
	STR - (	>- 80N	489.	387.	762.	3081.	585.	1.00	1.00	6.79	5662.
	BEND - (	80H	246.	574.	261.	2906.	885.	1.00	1.00	6.79	5387.
	STR - (	>- 80F	357.	511.	517.	744.	2701.	1.00	1.00	6.79	5032.
	STR - (	>- 85	357.	511.	517.	737.	2579.	1.00	1.00	6.79	4826.
	STR - (	>- 85.1	357.	512.	517.	764.	948.	1.00	1.00	6.79	2337.
	STR - (	>- 90N	357.	512.	517.	659.	832.	1.00	1.00	6.79	2086.

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 47

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT Type	FLEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
		>- 90N	357.	512.	517.	659.	832.	1.00	1.00	6.79	2086.
	BEND	(90N	567.	303.	623.	941.	507.	1.00	1.00	6.79	2212.
		>- 90F	507.	401.	605.	533.	931.	1.00	1.00	6.79	2175.
	STR	(92	507.	440.	605.	558.	797.	1.00	1.00	6.79	2023.
		>- 92.1	507.	459.	605.	1017.	702.	1.00	1.00	6.79	2430.
	STR	(95N	937.	1163.	605.	1365.	1831.	1.00	1.00	6.79	4173.
	BEND	(95N	912.	1142.	1203.	1256.	1514.	1.00	1.00	6.79	4073.
		>- 95F	754.	1126.	1684.	1132.	974.	1.00	1.00	6.79	3976.
	STR	(100N	755.	1122.	1684.	1684.	370.	1.00	1.00	6.79	4161.
104	BEND	(100N	1118.	745.	1147.	1773.	1186.	1.00	1.00	6.79	4279.
		>- 100F	867.	1071.	251.	892.	2103.	1.00	1.00	6.79	4061.
	STR	(105	867.	1071.	251.	2233.	2632.	1.00	1.00	6.79	6114.
		>- 105.1	813.	1351.	251.	2067.	2283.	1.00	1.00	6.79	5482.
	STR	(105.2	756.	211.	251.	1908.	2251.	1.00	1.00	6.79	5232.
		>- 110	648.	1132.	251.	2869.	3003.	1.00	1.00	6.79	7350. **
	STR	(110.1	603.	656.	251.	1067.	1301.	1.00	1.00	6.79	3006.
		>- 110.2	603.	656.	251.	2067.	2139.	1.00	1.00	6.79	5274.
	STR	(110.3	560.	573.	251.	1061.	1181.	1.00	1.00	6.79	2639.
		>- 115	484.	499.	251.	2614.	2796.	1.00	1.00	6.79	6775. **
	STR	(115.1	456.	479.	251.	696.	874.	1.00	1.00	6.79	2022.
		>- 115.2	456.	409.	251.	1932.	2132.	1.00	1.00	6.79	5102.
	STR	(115.3	435.	392.	251.	1431.	1543.	1.00	1.00	6.79	3744.

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 48

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELFM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSTON	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	STR - (	>- 115.3	435.	392.	251.	1431.	1543.	1.00	1.00	6.79	3744.
	STR - (	>- 120	417.	711.	251.	2167.	2356.	1.00	1.00	6.79	5672.
	STR - (	>- 120.1	430.	648.	251.	993.	938.	1.00	1.00	6.79	2453.
	STR - (	>- 125N	441.	562.	251.	869.	808.	1.00	1.00	6.79	2142.
	BEND - (	125N	334.	637.	666.	927.	688.	1.00	1.00	6.79	2354.
	STR - (	>- 125F	244.	626.	981.	951.	262.	1.00	1.00	6.79	2465.
	STR - (	>- 130N	244.	626.	981.	1167.	835.	1.00	1.00	6.79	3071.
	BEND - (	130N	320.	454.	526.	1270.	1277.	1.00	1.00	6.79	3314.
	STR - (	>- 130F	411.	367.	987.	1342.	1077.	1.00	1.00	6.79	3504.
105	STR - (	>- 130F.1	260.	507.	987.	1346.	907.	1.00	1.00	6.79	3355.
	STR - (	>- 140N	226.	582.	987.	997.	808.	1.00	1.00	6.79	2660.
	BEND - (	140N	433.	461.	787.	1109.	765.	1.00	1.00	6.79	2721.
	STR - (	>- 140F	420.	461.	788.	1098.	838.	1.00	1.00	6.79	2790.
	STR - (	>- 145N	420.	642.	788.	2309.	1058.	1.00	1.00	6.79	4685.
	BEND - (	145N	460.	590.	348.	2416.	1300.	1.00	1.00	6.79	4886.
	STR - (	>- 145F	548.	541.	296.	2509.	1347.	1.00	1.00	6.79	5057.
	STR - (	>- 145F.1	1251.	715.	296.	850.	2408.	1.00	1.00	6.79	4541.
	STR - (	>- 147	1251.	499.	296.	1935.	2255.	1.00	1.00	6.79	5275.
	STR - (	>- 150	1249.	229.	296.	1472.	1471.	1.00	1.00	6.79	3714.
	STR - (	>- 150N	1242.	806.	296.	2105.	370.	1.00	1.00	6.79	3812.
	BEND - (	150N	1412.	514.	478.	2190.	290.	1.00	1.00	6.79	3952.
	STR - (	>- 155F	762.	1303.	500.	235.	1861.	1.00	1.00	6.79	3448.

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
			AXIAL	RESISTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
STR	(	>- 155F	762.	1303.	540.	235.	1861.	1.00	1.00	6.79	3448.
STR	(	>- 157	779.	126.	540.	670.	17.	1.00	1.00	6.79	1520.
STR	(	>- 157.1	779.	126.	540.	462.	248.	1.00	1.00	6.79	1329.
	(	>- 160H	816.	126.	540.	310.	290.	1.00	1.00	6.79	1213.
HEND	(	160H	583.	585.	374.	194.	449.	1.00	1.00	6.79	1047.
STR	(	>- 160F	8.	826.	252.	94.	484.	1.00	1.00	6.79	978.
STR	(	>- 165	8.	830.	252.	503.	427.	1.00	1.00	6.79	1247.
STR	(	>- 165.1	8.	270.	252.	152.	638.	1.00	1.00	6.79	1242.
ANCMR	(	-- 170	8.	270.	252.	279.	1582.	1.00	1.00	6.79	2873.

108

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 50

 * DISPLACEMENTS AND ROTATIONS *

EXPLANATORY NOTES:

VALUES IN PARENTHESES ARE ACCELERATIONS (IN PER SECOND SQUARED)
 DISPLACEMENTS (INCHES) ROTATIONS (DEGREES) ABOUT

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
ANCHOR	--	5	.000	.000	.000	.000	.000	.000
	STRAIGHT -(		(.0)	(.0)	(.0)			
	>-	5.1	.000	.000	.001	.003	.024	.001
	STRAIGHT -(		(9.3)	(1.1)	(36.1)			
	>-	5.2	.001	.000	.002	.001	.047	.000
	STRAIGHT -(		(15.8)	(2.2)	(60.1)			
	>-	10	.000	.000	.000	.006	.071	.002
	STRAIGHT -(		(.0)	(3.3)	(.0)			
	>-	10.1	.002	.001	.006	.002	.105	.001
	STRAIGHT -(		(30.2)	(4.9)	(137.8)			
	>-	15	.000	.001	.000	.014	.139	.004
	STRAIGHT -(		(.0)	(6.5)	(.0)			
	>-	15.1	.004	.001	.015	.005	.173	.001
	STRAIGHT -(		(81.8)	(8.1)	(214.3)			
	>-	20	.000	.001	.000	.035	.207	.009
	STRAIGHT -(		(.0)	(9.7)	(.0)			
	>-	20.1	.010	.002	.038	.014	.241	.004
	STRAIGHT -(		(110.7)	(11.3)	(466.1)			
	>-	25	.000	.002	.000	.093	.275	.026
	STRAIGHT -(		(.0)	(12.8)	(.0)			
	>-	25.1	.019	.002	.078	.126	.295	.027
	STRAIGHT -(		(140.1)	(13.7)	(896.8)			
	>-	30H	.026	.002	.145	.056	.316	.023
	BEAD -(		(314.1)	(14.6)	(1758.6)			
	>-	30F	.025	.003	.143	.087	.319	.035
	STRAIGHT -(		(325.1)	(21.9)	(1725.7)			
	>-	30F	.025	.006	.123	.079	.322	.045
	STRAIGHT -(		(327.1)	(42.1)	(1491.1)			
	>-	35H	.025	.022	.050	.061	.324	.050
	BEAD -(		(327.0)	(135.7)	(926.3)			
	>-	35H	.024	.024	.049	.059	.323	.044

107

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 51

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
108	BEND - (	35H	.024 (321.7)	.026 (154.3)	.049 (1006.7)	.059	.323	.044
	>-	35F	.021 (310.4)	.027 (160.6)	.048 (989.9)	.060	.322	.037
	STRAIGHT - (	40	.000 (.0)	.027 (161.5)	.000 (.0)	.062	.308	.027
	>-	40.1	.016 (252.8)	.027 (162.4)	.037 (652.1)	.027	.296	.012
	STRAIGHT - (	40.2	.016 (231.6)	.028 (163.3)	.035 (591.9)	.030	.286	.013
	>-	45	.000 (.0)	.028 (160.0)	.000 (.0)	.054	.279	.026
	STRAIGHT - (	45.1	.021 (248.0)	.028 (164.7)	.041 (781.9)	.034	.275	.020
	>-	45.2	.026 (264.8)	.028 (165.3)	.044 (749.3)	.031	.275	.013
	STRAIGHT - (	50	.000 (.0)	.028 (165.8)	.000 (.0)	.073	.278	.051
	>-	50.1	.053 (328.3)	.028 (166.2)	.070 (741.7)	.067	.284	.054
	STRAIGHT - (	50.2	.074 (311.3)	.028 (166.6)	.090 (766.5)	.038	.295	.023
	>-	55	.000 (.0)	.028 (166.8)	.000 (.0)	.179	.309	.154
	STRAIGHT - (	55.1	.184 (315.5)	.028 (166.9)	.205 (493.9)	.297	.324	.272
	>-	60H	.439 (608.6)	.028 (166.9)	.472 (1002.1)	.329	.342	.341
	BEND - (	60M	.464 (630.8)	.033 (163.0)	.485 (1024.4)	.328	.344	.349
	>-	60F	.475 (639.6)	.053 (157.0)	.470 (941.4)	.328	.346	.357
	STRAIGHT - (	60F.1	.475 (649.6)	.266 (326.9)	.264 (492.1)	.327	.354	.376
	>-	65	.475 (639.5)	.484 (638.4)	.055 (12.8)	.329	.353	.359
	STRAIGHT - (	70H	.475 (639.5)	.502 (661.1)	.037 (53.5)	.330	.352	.356
	BEND - (	70H	.464 (633.5)	.518 (692.1)	.011 (15.0)	.331	.352	.349
>-	70F	.439 (616.2)	.505 (677.3)	.000 (.9)	.332	.351	.343	
STRAIGHT - (	70F.1	.487 (335.3)	.254 (355.8)	.000 (.4)	.339	.311	.286	
>-	80H	.000 (.0)	.000 (.0)	.000 (.0)	.332	.165	.235	

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 52

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	>-	80N	.000	.000	.000	.332	.165	.235
	(		(.0)	(.0)	(.0)			
	BEND - (	80M	.011	.031	.004	.329	.131	.230
	(		(25.5)	(43.0)	(10.3)			
	>-	80F	.019	.058	.013	.325	.100	.224
	STRAIGHT - (		(34.7)	(62.4)	(31.8)			
	>-	85	.015	.069	.018	.324	.087	.222
	STRAIGHT - (		(34.7)	(101.7)	(45.1)			
	>-	85.1	.015	.211	.032	.301	.028	.181
	STRAIGHT - (		(35.2)	(387.0)	(125.8)			
	>-	90N	.015	.322	.003	.283	.036	.137
	(		(35.7)	(651.9)	(30.0)			
	BEND - (	90M	.015	.323	.001	.282	.028	.130
	(		(42.4)	(661.6)	(9.5)			
	>-	90F	.017	.306	.000	.280	.023	.125
	STRAIGHT - (		(43.2)	(632.5)	(.4)			
	>-	92	.018	.277	.000	.277	.020	.118
	STRAIGHT - (		(45.6)	(575.4)	(.3)			
	>-	92.1	.017	.124	.000	.244	.021	.082
	STRAIGHT - (		(222.0)	(258.3)	(.2)			
100	>-	95N	.000	.000	.000	.173	.052	.056
	(		(.0)	(.0)	(.0)			
	BEND - (	95M	.002	.007	.000	.164	.058	.055
	(		(36.9)	(16.0)	(7.5)			
	>-	95F	.004	.012	.002	.155	.064	.054
	STRAIGHT - (		(71.6)	(33.8)	(30.7)			
	>-	100N	.018	.034	.016	.099	.080	.038
	(		(289.4)	(147.9)	(257.9)			
	BEND - (	100M	.022	.039	.019	.076	.082	.031
	(		(363.4)	(168.8)	(327.8)			
	>-	100F	.023	.040	.021	.058	.083	.026
	STRAIGHT - (		(386.5)	(173.8)	(353.2)			
	>-	105	.000	.000	.000	.090	.091	.082
	STRAIGHT - (		(.0)	(175.4)	(.0)			
	>-	105.1	.121	.040	.137	.105	.106	.090
	STRAIGHT - (		(2144.5)	(177.3)	(2354.6)			
	>-	105.2	.118	.001	.138	.105	.125	.095
	STRAIGHT - (		(1964.4)	(178.4)	(2234.5)			
	>-	110	.000	.041	.000	.119	.151	.098
	STRAIGHT - (		(.0)	(180.2)	(.0)			
	>-	110.1	.079	.041	.087	.107	.173	.104
	STRAIGHT - (		(1128.6)	(181.0)	(1179.3)			
	>-	110.2	.125	.041	.131	.045	.196	.036
	STRAIGHT - (		(2067.2)	(181.7)	(2167.6)			
	>-	110.3	.060	.041	.084	.108	.219	.103

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 53

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
100	STRAIGHT -	>- 110.3	.080 (1333.7)	.091 (182.1)	.088 (1391.9)	.108	.219	.103
	STRAIGHT -	>- 115	.000 (.0)	.041 (182.4)	.000 (.0)	.092	.242	.085
	STRAIGHT -	>- 115.1	.047 (773.5)	.041 (182.5)	.096 (933.4)	.125	.267	.114
	STRAIGHT -	>- 115.2	.152 (1576.6)	.041 (182.8)	.166 (1716.1)	.040	.292	.034
	STRAIGHT -	>- 115.3	.116 (1105.6)	.041 (182.1)	.124 (1221.3)	.116	.318	.105
	STRAIGHT -	>- 120	.000 (.0)	.041 (181.6)	.000 (.0)	.163	.343	.157
	STRAIGHT -	>- 120.1	.110 (324.7)	.041 (181.1)	.113 (620.1)	.199	.362	.192
	STRAIGHT -	>- 125H	.229 (660.5)	.041 (180.5)	.239 (1123.7)	.200	.380	.186
	BEND -	125H	.242 (709.1)	.042 (170.3)	.245 (1099.2)	.195	.383	.178
	STRAIGHT -	>- 125F	.248 (728.7)	.047 (176.7)	.230 (954.9)	.190	.385	.170
	STRAIGHT -	>- 130H	.248 (728.8)	.082 (377.6)	.169 (1305.1)	.176	.386	.146
	BEND -	130H	.252 (740.6)	.091 (438.7)	.166 (1570.0)	.173	.385	.135
	STRAIGHT -	>- 130F	.261 (765.5)	.095 (461.3)	.171 (1639.9)	.171	.385	.123
	STRAIGHT -	>- 130F.1	.322 (793.4)	.095 (462.3)	.237 (1077.4)	.164	.389	.076
	STRAIGHT -	>- 140H	.337 (646.3)	.095 (462.7)	.313 (627.6)	.141	.415	.089
	BEND -	140H	.328 (105.0)	.092 (448.0)	.311 (623.2)	.134	.419	.092
	STRAIGHT -	>- 140F	.306 (610.7)	.086 (416.8)	.292 (586.9)	.127	.422	.095
	STRAIGHT -	>- 145H	.024 (45.8)	.068 (69.3)	.010 (19.3)	.123	.333	.112
	BEND -	145H	.013 (24.4)	.065 (46.4)	.003 (4.9)	.126	.320	.111
	STRAIGHT -	>- 145F	.000 (.0)	.000 (.0)	.000 (.0)	.131	.307	.110
STRAIGHT -	>- 145F.1	.118 (291.7)	.079 (190.7)	.000 (2.1)	.134	.184	.100	
STRAIGHT -	>- 147	.208 (499.6)	.137 (1606.1)	.000 (8.3)	.065	.068	.092	
STRAIGHT -	>- 150	.183	.119	.001	.092	.105	.090	

GENERAL NOTES FOR THIS LOADING:

- (1) THE SPECIFICATIONS FOR THE SHOCK LOAD INCLUDING SPECTRUM INTERPOLATION RULES APPEAR IN THE EDITED PIPING SYSTEM DESCRIPTION.
- (2) THE GLOBAL COMPONENTS OF THE SHOCK HAVE BEEN ASSUMED TO ACT INDEPENDENTLY
- (3) THE ABSOLUTE VALUE OF THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE HAVE BEEN COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD. MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

FORCES (POUNDS)

MOMENTS (FOOT-POUNDS)

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)				
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT	
ANCHORS:									
5	17.	2486.	1.	2486.	3.	84.	50.	98.	
170	178.	46.	4.	184.	112.	1189.	198.	1211.	
RESTRAINTS:									
10	30.	0.	0.	30.	0.	0.	0.	0.	
10	0.	0.	4.	4.	0.	0.	0.	0.	
15	0.	0.	14.	14.	0.	0.	0.	0.	
15	72.	0.	0.	72.	0.	0.	0.	0.	

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 54

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

FORCES (POUNDS)

MOMENTS (FOOT-POUNDS)

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
20	225.	0.	0.	225.	0.	0.	0.	0.
20	0.	0.	50.	50.	0.	0.	0.	0.
25	894.	0.	0.	894.	0.	0.	0.	0.
25	0.	0.	98.	98.	0.	0.	0.	0.
40	484.	0.	0.	484.	0.	0.	0.	0.
40	0.	0.	97.	97.	0.	0.	0.	0.
45	147.	0.	0.	147.	0.	0.	0.	0.
45	0.	0.	140.	140.	0.	0.	0.	0.
50	0.	0.	348.	348.	0.	0.	0.	0.
50	331.	0.	0.	331.	0.	0.	0.	0.

118

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 57

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. ID.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
55	0.	0.	546.	546.	0.	0.	0.	0.
55	492.	0.	0.	492.	0.	0.	0.	0.
80H	0.	0.	483.	483.	0.	0.	0.	0.
80N	770.	0.	0.	770.	0.	0.	0.	0.
80F	0.	344.	0.	344.	0.	0.	0.	0.
95N	0.	3415.	0.	3415.	0.	0.	0.	0.
95N	950.	0.	0.	950.	0.	0.	0.	0.
114	0.	0.	523.	523.	0.	0.	0.	0.
105	0.	0.	731.	731.	0.	0.	0.	0.
105	735.	0.	0.	735.	0.	0.	0.	0.

DYNAFLEX

LOADING - SHOCK LOADING MD. 3

PAGE 58

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

FORCES (POUNDS)

MOMENTS (FOOT-POUNDS)

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
110	207.	0.	0.	207.	0.	0.	0.	0.
110	0.	0.	215.	215.	0.	0.	0.	0.
115	0.	0.	379.	379.	0.	0.	0.	0.
115	434.	0.	0.	434.	0.	0.	0.	0.
120	471.	0.	0.	471.	0.	0.	0.	0.
120	0.	0.	565.	565.	0.	0.	0.	0.
145F	0.	0.	666.	666.	0.	0.	0.	0.
115 145F	519.	0.	0.	519.	0.	0.	0.	0.
145F	0.	391.	0.	391.	0.	0.	0.	0.
157	308.	0.	0.	308.	0.	0.	0.	0.

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 59

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

FORCES (POUNDS)

MOMENTS (FOOT-POUNDS)

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	Y	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED)								
157	0.	0.	525.	525.	0.	0.	0.	0.
165	0.	387.	0.	387.	0.	0.	0.	0.

DYNAFLEX

LOADING = SHOCK LOADING NO. 3

PAGE 60

* INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *

THE MAXIMUM STRESS OF 6954. OCCURS AT POINT 1004

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE
ANSI B31.1 - 1977
PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (**) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE HEADING BELOW) ARE
AUTOMATICALLY CALCULATED AND APPLIED AT BENDS, ELBOWS, MITERS AND ADMISSIBLE TYPES OF TEES
(AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED
STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS
UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY
REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE
MODULUS IS USED FOR THE BRANCH LEG AT REDUCED
OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK.
THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

LOADING - SHOCK LOADING NO. 3

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)			SIF	SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
		AXIAL	WEAR SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE			
ANCHP	5	2486.	17.	84.	56.	3.	1.00	1.00	6.79	173.
STR - (	5.1	2485.	11.	84.	9.	0.	1.00	1.00	6.79	149.
STR - (	5.2	2485.	11.	84.	44.	3.	1.00	1.00	6.79	167.
STR - (	10	2483.	6.	84.	42.	7.	1.00	1.00	6.79	171.
STR - (	10.1	2473.	19.	84.	94.	9.	1.00	1.00	6.79	224.
STR - (	15	2466.	63.	84.	115.	22.	1.00	1.00	6.79	255.
STR - (	15.1	2466.	63.	84.	200.	32.	1.00	1.00	6.79	387.
STR - (	20	2444.	194.	84.	360.	81.	1.00	1.00	6.79	668.
STR - (	20.1	2444.	194.	84.	584.	116.	1.00	1.00	6.79	1063.
STR - (	25	2419.	783.	84.	1142.	295.	1.00	1.00	6.79	2090.
STR - (	25.1	2419.	783.	84.	1201.	113.	1.00	1.00	6.79	2136.
STR - (	30N	2409.	691.	84.	3267.	61.	1.00	1.00	6.79	5775.
BEND - (	30M	2134.	1260.	26.	3135.	116.	1.00	1.00	6.79	5503.
STR - (	30F	587.	2391.	84.	2379.	108.	1.00	1.00	6.79	4210.
STR - (	35N	550.	2344.	84.	1227.	175.	1.00	1.00	6.79	2195.
BEND - (	35M	2051.	1270.	77.	1910.	197.	1.00	1.00	6.79	3501.
STR - (	35F	2347.	556.	198.	2117.	105.	1.00	1.00	6.79	3761.
STR - (	40	2076.	71.	194.	322.	276.	1.00	1.00	6.79	827.
STR - (	40.1	1902.	72.	194.	274.	110.	1.00	1.00	6.79	628.
STR - (	40.2	1902.	72.	194.	197.	106.	1.00	1.00	6.79	520.
STR - (	45	1728.	91.	194.	271.	270.	1.00	1.00	6.79	761.
STR - (	45.1	1566.	117.	194.	200.	113.	1.00	1.00	6.79	535.

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 62

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PST
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	STR - (	>- 45.1	1366.	117.	198.	200.	113.	1.00	1.00	6.79	535.
	STR - (	>- 45.2	1366.	117.	194.	452.	437.	1.00	1.00	6.79	1164.
	STR - (	>- 50	999.	382.	198.	686.	730.	1.00	1.00	6.79	1804.
	STR - (	>- 50.1	999.	382.	198.	472.	443.	1.00	1.00	6.79	1196.
	STR - (	>- 50.2	814.	334.	198.	1402.	1482.	1.00	1.00	6.79	3621.
	STR - (	>- 55	497.	488.	198.	2179.	2357.	1.00	1.00	6.79	5682.
	STR - (	>- 55.1	497.	488.	198.	1443.	1061.	1.00	1.00	6.79	3184.
	STR - (	>- 60N	406.	340.	198.	1558.	441.	1.00	1.00	6.79	2933.
	HEND - (	60H	330.	282.	345.	1579.	340.	1.00	1.00	6.79	2918.
118	STR - (	>- 60F	142.	411.	433.	1484.	258.	1.00	1.00	6.79	2769.
	STR - (	>- 60F.1	135.	399.	433.	736.	415.	1.00	1.00	6.79	1676.
	STR - (	>- 65	302.	247.	433.	839.	580.	1.00	1.00	6.79	1957.
	STR - (	>- 70N	302.	247.	433.	845.	601.	1.00	1.00	6.79	2012.
	HEND - (	70H	234.	318.	617.	609.	783.	1.00	1.00	6.79	2064.
	STR - (	>- 70F	129.	373.	906.	578.	473.	1.00	1.00	6.79	2074.
	STR - (	>- 70F.1	130.	508.	906.	548.	1473.	1.00	1.00	6.79	3206.
	HEND - (	80H	515.	375.	906.	3219.	928.	1.00	1.00	6.79	6130.
	STR - (	>- 80F	228.	595.	446.	3056.	1171.	1.00	1.00	6.79	5834.
	STR - (	>- 85	323.	549.	854.	872.	2834.	1.00	1.00	6.79	5458.
	STR - (	>- 85.1	323.	549.	854.	857.	2710.	1.00	1.00	6.79	5242.
	STR - (	>- 90N	325.	546.	854.	839.	972.	1.00	1.00	6.79	2724.
	STR - (	>- 90N	327.	553.	854.	755.	854.	1.00	1.00	6.79	2515.

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 63

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELFM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)		SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI	
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE		OUT-OF PLANE	
		>- 90N	327.	553.	854.	755.	854.	1.00	1.00	6.79	2515.
	BEND - (	90M	579.	439.	955.	995.	580.	1.00	1.00	6.79	2643.
		>- 90F	531.	552.	782.	759.	971.	1.00	1.00	6.79	2578.
	STR - (	92	531.	695.	782.	687.	835.	1.00	1.00	6.79	2357.
	STR - (	>- 92.1	531.	791.	782.	1684.	551.	1.00	1.00	6.79	3421.
		>- 95N	654.	2891.	782.	1222.	3608.	1.00	1.00	6.79	6864.
	BEND - (	95M	754.	2869.	1443.	1108.	2943.	1.00	1.00	6.79	6113.
		>- 95F	895.	2852.	2309.	993.	1832.	1.00	1.00	6.79	5495.
	STR - (	>- 100N	805.	2888.	2309.	2469.	274.	1.00	1.00	6.79	5992.
120	BEND - (	100M	2464.	1586.	1537.	3240.	1624.	1.00	1.00	6.79	6958.
		>- 100F	2674.	982.	72.	3050.	2480.	1.00	1.00	6.79	6946.
	STR - (	>- 105	2674.	982.	72.	758.	757.	1.00	1.00	6.79	1897.
	STR - (	>- 105.1	2513.	388.	72.	664.	655.	1.00	1.00	6.79	1652.
	STR - (	>- 105.2	2334.	122.	72.	996.	992.	1.00	1.00	6.79	2487.
	STR - (	>- 110	2162.	243.	72.	417.	442.	1.00	1.00	6.79	1080.
	STR - (	>- 110.1	1858.	167.	72.	815.	814.	1.00	1.00	6.79	2039.
	STR - (	>- 110.2	1858.	167.	72.	1146.	1237.	1.00	1.00	6.79	3006.
	STR - (	>- 110.3	1714.	239.	72.	642.	730.	1.00	1.00	6.79	1723.
	STR - (	>- 115	1820.	306.	72.	875.	768.	1.00	1.00	6.79	2061.
	STR - (	>- 115.1	1820.	306.	72.	727.	812.	1.00	1.00	6.79	1930.
	STR - (	>- 115.2	1266.	172.	72.	797.	853.	1.00	1.00	6.79	2066.
	STR - (	>- 115.3	1113.	261.	72.	464.	455.	1.00	1.00	6.79	1154.

DYNALOX

LOADING - SPOCK LOADING NO. 3

PAGE 60

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	STR - (	>- 115.3	1113.	241.	72.	464.	455.	1.00	1.00	6.79	1154.
	STR - (	>- 120	830.	404.	72.	1132.	1172.	1.00	1.00	6.79	2841.
	STR - (	>- 120.1	830.	406.	72.	612.	435.	1.00	1.00	6.79	1333.
	STR - (	>- 125N	654.	236.	72.	636.	709.	1.00	1.00	6.79	1688.
	HFND - (	125N	464.	530.	558.	617.	535.	1.00	1.00	6.79	1747.
	STR - (	>- 125F	72.	632.	796.	591.	88.	1.00	1.00	6.79	1754.
	STR - (	>- 130N	72.	632.	796.	1154.	318.	1.00	1.00	6.79	2555.
	HEND - (	130N	431.	378.	424.	1330.	776.	1.00	1.00	6.79	2817.
	STR - (	>- 130F	551.	136.	369.	1388.	822.	1.00	1.00	6.79	2924.
121	STR - (	>- 130F.1	437.	214.	369.	888.	508.	1.00	1.00	6.79	1920.
	STR - (	>- 140N	215.	402.	369.	902.	260.	1.00	1.00	6.79	1782.
	HEND - (	140N	419.	185.	317.	985.	289.	1.00	1.00	6.79	1898.
	STR - (	>- 140F	384.	246.	268.	966.	374.	1.00	1.00	6.79	1890.
	STR - (	>- 145N	382.	290.	268.	844.	416.	1.00	1.00	6.79	1737.
	HEND - (	145N	356.	303.	180.	881.	493.	1.00	1.00	6.79	1812.
	STR - (	>- 145F	551.	392.	208.	500.	915.	1.00	1.00	6.79	1878.
	STR - (	>- 145F.1	551.	290.	208.	475.	472.	1.00	1.00	6.79	1238.
	STR - (	>- 147	551.	290.	208.	884.	711.	1.00	1.00	6.79	2037.
	STR - (	>- 150	550.	103.	266.	615.	921.	1.00	1.00	6.79	1990.
	STR - (	>- 155N	547.	401.	208.	927.	186.	1.00	1.00	6.79	1710.
	HEND - (	155N	616.	244.	244.	962.	210.	1.00	1.00	6.79	1791.
	STR - (	>- 155F	327.	594.	264.	237.	816.	1.00	1.00	6.79	1572.

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 65

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	FLEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	STR - (	>- 155F	327.	599.	264.	237.	816.	1.00	1.00	6.79	1972.
	STR - (	>- 157	334.	97.	264.	552.	11.	1.00	1.00	6.79	1081.
	STR - (	>- 157.1	334.	97.	264.	341.	105.	1.00	1.00	6.79	784.
		>- 160H	349.	85.	264.	132.	225.	1.00	1.00	6.79	656.
	BEND - (	160H	249.	258.	176.	83.	272.	1.00	1.00	6.79	591.
	STR - (	>- 160F	4.	359.	198.	40.	224.	1.00	1.00	6.79	533.
	STR - (	>- 165	4.	363.	198.	215.	183.	1.00	1.00	6.79	608.
	STR - (	>- 165.1	4.	184.	198.	64.	484.	1.00	1.00	6.79	931.
ANCHR		-- 170	4.	184.	198.	118.	1189.	1.00	1.00	6.79	2139.

122

LOADING - SPOCK LOADING NO. 3

DYNAFLEX

 * DISPLACEMENTS AND ROTATIONS *
 * *****

EXPLANATORY NOTES:

VALUES IN PARENTHESES ARE ACCELERATIONS (IN PER SECOND SQUARED)
 DISPLACEMENTS (INCHES) ROTATIONS (DEGREES) ABOUT

PRGM DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	X	Y	Z	X AXIS	Y AXIS	Z AXIS
	STRAIGHT - (	5	.000	.000	.000	.000	.000	.000
	>-	5.1	(.0)	(.0)	(.0)	.000	.007	.001
	STRAIGHT - (		(21.9)	(3.0)	(.2)	.000	.015	.000
	>-	5.2	.001	.001	.000	.000	.022	.003
	STRAIGHT - (		(36.2)	(5.9)	(.3)	.000	.032	.001
	>-	10	.000	.001	.000	.001	.043	.008
	STRAIGHT - (		(.0)	(R.4)	(.0)	.001	.053	.004
	>-	10.1	.003	.000	.000	.005	.064	.023
	STRAIGHT - (		(78.9)	(13.1)	(1.1)	.003	.074	.012
	>-	15	.000	.003	.000	.017	.085	.071
	STRAIGHT - (		(.0)	(17.3)	(.0)	.029	.091	.069
	>-	15.1	.009	.003	.002	.030	.098	.061
	STRAIGHT - (		(95.3)	(21.6)	(3.2)	.029	.099	.098
	>-	20	.000	.004	.000	.029	.100	.130
	STRAIGHT - (		(.0)	(25.4)	(.0)	.026	.104	.147
	>-	20.1	.026	.005	.005	.026	.104	.147
	STRAIGHT - (		(178.2)	(30.0)	(10.5)	.017	.106	.128
	>-	25	.000	.005	.000	.017	.106	.128
	STRAIGHT - (		(.0)	(34.1)	(.0)	.029	.100	.130
	>-	25.1	.052	.006	.015	.029	.100	.130
	STRAIGHT - (		(304.6)	(34.4)	(25.4)	.030	.098	.061
	>-	30M	.061	.006	.034	.029	.099	.098
	STRAIGHT - (		(424.2)	(39.1)	(57.4)	.029	.099	.098
	>-	30M	.056	.009	.033	.029	.099	.098
	STRAIGHT - (		(391.4)	(56.5)	(56.2)	.029	.100	.130
	>-	30F	.052	.017	.027	.029	.100	.130
	STRAIGHT - (		(372.7)	(113.0)	(45.1)	.026	.104	.147
	>-	35M	.053	.065	.006	.025	.106	.128
	STRAIGHT - (		(373.0)	(410.4)	(35.0)	.025	.106	.128
	>-	35M	.044	.075	.012	.025	.106	.128

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 67

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	MEMO - (	35H	.048	.075	.012	.025	.106	.124
	(		(347.9)	(403.4)	(45.3)			
	>-	35F	.040	.079	.014	.024	.100	.105
	STRAIGHT - (		(295.7)	(508.1)	(46.4)			
	>-	40	.000	.079	.000	.011	.126	.025
	STRAIGHT - (		(.0)	(510.4)	(.0)			
	>-	40.1	.012	.080	.003	.004	.144	.007
	STRAIGHT - (		(134.1)	(513.5)	(39.6)			
	>-	40.2	.011	.080	.003	.004	.163	.010
	STRAIGHT - (		(120.6)	(515.9)	(40.4)			
	>-	45	.000	.080	.000	.011	.181	.017
	STRAIGHT - (		(.0)	(518.1)	(.0)			
	>-	45.1	.016	.081	.013	.017	.201	.017
	STRAIGHT - (		(135.6)	(520.1)	(51.8)			
	>-	45.2	.022	.081	.020	.004	.221	.008
	STRAIGHT - (		(142.7)	(521.9)	(58.2)			
	>-	50	.000	.081	.000	.049	.241	.048
	STRAIGHT - (		(.0)	(523.4)	(.0)			
	>-	50.1	.054	.081	.056	.061	.262	.057
	STRAIGHT - (		(205.2)	(524.8)	(101.6)			
	>-	50.2	.078	.082	.082	.019	.283	.020
	STRAIGHT - (		(226.2)	(525.8)	(132.0)			
	>-	55	.000	.082	.000	.177	.304	.165
	STRAIGHT - (		(.0)	(526.5)	(.0)			
	>-	55.1	.198	.082	.210	.307	.324	.294
	STRAIGHT - (		(321.3)	(526.9)	(289.2)			
	>-	60H	.475	.082	.490	.349	.344	.373
	(		(569.4)	(527.0)	(625.0)			
	MEMO - (	60F	.503	.083	.506	.350	.346	.383
	(		(538.5)	(520.4)	(639.4)			
	>-	60F	.514	.093	.491	.350	.349	.394
	STRAIGHT - (		(596.1)	(502.7)	(616.4)			
	>-	60F.1	.514	.295	.280	.354	.365	.419
	STRAIGHT - (		(546.2)	(487.7)	(338.6)			
	>-	65	.514	.531	.060	.360	.379	.403
	STRAIGHT - (		(596.1)	(417.4)	(68.7)			
	>-	70H	.514	.552	.040	.361	.380	.400
	(		(596.1)	(454.4)	(45.7)			
	MEMO - (	70F	.543	.570	.012	.362	.342	.392
	(		(543.9)	(490.7)	(13.3)			
	>-	70F	.474	.554	.000	.364	.383	.384
	STRAIGHT - (		(553.2)	(473.5)	(.2)			
	>-	70F.1	.194	.279	.000	.373	.334	.323
	STRAIGHT - (		(244.7)	(451.4)	(.1)			
	>-	80H	.000	.000	.000	.365	.173	.272

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 68

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
125	>= 80H	(.000	.000	.000	.365	.173	.272
	(	(.0)	(.0)	(.0)			
	HEND - (80H	.012	.035	.005	.361	.137	.267
	(((15.3)	(60.4)	(6.1)			
	>= 80F	(.015	.064	.013	.358	.104	.262
	STRAIGHT - ((20.5)	(129.8)	(18.1)			
	>= 85	(.015	.077	.018	.356	.091	.260
	STRAIGHT - ((20.5)	(169.2)	(25.2)			
	>= 85.1	(.015	.245	.033	.341	.029	.219
	STRAIGHT - ((20.5)	(749.3)	(53.9)			
	>= 90H	(.015	.342	.003	.340	.035	.181
	(((20.6)	(1319.2)	(9.7)			
	HEND - (90H	.016	.385	.001	.341	.027	.177
	(((22.7)	(1344.4)	(3.0)			
	>= 90F	(.018	.365	.000	.341	.019	.175
	STRAIGHT - ((28.3)	(1281.4)	(.2)			
	>= 92	(.019	.329	.000	.340	.016	.174
	STRAIGHT - ((36.7)	(1152.5)	(.2)			
	>= 92.1	(.015	.142	.000	.295	.022	.173
	STRAIGHT - ((70.4)	(449.5)	(.1)			
>= 95H	(	.000	.000	.000	.186	.042	.190
(	(	(.0)	(.0)	(.0)			
HEND - (	95H	.002	.007	.000	.175	.047	.192
(	(	(11.9)	(17.0)	(2.4)			
>= 95F	(	.004	.013	.002	.165	.052	.193
STRAIGHT - (		(23.0)	(47.3)	(9.8)			
>= 100H	(	.015	.057	.013	.112	.065	.154
(	(	(48.2)	(311.7)	(82.7)			
HEND - (	100H	.015	.067	.016	.085	.068	.124
(	(	(94.7)	(374.0)	(109.8)			
>= 100F	(	.011	.070	.019	.057	.069	.090
STRAIGHT - (		(48.0)	(393.1)	(127.5)			
>= 105	(	.000	.071	.000	.052	.069	.048
STRAIGHT - (		(.0)	(397.9)	(.0)			
>= 105.1	(	.056	.071	.057	.045	.070	.045
STRAIGHT - (		(475.2)	(402.1)	(434.2)			
>= 105.2	(	.066	.072	.066	.031	.070	.032
STRAIGHT - (		(596.6)	(408.0)	(517.5)			
>= 110	(	.000	.072	.000	.090	.073	.087
STRAIGHT - (		(.0)	(409.5)	(.0)			
>= 110.1	(	.068	.073	.072	.073	.076	.068
STRAIGHT - (		(531.7)	(412.2)	(530.9)			
>= 110.2	(	.096	.073	.105	.011	.079	.013
STRAIGHT - (		(721.4)	(414.6)	(739.4)			
>= 110.3	(	.063	.073	.070	.074	.093	.070

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 69

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		>- 110.3	.063	.073	.070	.074	.083	.070
	STRAIGHT - (		(454.9)	(416.8)	(481.9)			
		>- 115	.000	.073	.000	.085	.088	.074
	STRAIGHT - (		(.0)	(419.4)	(.0)			
		>- 115.1	.052	.074	.049	.049	.092	.045
	STRAIGHT - (		(401.1)	(420.8)	(416.6)			
		>- 115.2	.066	.074	.074	.024	.098	.024
	STRAIGHT - (		(557.9)	(422.5)	(548.7)			
		>- 115.3	.039	.074	.043	.054	.103	.049
	STRAIGHT - (		(339.7)	(424.0)	(320.5)			
		>- 120	.000	.074	.000	.049	.109	.046
	STRAIGHT - (		(.0)	(425.2)	(.0)			
		>- 120.1	.035	.074	.035	.063	.114	.067
	STRAIGHT - (		(247.9)	(426.0)	(224.1)			
		>- 125N	.077	.075	.071	.052	.118	.074
	(		(538.4)	(426.6)	(458.6)			
	BEND - (	125N	.082	.076	.075	.046	.118	.074
	(		(569.3)	(434.4)	(489.1)			
		>- 125F	.044	.080	.079	.042	.118	.072
128	STRAIGHT - (		(581.2)	(459.1)	(528.3)			
		>- 130N	.084	.047	.098	.036	.115	.056
	(		(581.3)	(574.7)	(756.3)			
	BEND - (	130N	.045	.100	.103	.039	.112	.046
	(		(585.4)	(597.8)	(812.8)			
		>- 130F	.087	.101	.104	.044	.109	.037
	STRAIGHT - (		(589.9)	(605.4)	(820.5)			
		>- 130F.1	.073	.101	.075	.078	.090	.070
	STRAIGHT - (		(424.7)	(606.0)	(486.5)			
		>- 140N	.059	.101	.059	.077	.081	.096
	(		(293.3)	(606.2)	(315.9)			
	BEND - (	140N	.060	.098	.059	.072	.081	.096
	(		(310.3)	(591.0)	(312.7)			
		>- 140F	.058	.092	.055	.069	.081	.097
	STRAIGHT - (		(302.1)	(553.4)	(294.0)			
		>- 145N	.005	.006	.002	.065	.069	.099
	(		(23.2)	(43.4)	(9.6)			
	BEND - (	145N	.003	.003	.001	.066	.068	.098
	(		(12.7)	(24.3)	(2.5)			
		>- 145F	.000	.000	.000	.067	.068	.098
	STRAIGHT - (		(.0)	(.0)	(.0)			
		>- 145F.1	.138	.037	.000	.061	.066	.089
	STRAIGHT - (		(226.7)	(399.1)	(.9)			
		>- 147	.070	.063	.000	.027	.045	.082
	STRAIGHT - (		(471.5)	(674.2)	(1.7)			
		>- 150	.078	.053	.000	.042	.032	.075

DYNAFLEX

LOADING - SHOCK LOADING NO. 0

PAGE 71

GENERAL NOTES FOR THIS LOADING:

- (1) THE SPECIFICATIONS FOR THE SHOCK LOAD INCLUDING SPECTRUM INTERPOLATION HULES APPEAR IN THE EDITED PIPING SYSTEM DESCRIPTION.
- (2) THE GLOBAL COMPONENTS OF THE SHOCK HAVE BEEN ASSUMED TO ACT INDEPENDENTLY
- (3) THE ABSOLUTE VALUE OF THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE HAVE BEEN COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD. MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)				
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT	
ANCHORS:									
5	85.	3095.	30.	3096.	89.	323.	245.	415.	
128	170	862.	169.	14.	878.	438.	5702.	885.	5787.
RESTRAINTS:									
10	103.	0.	0.	103.	0.	0.	0.	0.	
10	0.	0.	57.	57.	0.	0.	0.	0.	
15	0.	0.	124.	124.	0.	0.	0.	0.	
15	107.	0.	0.	107.	0.	0.	0.	0.	

DYNAFLEX

LOADING - SHOCK LOADING III, 4

PAGE 72

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
20	307.	0.	0.	307.	0.	0.	0.	0.
20	0.	0.	332.	332.	0.	0.	0.	0.
25	1100.	0.	0.	1100.	0.	0.	0.	0.
25	0.	0.	621.	621.	0.	0.	0.	0.
40	783.	0.	0.	783.	0.	0.	0.	0.
40	0.	0.	394.	394.	0.	0.	0.	0.
45	529.	0.	0.	529.	0.	0.	0.	0.
129 45	0.	0.	492.	492.	0.	0.	0.	0.
50	0.	0.	913.	913.	0.	0.	0.	0.
50	805.	0.	0.	805.	0.	0.	0.	0.

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 73

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
55	0.	0.	1317.	1317.	0.	0.	0.	0.
55	1186.	0.	0.	1186.	0.	0.	0.	0.
80N	0.	0.	1225.	1225.	0.	0.	0.	0.
80N	1801.	0.	0.	1801.	0.	0.	0.	0.
80N	0.	592.	0.	592.	0.	0.	0.	0.
95N	0.	3916.	0.	3916.	0.	0.	0.	0.
95N	1759.	0.	0.	1759.	0.	0.	0.	0.
95N	0.	0.	1571.	1571.	0.	0.	0.	0.
105	0.	0.	2781.	2781.	0.	0.	0.	0.
105	2344.	0.	0.	2344.	0.	0.	0.	0.

130

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 74

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED)								
110	2441.	0.	0.	2441.	0.	0.	0.	0.
110	0.	0.	2487.	2487.	0.	0.	0.	0.
115	0.	0.	1991.	1991.	0.	0.	0.	0.
115	2181.	0.	0.	2181.	0.	0.	0.	0.
120	1474.	0.	0.	1474.	0.	0.	0.	0.
120	0.	0.	1534.	1534.	0.	0.	0.	0.
145F	0.	0.	2450.	2450.	0.	0.	0.	0.
131 145F	1655.	0.	0.	1655.	0.	0.	0.	0.
145F	0.	1427.	0.	1427.	0.	0.	0.	0.
157	1022.	0.	0.	1022.	0.	0.	0.	0.

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 75

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
157	0.	0.	1907.	1907.	0.	0.	0.	0.
165	0.	1430.	0.	1430.	0.	0.	0.	0.

182

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 76

* INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *

THE MAXIMUM STRESS OF 13,377. OCCURS AT POINT R0N

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE
ANSI B31.1 - 1977
PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (**) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE READING BELOW) ARE
AUTOMATICALLY CALCULATED AND APPLIED AT BENDS, ELBOWS, MITERS AND ADMISSIBLE TYPES OF TEES
(AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED
STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS
UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY
REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE
MODULUS IS USED FOR THE BRANCH LEG AT REDUCED
OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK.
THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 77

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELFM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RE-SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
ANCHP	STR - (	5	3095.	90.	323.	245.	49.	1.00	1.00	6.79	733.
	STR - (	>- 5.1	3094.	51.	323.	47.	14.	1.00	1.00	6.79	578.
	STR - (	>- 5.2	3091.	20.	323.	209.	79.	1.00	1.00	6.79	694.
	STR - (	>- 10	3091.	20.	323.	162.	91.	1.00	1.00	6.79	659.
	STR - (	>- 10.1	3087.	120.	323.	421.	176.	1.00	1.00	6.79	988.
	STR - (	>- 15	3070.	167.	323.	169.	195.	1.00	1.00	6.79	731.
	STR - (	>- 15.1	3070.	167.	323.	500.	378.	1.00	1.00	6.79	1246.
	STR - (	>- 20	3044.	395.	323.	482.	520.	1.00	1.00	6.79	1376.
	STR - (	>- 20.1	3027.	197.	323.	833.	964.	1.00	1.00	6.79	2322.
134	STR - (	>- 25	3012.	1092.	323.	1430.	1457.	1.00	1.00	6.79	3652.
	STR - (	>- 25.1	3012.	1092.	323.	1460.	377.	1.00	1.00	6.79	2724.
	STR - (	>- 30N	3000.	892.	323.	3982.	1051.	1.00	1.00	6.79	7297.
	HEND - (	30M	2645.	1574.	621.	3824.	909.	1.00	1.00	6.79	7030.
	STR - (	>- 30F	765.	2988.	1054.	2920.	330.	1.00	1.00	6.79	5514.
	STR - (	>- 35M	767.	2940.	1054.	1948.	418.	1.00	1.00	6.79	3982.
	HEND - (	35M	2595.	1580.	629.	2785.	769.	1.00	1.00	6.79	5310.
	STR - (	>- 35F	2927.	813.	509.	2923.	956.	1.00	1.00	6.79	5507.
	STR - (	>- 40	2621.	277.	509.	710.	742.	1.00	1.00	6.79	2035.
	STR - (	>- 40.1	2425.	224.	509.	866.	885.	1.00	1.00	6.79	2365.
	STR - (	>- 40.2	2425.	224.	509.	583.	780.	1.00	1.00	6.79	1941.
	STR - (	>- 45	2032.	478.	509.	893.	851.	1.00	1.00	6.79	2357.
	STR - (	>- 45.1	2032.	474.	509.	595.	850.	1.00	1.00	6.79	2042.

DYNAFLEX

LOADING - SPOCK LOADING NO. 4

PAGE 78

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELFP TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	STR - (	> 45.1	2042.	274.	509.	595.	850.	1.00	1.00	6.79	2042.
	STR - (	> 45.2	1431.	301.	509.	1178.	1291.	1.00	1.00	6.79	3216.
	STR - (	> 50	1439.	459.	509.	1607.	1807.	1.00	1.00	6.79	4366.
	STR - (	> 50.1	1439.	459.	509.	1322.	1329.	1.00	1.00	6.79	3430.
	STR - (	> 50.2	1249.	754.	509.	3182.	3480.	1.00	1.00	6.79	4374.
	STR - (	> 55	904.	1132.	509.	4898.	5363.	1.00	1.00	6.79	12863.
	STR - (	> 55.1	904.	1132.	509.	3095.	2369.	1.00	1.00	6.79	6943.
	STR - (	> 60N	855.	791.	509.	3348.	1204.	1.00	1.00	6.79	6349.
	BEND - (	60M	719.	620.	881.	3324.	932.	1.00	1.00	6.79	6360.
138	STR - (	> 60F	349.	884.	1161.	3102.	617.	1.00	1.00	6.79	5953.
	STR - (	> 60F.1	349.	880.	1161.	1471.	1227.	1.00	1.00	6.79	3957.
	STR - (	> 65	732.	657.	1161.	1719.	2382.	1.00	1.00	6.79	5580.
	STR - (	> 70N	732.	657.	1161.	1764.	2500.	1.00	1.00	6.79	5787.
	BEND - (	70M	744.	670.	1441.	2601.	1630.	1.00	1.00	6.79	5990.
	STR - (	> 70F	528.	854.	1852.	2524.	1234.	1.00	1.00	6.79	5944.
	STR - (	> 70F.1	528.	1282.	1852.	1186.	3332.	1.00	1.00	6.79	7050.
	BEND - (	80N	1148.	818.	1852.	7180.	1531.	1.00	1.00	6.79	13377.
	BEND - (	80M	514.	1315.	718.	6818.	2216.	1.00	1.00	6.79	12728.
	STR - (	> 80F	720.	1211.	1398.	1801.	6334.	1.00	1.00	6.79	11893.
	STR - (	> 85	720.	1211.	1398.	1781.	6048.	1.00	1.00	6.79	11408.
	STR - (	> 85.1	723.	1204.	1391.	1867.	2142.	1.00	1.00	6.79	5602.
	STR - (	> 90N	728.	1207.	1390.	1656.	1904.	1.00	1.00	6.79	5096.

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 79

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
		AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	>- 90H	728.	1207.	1398.	1656.	1904.	1.00	1.00	6.79	5096.
BEND - (	90H	1291.	727.	1624.	2220.	1324.	1.00	1.00	6.79	5392.
	>- 90F	1185.	942.	1563.	1377.	2167.	1.00	1.00	6.79	5310.
STR - (	92	1186.	1109.	1563.	1390.	1865.	1.00	1.00	6.79	4950.
STR - (	>- 92.1	1186.	1228.	1563.	2778.	1230.	1.00	1.00	6.79	6035.
STR - (	>- 95H	1757.	3617.	1563.	2627.	5352.	1.00	1.00	6.79	10888.
BEND - (	95H	1758.	3597.	3019.	2437.	4405.	1.00	1.00	6.79	10370.
	>- 95F	1545.	3606.	4358.	2202.	2796.	1.00	1.00	6.79	9940.
STR - (	>- 100H	1546.	3999.	4358.	4244.	660.	1.00	1.00	6.79	10809.
BEND - (	100H	3267.	2109.	2938.	5012.	3084.	1.00	1.00	6.79	11541.
	>- 100F	3216.	2065.	350.	3546.	5243.	1.00	1.00	6.79	11199.
STR - (	>- 105	3216.	2065.	350.	3478.	3749.	1.00	1.00	6.79	9055.
STR - (	>- 105.1	3008.	1995.	350.	3238.	3265.	1.00	1.00	6.79	8144.
STR - (	>- 105.2	2784.	330.	350.	3154.	3218.	1.00	1.00	6.79	7984.
STR - (	>- 110	2359.	1725.	350.	4279.	4374.	1.00	1.00	6.79	10827.
STR - (	>- 110.1	2181.	983.	350.	1934.	1848.	1.00	1.00	6.79	4761.
STR - (	>- 110.2	2181.	983.	350.	3407.	3366.	1.00	1.00	6.79	8483.
STR - (	>- 110.3	2005.	836.	350.	1762.	1981.	1.00	1.00	6.79	4673.
STR - (	>- 115	1666.	1404.	350.	4045.	3704.	1.00	1.00	6.79	9709.
STR - (	>- 115.1	1505.	874.	350.	1377.	1592.	1.00	1.00	6.79	3769.
STR - (	>- 115.2	1505.	874.	350.	3040.	2903.	1.00	1.00	6.79	7451.
STR - (	>- 115.3	1358.	595.	350.	2066.	2110.	1.00	1.00	6.79	5253.

138

DYNAFLEX

LOADING = SHOCK LOADING NO. 4

PAGE 80

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	FLEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			STIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS (PSI)
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	STR - (	>- 115.3	1358.	595.	350.	2066.	2110.	1.00	1.00	6.79	5253.
	STR - (	>- 120	1133.	1047.	350.	3229.	3130.	1.00	1.00	6.79	7968.
	STR - (	>- 120.1	1081.	921.	350.	1786.	1463.	1.00	1.00	6.79	4125.
	STR - (	>- 125N	1057.	782.	350.	1691.	1755.	1.00	1.00	6.79	4301.
	BEND - (	125N	783.	1087.	1414.	1671.	1328.	1.00	1.00	6.79	4523.
	STR - (	>- 125F	329.	1202.	1984.	1632.	360.	1.00	1.00	6.79	4583.
	STR - (	>- 130N	329.	1202.	1984.	2140.	1113.	1.00	1.00	6.79	5518.
	BEND - (	130N	746.	810.	1145.	2380.	2079.	1.00	1.00	6.79	5938.
	STR - (	>- 130F	962.	504.	1316.	2496.	2079.	1.00	1.00	6.79	6192.
137	STR - (	>- 130F.1	605.	286.	1316.	2058.	1373.	1.00	1.00	6.79	4945.
	STR - (	>- 140N	519.	983.	1316.	1942.	1037.	1.00	1.00	6.79	4530.
	BEND - (	140N	885.	690.	1015.	2123.	1049.	1.00	1.00	6.79	4552.
	STR - (	>- 140F	775.	797.	1017.	2064.	1191.	1.00	1.00	6.79	4577.
	BEND - (	>- 145N	773.	1048.	1017.	4086.	1606.	1.00	1.00	6.79	7962.
	BEND - (	145N	720.	1037.	654.	4259.	1897.	1.00	1.00	6.79	8317.
	STR - (	>- 145F	2004.	1423.	767.	1910.	4417.	1.00	1.00	6.79	8608.
	STR - (	>- 145F.1	2004.	1423.	767.	1490.	3020.	1.00	1.00	6.79	6102.
	STR - (	>- 147	2003.	1070.	767.	3152.	3066.	1.00	1.00	6.79	7685.
	STR - (	>- 150	2001.	827.	767.	2301.	3251.	1.00	1.00	6.79	7165.
	STR - (	>- 155N	1991.	1070.	767.	3372.	915.	1.00	1.00	6.79	6319.
	BEND - (	155N	2253.	1024.	1206.	3503.	533.	1.00	1.00	6.79	6612.
	STR - (	>- 155F	1196.	2166.	1204.	2974.	593.	1.00	1.00	6.79	5765.

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 81

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	STR	>- 155F	1196.	2166.	1204.	2974.	593.	1.00	1.00	6.79	5765.
	STR	>- 157	1232.	352.	1204.	1502.	30.	1.00	1.00	6.79	3401.
	STR	>- 157.1	1232.	352.	1204.	1359.	390.	1.00	1.00	6.79	3202.
	STR	>- 160H	1299.	385.	1204.	989.	1047.	1.00	1.00	6.79	2949.
	HEAD	160H	921.	920.	641.	306.	1332.	1.00	1.00	6.79	2667.
	STR	>- 160F	14.	1345.	885.	148.	1025.	1.00	1.00	6.79	2406.
	STR	>- 165	14.	1370.	885.	790.	827.	1.00	1.00	6.79	2558.
	STR	>- 165.1	14.	878.	885.	238.	2286.	1.00	1.00	6.79	4351.
ANCHR		-- 170	14.	878.	885.	438.	5702.	1.00	1.00	6.79	10223.

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 82

 * DISPLACEMENTS AND ROTATIONS *

EXPLANATORY NOTES:

VALUES IN PARENTHESES ARE ACCELERATIONS (IN PER SECOND SQUARED)
 DISPLACEMENTS (INCHES) ROTATIONS (DEGREES) ABOUT

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
ANCHOR		5	.000	.000	.000	.000	.000	.000
	STRAIGHT -(		(.0)	(.0)	(.0)			
	>-	5.1	.004	.001	.001	.003	.028	.007
	STRAIGHT -(		(119.8)	(4.1)	(36.1)			
	>-	5.2	.006	.001	.002	.001	.056	.002
	STRAIGHT -(		(197.4)	(8.1)	(60.1)			
	>-	10	.000	.002	.000	.006	.084	.014
	STRAIGHT -(		(.0)	(12.2)	(.0)			
	>-	10.1	.013	.003	.007	.002	.125	.002
	STRAIGHT -(		(424.0)	(18.1)	(137.9)			
	>-	15	.000	.003	.000	.015	.165	.022
	STRAIGHT -(		(.0)	(23.9)	(.0)			
	>-	15.1	.018	.004	.015	.006	.206	.005
	STRAIGHT -(		(439.9)	(29.7)	(214.6)			
	>-	20	.000	.005	.000	.037	.246	.034
	STRAIGHT -(		(.0)	(35.5)	(.0)			
	>-	20.1	.035	.006	.040	.016	.287	.015
	STRAIGHT -(		(813.2)	(41.2)	(467.5)			
	>-	25	.000	.007	.000	.100	.327	.091
	STRAIGHT -(		(.0)	(36.8)	(.0)			
	>-	25.1	.066	.007	.080	.140	.351	.091
	STRAIGHT -(		(623.2)	(50.2)	(400.4)			
	>-	30H	.085	.008	.162	.115	.376	.080
	END -(		(1011.4)	(53.5)	(1767.4)			
	>-	30H	.080	.011	.159	.106	.379	.122
	END -(		(1027.1)	(70.6)	(1734.1)			
	>-	30F	.078	.022	.135	.099	.383	.160
	STRAIGHT -(		(1030.4)	(150.8)	(1497.8)			
	>-	35H	.078	.079	.052	.081	.390	.178
	END -(		(1030.2)	(497.7)	(937.4)			
	>-	35H	.073	.092	.056	.079	.392	.157

139

LOADING - SHOCK LOADING NO. 4

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	BEAD - (	35H	.073	.092	.056	.079	.392	.157
	(		(1010.6)	(566.4)	(1021.7)			
	>-	35F	.064	.096	.056	.078	.393	.131
	(		(950.0)	(592.5)	(1005.3)			
	>-	40	.000	.007	.000	.067	.404	.067
	(		(.0)	(596.0)	(.0)			
	>-	40.1	.035	.097	.039	.028	.420	.021
	(		(625.2)	(594.3)	(667.5)			
	>-	40.2	.030	.098	.037	.032	.441	.031
	(		(512.3)	(602.3)	(607.3)			
	>-	45	.000	.098	.000	.059	.466	.045
	(		(.0)	(605.1)	(.0)			
	>-	45.1	.041	.099	.050	.049	.497	.045
	(		(597.4)	(607.7)	(796.3)			
	>-	45.2	.055	.099	.062	.033	.530	.023
	(		(610.0)	(610.0)	(767.6)			
	>-	50	.000	.099	.000	.126	.546	.117
	(		(.0)	(611.9)	(.0)			
	>-	50.1	.127	.100	.137	.142	.607	.130
	(		(613.2)	(613.6)	(793.2)			
	>-	50.2	.176	.100	.192	.056	.651	.055
	(		(631.3)	(615.0)	(843.1)			
	>-	55	.000	.100	.000	.406	.695	.368
	(		(.0)	(615.9)	(.0)			
	>-	55.1	.438	.100	.477	.692	.738	.650
	(		(695.4)	(616.0)	(868.0)			
	>-	60H	1.052	.100	1.102	.776	.782	.819
	(		(131.4)	(616.6)	(1801.0)			
	BEND - (	60H	1.112	.109	1.136	.776	.787	.840
	(		(1343.2)	(610.9)	(1834.3)			
	>-	60F	1.137	.198	1.101	.776	.793	.860
	(		(1403.6)	(600.1)	(1761.2)			
	>-	60F.1	1.137	.644	.625	.781	.822	.908
	(		(1003.7)	(841.1)	(915.9)			
	>-	65	1.137	1.160	.132	.792	.801	.871
	(		(1403.6)	(1586.2)	(108.8)			
	>-	70H	1.137	1.214	.088	.793	.842	.860
	(		(1403.6)	(1655.6)	(110.8)			
	BEAD - (	70H	1.111	1.252	.026	.796	.844	.848
	(		(1300.1)	(1719.6)	(11.8)			
	>-	70F	1.040	1.214	.000	.799	.805	.832
	(		(1321.0)	(1603.2)	(1.2)			
	>-	70F.1	.062	.614	.000	.819	.701	.698
	(		(855.9)	(801.7)	(.6)			
	>-	80H	.000	.000	.000	.804	.346	.583

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 84

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	>- 80N	(	.000	.000	.000	.805	.386	.583
	(		(.0)	(.0)	(.0)			
	BEND - (80N	(	.026	.076	.010	.797	.307	.571
	(		(44.0)	(113.4)	(17.6)			
	>- 80F	(	.034	.141	.030	.790	.233	.558
	STRAIGHT - (		(59.5)	(228.3)	(53.7)			
	>- 85	(	.034	.169	.041	.786	.203	.553
	STRAIGHT - (		(59.6)	(245.1)	(75.6)			
	>- 85.1	(	.030	.524	.074	.738	.066	.456
	STRAIGHT - (		(60.1)	(1135.8)	(193.2)			
	>- 90N	(	.034	.005	.007	.707	.090	.352
	(		(60.6)	(1931.0)	(43.0)			
	BEND - (90N	(	.036	.009	.002	.705	.060	.337
	(		(70.4)	(1961.3)	(13.6)			
	>- 90F	(	.034	.767	.060	.702	.043	.325
	STRAIGHT - (		(98.0)	(1871.0)	(.6)			
	>- 92	(	.042	.694	.060	.697	.035	.311
	STRAIGHT - (		(122.1)	(1693.1)	(.6)			
	>- 92.1	(	.033	.309	.000	.614	.049	.247
	STRAIGHT - (		(315.6)	(720.9)	(.3)			
141	>- 95N	(	.000	.000	.000	.429	.092	.222
	(		(.0)	(.0)	(.0)			
	BEND - (95N	(	.004	.016	.001	.405	.103	.223
	(		(52.4)	(39.7)	(10.6)			
	>- 95F	(	.008	.029	.003	.383	.113	.223
	STRAIGHT - (		(101.5)	(86.8)	(43.5)			
	>- 100N	(	.032	.095	.028	.249	.143	.173
	(		(424.9)	(441.5)	(385.8)			
	BEND - (100N	(	.038	.110	.034	.191	.148	.140
	(		(513.0)	(519.8)	(464.6)			
	>- 100F	(	.039	.114	.036	.132	.150	.103
	STRAIGHT - (		(545.5)	(543.8)	(499.1)			
	>- 105	(	.000	.115	.000	.139	.157	.139
	STRAIGHT - (		(.0)	(548.6)	(.0)			
	>- 105.1	(	.196	.115	.197	.151	.172	.148
	STRAIGHT - (		(3262.5)	(554.0)	(3345.5)			
	>- 105.2	(	.198	.116	.200	.150	.193	.148
	STRAIGHT - (		(3027.8)	(558.8)	(3154.8)			
	>- 110	(	.000	.117	.000	.184	.225	.187
	STRAIGHT - (		(.0)	(563.0)	(.0)			
	>- 110.1	(	.148	.117	.145	.177	.254	.176
	STRAIGHT - (		(1805.1)	(566.0)	(1685.4)			
	>- 110.2	(	.222	.117	.224	.058	.283	.057
	STRAIGHT - (		(3103.6)	(568.6)	(3103.9)			
	>- 110.3	(	.143	.118	.150	.175	.314	.177

DYNAFLEX

LOADING - SPOCK LOADING NO. 4

PAGE 85

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		>- 110.3	.143 (2055.2)	.118 (570.8)	.150 (2096.0)	.175	.314	.177
	STRAIGHT - (	>- 115	.000 (.0)	.118 (572.7)	.000 (.0)	.173	.346	.156
	STRAIGHT - (	>- 115.1	.142 (1243.9)	.118 (570.2)	.147 (1227.1)	.172	.340	.177
	STRAIGHT - (	>- 115.2	.236 (2405.3)	.118 (575.4)	.235 (2227.9)	.062	.414	.055
	STRAIGHT - (	>- 115.3	.172 (1717.8)	.119 (576.1)	.171 (1628.8)	.164	.448	.167
	STRAIGHT - (	>- 120	.000 (.0)	.119 (576.4)	.000 (.0)	.222	.443	.215
	STRAIGHT - (	>- 120.1	.144 (596.3)	.119 (576.4)	.150 (874.1)	.258	.509	.248
		>- 125H	.235 (1113.5)	.119 (576.1)	.308 (1549.9)	.249	.534	.245
	BEND - (	125H	.311 (1177.0)	.120 (570.1)	.317 (1517.7)	.242	.537	.238
		>- 125F	.314 (1202.0)	.125 (580.2)	.304 (1392.6)	.236	.539	.231
	STRAIGHT - (	>- 130H	.318 (1202.1)	.161 (831.7)	.273 (2180.6)	.223	.537	.200
	BEND - (	130H	.323 (1215.8)	.170 (920.8)	.280 (2501.6)	.226	.534	.184
		>- 130F	.333 (1246.2)	.174 (960.1)	.280 (2576.9)	.230	.530	.168
	STRAIGHT - (	>- 130F.1	.395 (1276.7)	.174 (962.0)	.299 (1463.6)	.269	.514	.152
	STRAIGHT - (	>- 140H	.412 (1218.2)	.174 (963.0)	.385 (1208.6)	.247	.526	.197
	BEND - (	140H	.403 (1233.2)	.170 (935.0)	.383 (1219.4)	.234	.529	.201
		>- 140F	.376 (1165.7)	.159 (872.6)	.360 (1145.2)	.222	.532	.206
	STRAIGHT - (	>- 145H	.029 (66.3)	.013 (119.0)	.012 (27.7)	.211	.408	.235
	BEND - (	145H	.015 (35.9)	.008 (78.5)	.003 (7.2)	.216	.390	.234
		>- 145F	.000 (.0)	.000 (.0)	.000 (.0)	.222	.375	.233
	STRAIGHT - (	>- 145F.1	.174 (701.2)	.150 (1437.1)	.000 (.3)	.217	.264	.228
	STRAIGHT - (	>- 147	.292 (1572.4)	.224 (2821.2)	.001 (6.6)	.101	.155	.234
	STRAIGHT - (	>- 150	.298 (.0)	.192 (.0)	.001 (.0)	.150	.146	.272

142

DYNAFLEX

STEARNS - ROGER CMP

PAGE 07

PROJECT
JOB
RUN NO.

10MW SOLAR PILOT PLANT - C-21700
RECEIVER FEEDWATER (X-FW-01-C-4)
7

DATE 3/20/80

* STRESS SUMMARY *

EXPLANATORY NOTES:

- (1) EQUATION NUMBERS REFER TO ARTICLE 104.8 OF THE ANSI B31.1-1977 PIPING CODE.
- (7) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE MODULUS IS USED FOR THE BRANCH LEG AT REDUCED OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK. THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.
- (9) THE CILD MODULUS WAS USED IN ANALYZING THE OCCASIONAL LOADS.

DYNAFLEX

STRESS SUMMARY (CONTINUED)

PAGE 04

STRESSES ARE IN PSI

EQ (12) EQ (12) EQ (12) EQ (12)

SHOCK 1 SHOCK 2 SHOCK 3 SHOCK 4

LOG NO.

LOG NO.	SHOCK 1	SHOCK 2	SHOCK 3	SHOCK 4
5	502	506	173	733
5.1	284	480	149	578
5.2	451	501	167	694
10	384	507	171	659
10.1	770	577	224	988
15	347	591	255	751
15.1	844	830	387	1246
20	642	1016	668	1376
20.1	1073	1765	1063	2322
25	1673	2485	2090	3652
25.1	1354	1013	2136	2724
30N	3520	2740	5775	7297
30W	3394	2679	5543	7030
30F	2651	2379	4210	5514
35N	2525	2159	2195	3942
35W	3217	2365	3501	5310
35F	3206	2320	3761	5507
40	1522	1069	827	2035
40.1	1515	1705	628	2365
40.2	1083	1521	528	1941
45	1786	1336	761	2357

DYNAFLEX

STRESS SUMMARY (CONTINUED)

LOG NO.	STRESSES ARE IN PSI			
	EQ (12)	EQ (12)	EQ (12)	EQ (12)
	SHOCK 1	SHOCK 2	SHOCK 3	SHOCK 4
45.1	1102	1634	535	2042
45.2	2306	1917	1164	3216
50	3344	2150	1804	4366
50.1	2536	1975	1196	3430
50.2	6551	3766	3621	8379
55	10108	5568	5682	12863
55.1	5008	2972	3184	6943
60N	4974	2637	2933	6349
60N	4943	2595	2919	6300
60E	4669	2443	2769	5953
60E.1	3066	1857	1676	3957
65	4171	3147	1957	5580
70N	4317	3287	2012	5787
70N	4459	3426	2064	5990
70E	4432	3375	2074	5944
70E.1	5509	3011	3206	7050
80N	10454	5662	6130	13377
80N	9947	5387	5834	12728
80E	9291	5032	5458	11843
85	4910	4824	5242	11408
85.1	4353	2337	2724	5642

DYNAFLEX

STRESS SUMMARY (CONTINUED)

PAGE 90

STRESSES ARE IN PSI

EQ (12) EQ (12) EQ (12) EQ (12)

SHOCK 1 SHOCK 2 SHOCK 3 SHOCK 4

LOC. NO.

LOC. NO.	EQ (12) SHOCK 1	EQ (12) SHOCK 2	EQ (12) SHOCK 3	EQ (12) SHOCK 4
90N	3911	2086	2515	5096
90M	4147	2212	2643	5392
90F	4101	2175	2578	5310
92	3955	2023	2357	4950
92.1	4330	2430	3421	6035
95N	7345	4173	6369	10888
95M	7319	4073	6113	10370
95F	7267	3976	5495	9940
100N	7974	4161	5992	10809
100M	8228	4279	6954	11591
100F	7790	4061	6946	11199
105	6404	6114	1897	9055
105.1	5792	5482	1552	8144
105.2	5494	5232	2487	7980
110	7875	7350	1080	10827
110.1	3077	3006	2034	4761
110.2	5924	5274	3006	8443
110.3	3208	2439	1723	4673
115	6642	6775	2061	9709
115.1	2529	2022	1930	3769
115.2	5021	5102	2066	7451

DYNAFLEX

STRESS SUMMARY (CONTINUED)

PAGE 91

STRESSES ARE IN PSI

EQ (12) EQ (12) EQ (12) EQ (12)

SHOCK 1 SHOCK 2 SHOCK 3 SHOCK 4

LOG NO.

115 ³	3499	3744	1154	5253
120	479A	5672	2841	7968
120 ¹	3037	2453	1333	4125
125H	3326	2142	1688	4301
125H	3444	2354	1747	4523
125F	3440	2465	1759	4583
130N	3807	3071	2555	5514
130H	4043	3314	2817	5934
130F	4185	3504	2924	6192
130F.1	3084	3355	1920	4945
140N	3028	2860	1782	4530
140H	3116	2721	1898	4552
140F	3098	2790	1890	4577
145H	6199	4625	1737	7962
145H	6482	4886	1812	8317
145F	6708	5057	1878	8608
145F.1	3883	4541	1234	6102
147	5495	5275	2037	7845
150	5795	3714	1990	7165
155H	4741	3812	1710	6310
155H	4957	3992	1791	6612

DYNAFLEX

STRESS SUMMARY (CONTINUED)

PAGE 92

STRESSES ARE IN PSI

EQ (12) EQ (12) EQ (12) EQ (12)

SHOCK 1 SHOCK 2 SHOCK 3 SHOCK 4

LOC.
NO.

155E 4344 3408 1572 5765

157 2844 1520 1081 3401

157.1 2896 1329 784 3282

160M 2606 1213 656 2949

160M 2363 1087 591 2667

160F 2133 974 533 2406

165 2149 1247 608 2558

165.1 4064 1242 931 4751

170 9575 2877 2139 10223

18

RUN NO. 7

DYNALIFE

TABLE OF CONTENTS

INPUT DATA - (CARD IMAGES) 1

EDITED PIPING SYSTEM DESCRIPTION 4

LUMPED DYNAMIC MODEL 17

FREQUENCIES, PERIODS OF VIBRATION AND MASS PARTICIPATION FACTORS 21

LOADING - SHOCK LOADING NO. 1 23

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS 28

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS 34

DISPLACEMENTS AND ROTATIONS 34

LOADING - SHOCK LOADING NO. 2 39

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS 44

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS 50

DISPLACEMENTS AND ROTATIONS 50

LOADING - SHOCK LOADING NO. 3 55

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS 60

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS 66

DISPLACEMENTS AND ROTATIONS 66

LOADING - SHOCK LOADING NO. 4 71

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS 76

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS 82

DISPLACEMENTS AND ROTATIONS 82

STRESS SUMMARY 87

Stearns-Roger

PIPE STRESS ANALYSIS REPORT

FOR

10MWe SOLAR PILOT PLANT

C-21700

RECEIVER FEEDWATER TO HEATERS & R INTERFACE 2I

PIPING SYSTEM

4" - FW-2-MBA & 2½" - FW-9-MBA

151

CONDITIONS ANALYZED / ANAL. I.D. NO.

THERMAL T-21700-FW-2-A-4
DEAD WEIGHT W-21700-FW-2-A-3
PRESSURE P-21700-FW-2-A-0
SEISMIC X-21700-FW-2-A-2

CODE REFERENCE: **ANSI B31.1-1973**
W/ APPENDA B.
(SUMMER 1979)

ANALYST G.H. MAY

DATE 7-25-80

DIVISION USAGE					
MM	P	PP	SH	FI	SP

Stearns-Roger
INCORPORATED
ENGINEERING STANDARD

STANDARD NUMBER

EE16.01.2

PAGE 1 OF 1

ISSUED 8-31-73
REVISED 4-15-74

APPROVALS
Des. Sect. _____
Sect. Superv. _____
Div. _____

PIPING ANALYSIS RESULTS

Date MARCH 23, 1980

TO: T.E. OLSON

FROM: G.H. MAY, Piping Engineering Group

Client DEPT. OF ENERGY Project SOLAR I Job No. C-21700

Pipe Line Analyzed RECEIVER FEEDWATER 1 4" FW-2-MBA, 2 1/2" FW-9-MBA

Reference Dwg. PB-4 A

This piping has been analyzed for the THERMAL, DEAD WEIGHT, PRESSURE & DESIGN BASIS EARTHQUAKE loading condition and is found to be:

- Satisfactory, as is.
- Satisfactory, with comments noted.
- Unsatisfactory - See Comments.

COMMENT (1) ALL PIPE STRESSES ARE SATISFACTORY.

(2) ALL RESTRAINT FORCES AND MOMENTS ARE REASONABLE.

(3) FOUR PAIRS OF SNAGGERS ARE REQUIRED.

RECOMMENDATION (1) USE THE REFERENCED ROUTING.

(2) REVISE THE ISOMETRIC AS SHOWN.

(3) FORCES AND MOMENTS MAY BE SENT TO SCE AS PRELIMINARY.

ATTACHS: PIPE STRESS SUMMARY REPORT (2), SUMMARY OF FORCES & MOMENTS (2)

G.H. MAY
Signature

Copies to: Sender
Analysis Folder - Job File
Piping Engrg. Supervisor TCT
K.E. NOBLE W/ ISOMETRIC

Stearns-Roger <small>INCORPORATED</small> ENGINEERING STANDARD						STANDARD NUMBER EE16.01.8
PIPE STRESS SUMMARY REPORT						PAGE <u>1</u> OF <u>1</u>
ANSI B31.1 - 1973 EDITION						ISSUED 5/27/75 REVISED

10 MWE SOLAR PILOT PLANT
Job Name

RECEIVER FEEDWATER (HEATER TO PIPE RACK ANCHOR)
System/Pipe Line Name

C-21700
Job No.

FW-02
Analysis No.

1. Loading Conditions Analyzed

Pressure <u>X</u>	<u>P-FW-02-A-0</u>
Weight <u>X</u>	<u>W-FW-02-A-3</u>
Thermal Expansion <u>X</u>	<u>T-FW-02-A-4</u>
Sustained Mech. Loads _____	
Occasional Loads <u>X</u>	<u>X-FW-02-A-1</u>
	<u>DESIGN BASIS EARTHQUAKE</u>

2. Stress Evaluation (Code Equations)

Eq. (11) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{z} \leq 1.0 S_h$ 4027 psi \leq 15000 psi

Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 400

Eq. (12) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{z} + \frac{0.75 iM_C}{z} \leq K S_h$ 15915 psi \leq 18000 psi

Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 400

Eq. (13) $S_E = \frac{iM_C}{z} \leq S_A$ 5992 psi \leq 22500 psi

Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 900

Eq. (14) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{z} + \frac{iM_C}{z} \leq (S_h + S_A)$ 10019 psi \leq 37500 psi

Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 900

3. Stress Evaluation (Local or Special)

<u>Loading</u>	<u>Analysis Ident. Code</u>	<u>Calculated Stress (psi)</u>	<u>Allowable Stress (psi)</u>
_____	_____	_____	_____
_____	_____	_____	_____

REMARKS:

(1) ALL PIPE STRESSES ARE LESS THAN THE ALLOWABLES.

J.H. Gray
Prepared By 2-13-80
Date

J.H.M.
Approved By 2-13-80
Date

DIVISION USAGE						Stearns-Roger INCORPORATED ENGINEERING STANDARD	STANDARD NUMBER
MM	P	PP	SH	FI	SP		EE16.01.8
APPROVALS						PIPE STRESS SUMMARY REPORT ANSI B31.1 - 1973 EDITION	PAGE <u>1</u> OF <u>1</u>
Des. Sect. <u>NY 2nd</u>							ISSUED 5/27/75 REVISED
Sect. Superv. <u>[Signature]</u>							
Div. _____							

10MW SOLAR PILOT PLANT - DOE Job Name C-21700
RECEIVER FEEDWATER (RECEIVER TO PIPE RACK ANCHOR) Job No. FW-01
 System/Pipe Line Name 4" FW-2-MBA Analysis No. _____

1. Loading Conditions Analyzed
- | | | |
|-----------------------|----------|--------------------|
| Pressure | <u>X</u> | <u>P-FW-01-A-0</u> |
| Weight | <u>X</u> | <u>W-FW-01-A-2</u> |
| Thermal Expansion | <u>X</u> | <u>T-FW-01-A-2</u> |
| Sustained Mech. Loads | _____ | |
| Occasional Loads | <u>X</u> | <u>X-FW-01-A-6</u> |
- Analysis Ident. Code
DESIGN BASIS EARTHQUAKE

2. Stress Evaluation (Code Equations)
- Eq. (11) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{z} \leq 1.0 S_h$ 3887 psi \leq 15000 psi
 Material: - ASTM A106 GR.B Press = 2386 psi \Rightarrow SLP = 2298 psi
 Temp = 440°F @ Pt. 150
- Eq. (12) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{z} + \frac{0.75 iM_B}{z} \leq K S_h$ 17303 psi \leq 26400 psi
 Material: - ASTM A 106 GR.B Temp = 440°F @ Pt. 80N
 (0.95y)
- Eq. (13) $S_E = \frac{iM_C}{z} \leq S_A$ 8308 psi \leq 22900 psi
 Material: - ASTM A 106 GR.B Temp = 440°F @ Pt. 140M
- Eq. (14) $\frac{Pd^2}{Do^2-d^2} + \frac{0.75 iM_A}{z} + \frac{iM_C}{z} \leq (S_h + S_A)$ 11522 psi \leq 37500 psi
 Material: - ASTM A106 GR.B Temp = 440°F @ Pt. 140M

3. Stress Evaluation (Local or Special)

Loading	Analysis Ident. Code	Calculated Stress (psi)	Allowable Stress (psi)
_____	_____	_____	_____
_____	_____	_____	_____

REMARKS:

1) ALL PIPE STRESSES ARE LESS THAN THE ALLOWABLES.

2) EARTHQUAKE IS RMS SUMMATION OF X, Y & Z SHOCK LOADINGS.

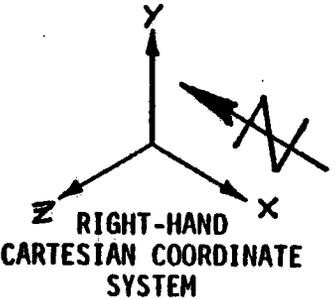
J. H. [Signature] 3-23-80
 Prepared by Date
[Signature] 3-23-80
 Approved By Date

**SUMMARY OF FORCES & MOMENTS
ON SYSTEM TERMINAL EQUIPMENT
(SYSTEM)**

RECEIVER FEEDWATER HEATER TO PIPERACK ANCHOR
4"-FW-2-MBA / 2 1/2"-FW-9-MBA

CUSTOMER: DOE
PROJECT: 10MW SOLAR PILOT PLANT
JOB NO: C-21700
BY: GAM DATE: FEB. 14, 1980
REF. DWGS: P13-4 A
ANALYSIS CODE: T/W-FW-02-A-4/3
X-FW-02-A-1

THE REPORTED REACTIONS BASED ON A THERMAL EXPANSION ANALYSIS FROM ...70.°F TO 110.°F USING E_c THE COLD MOD. OF ELASTICITY, AND% COLD SPRING.



DIVISION USAGE				
MM	P	SH	FI	SP
X				

APPROVALS
Des. Sec'y: [Signature]
Spec. Sec'y: [Signature]
Div. Mgr.: [Signature]

Stearns-Roger
INCORPORATED
ENGINEERING STANDARD

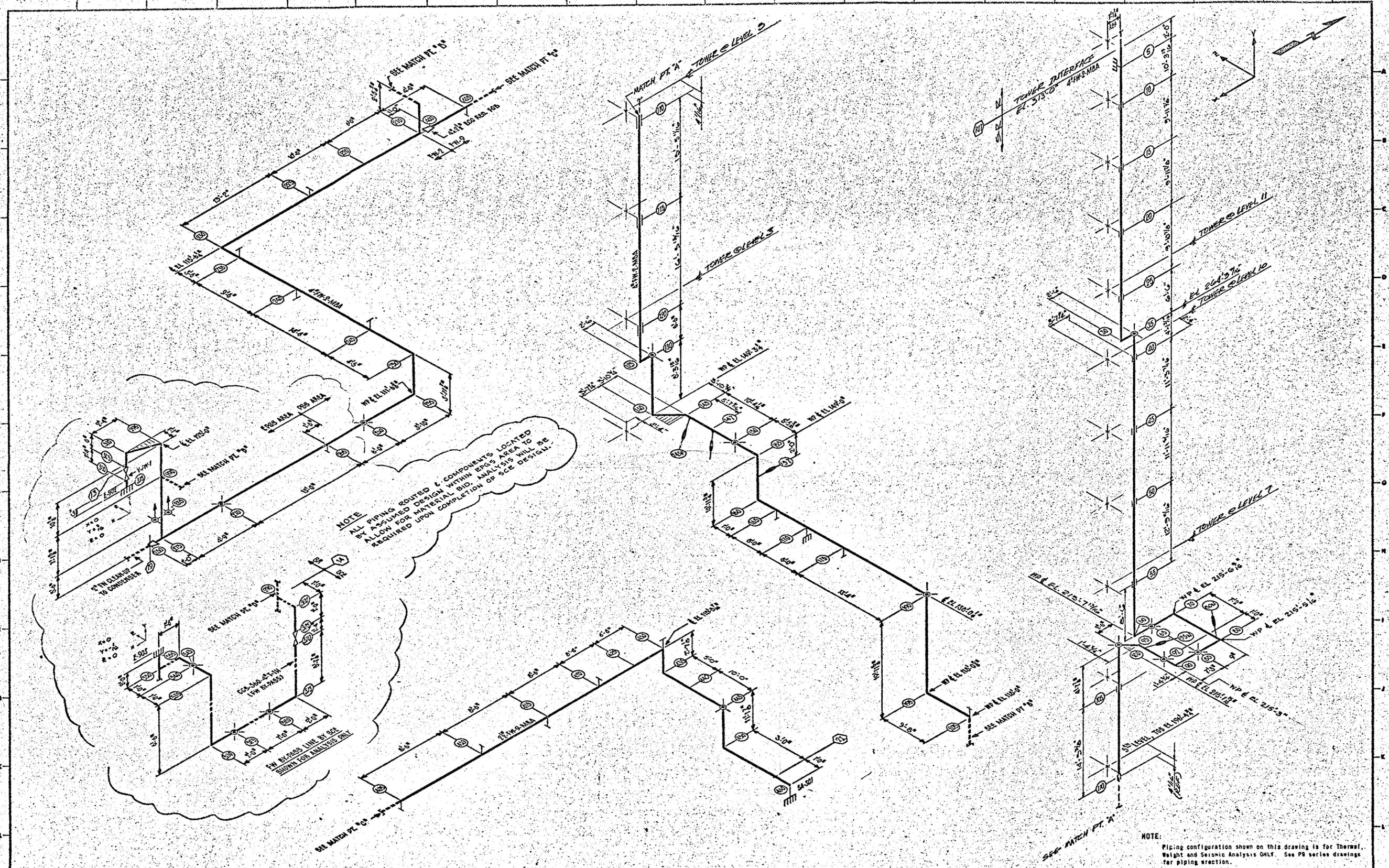
SUMMARY OF FORCES & MOMENTS
PER. ANSI B31.1-1973 PWR. PIPING CODE

STANDARD NUMBER
EE 16.01.7

PAGE 1 OF 1
ISSUED 2/28/74
REVISED 4/18/78

EQUIPMENT CONNECTIONS	LOC. NO.	FORCES (LBS)				MOMENTS (FT.-LBS)				
		X	Y	Z	RESULTANT	X	Y	Z	RESULTANT	
HEATER OUTLET E-902	THERMAL	315	-150	-76	-71	182	436	-376	-529	782
	WEIGHT	315	-21	-292	-7	292	-185	32	-14	193
	SEISMIC	315	443	265	332	614	2442	1977	1277	3183
	TOTAL	315	614	633	410	973	2393	2321	1850	3813
HEATER INLET E-903	THERMAL	553	221	101	6	243	221	-382	461	638
	WEIGHT	553	22	9	5	25	-71	-3	-51	88
	SEISMIC	553	316	141	140	373	1273	667	1237	1896
	TOTAL	553	559	251	151	631	1423	1052	1647	2417
1'D EAST OF INTERFACE 2 I ON SKID SA301	THERMAL	460	-43	-14	-18	49	9	-389	371	538
	WEIGHT	460	-3	5	-1	6	-27	-30	-7	41
	SEISMIC	460	159	102	233	300	1052	808	1138	1747
	TOTAL	460	205	111	252	343	1079	1227	1502	2219

156



BRANCH CONNECTION SYMBOLS	PIPE SUPPORT SYMBOLS	ANCHOR OR RESTRAINT NO.	DISPLACEMENT (COLD TO HOT) IN.			ANCHOR &/OR TERM. POINTS	COORDINATE		
			X	Y	Z		X	Y	Z
UNREINFORCED PIPE—PIPE INTERSECTION	CONSTANT SUPPORT	5	0.0	0.0	0.0	5 } FW-01	0'-0"	0'-0"	0'-0"
REINFORCED PIPE—PIPE INTERSECTION	VARIABLE SPRING SUPPORT	170	↓	↓	↓	170 }	-6'-4 3/4"	-172'-2 5/8"	-28'-8"
ASA TEE	RIGID ROD OR STRUT	315	↓	0.18					
WELDOLET	HYDRAULIC SNUBBER	460	↓	0.0		170 }	0'-0"	0'-0"	0'-0"
SWEEPOLET	RIGID GUIDE	555	↓	-0.065	↓	315 } FW-02	59'-1"	-15'-3 1/2"	-61'-8"
	ANCHOR					460 }	-44'-6"	-36'-2 7/8"	-49'-0"
						555 }	69'-3"	-13'-3 1/2"	-61'-9"

MODELING SYMBOLS	PIPING SYMBOLS
POINT OF INTEREST	ELBOW
DATA POINT NO.	BEND
MASS POINT OR CENTER OF GRAVITY	VALVES (ASSUMED RIGID)
INTERFACE POINT	REDUCER OR INCREASER
	EQUIPMENT NOZZLE

ANALYZED CONDITIONS			VALVES & SPECIAL COMPONENTS			
OPERATING TEMP (°F)	DESIGN PRESSURE (PSIG)	CASE	VALVE OR SPEC. COMP. NO.	WGT. (LBS.)	STATUS EST. OR FINAL	REFERENCE & COMMENTS
440°	2310		V-FW-1	250 #	EST	WALWORTH 5262PS +25#
			V-FW-2	250 #	EST	" " "

NOTES:

- 1) DIMENSIONS ARE IN FEET AND INCHES UNLESS NOTED OTHERWISE.
- 2) ALL ELBOWS ARE ASA LONG RADIUS UNLESS NOTED OTHERWISE.
- 3) PIPE ANALYZED FROM COLD TO HOT.
- 4) THERMAL ANALYSIS TEMPERATURE RANGE IS FROM 70° F. TO OPERATING TEMPERATURE UNLESS NOTED OTHERWISE.
- 5) SCALE: NONE
- 6) THIS DATA AND ATTACHED DRAWINGS USED FOR ANALYSIS PURPOSES ONLY.

DATA POINTS		PIPE MATERIAL	LINE SPEC.	PIPE SIZE (IN.)		WEIGHT LBS./LINEAR FT.			INS. THK.
FROM	TO			O.D.	W.T.	PIPE	FLUID	INSULATION	
5	315/400/555	A106 Gr. B	MBA	4.50	.674	27.5	3.38	705	2 1/2"
400	460	↓	MBA	2.875	.522	13.1	1.14	3.69	2"

NO.	REFERENCES	NO.	ANALYSIS CODES	NO.	REVISIONS	DATE	BY	CH'D	APP'D
	P13-4 A		T/W-FW-01-A-2,2	△					
			T/W/X-FW-02-A-4,3/1	△					

PIPING ANALYSIS DATA (P13-4)

Stearns-Roger
INCORPORATED

10MW SOLAR PILOT PLANT DAGGETT, CALIF.
R.S. FEEDWATER
FOR ISOMETRIC P13-4

DRAWN: KEN	DATE: 11-21-79	ANAL. BY GHM	DATE: 11/28/79
CHECKED: KED	DATE: 2-25-80	APP'D. BY	DATE: 2-26-80
JOB NO. C-21700	SYSTEM NO. FW-01, 02	SHEET 1 OF 1	


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FOREWORD

THE FOLLOWING REPORT WAS GENERATED BY THE DYNAFLEX PIPING ANALYSIS PROGRAM. THE PROGRAM ACCOMMODATES THE WIDEST RANGE OF PRACTICAL SITUATIONS ENCOUNTERED IN MODERN PIPING SYSTEMS INCLUDING DYNAMIC AS WELL AS THERMAL, WEIGHT AND PRESSURE EFFECTS.

FOR FURTHER INFORMATION OR PROMPT ASSISTANCE IN USING THE DYNAFLEX PROGRAM, PLEASE CONTACT YOUR LOCAL COMPUTER CENTER REPRESENTATIVE OR:

ENGINEERING SERVICES MANAGER
 AUTON COMPUTING CORPORATION
 1 METRO PLAZA
 505 THORNALL STREET
 EDISON, N.J. 08817

THE STRESS FORMULATION OF
 ANSI B31.1 - 1977
 INCLUDING THE LATEST MANDATORY UPDATES
 HAS BEEN APPLIED IN THIS ANALYSIS

THE TABLE OF CONTENTS APPEARS AT THE END OF THIS REPORT.

 STEARNS - ROGER CORP

100W SOLAR PILOT PLANT - DOE - C-21700
 RECVR FW-HINS TO TOWER(T/W-FW-02-A-4/3)

2/12/80

 DYNAFLEX (H00204F-UCC)

LAST UPDATE -- 12/25/79

PROJECT - 1014 SULAR PILOT PLANT - UOE - C-21700
 JOB - RECVR FRONT TO TOWER (T/W-PH-02-R-473)

DATE 2712700

INPUT DATA - (CARU IMAGES)

LINE NUMBER	TYPIC	FRONT	DELTA X	DELTA Y	DELTA Z	RADIUS	ADDITIONAL DATA	LINE NUMBER
1	37	110	13	125	137	149	160	1
2	GEN						STEARS - ROGER COMP, 2712700, MOUNT COM	2
3							SLAR PILOT PLANT - UOE, C-21700, JUURECYR F	3
4							APPLY U31.1-1973, EXA	4
5							MATECO, UNIT 7.95	5
6							STEP 400	6
7								7
8								8
9								9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24
25								25
26								26
27								27
28								28
29								29
30								30
31								31

INPUT DATA (CARD IMAGES)

LINE NUMBER	SYMBOL	DELTA X	DELTA Y	DELTA Z	RADIUS	ADDITIONAL DATA	LINE NUMBER
32		1520320					32
33		1525370					33
34		1530320					34
35		15358	6=6				35
36		15403	11=0				36
37		15453	11=0				37
38		155031=6					38
39		15553	12=0				39
40		1210:000:1=0				51F=2.0	40
41		14051-3=0				100=2.875, A1=.522,	41
42						UNIT=3.69	42
43		1410:0=6					43
44		1415:0=6					44
45		1420:0=6					45
46		1425:0=6					46
47		1430:0=6					47
48		1435:0	12=7+776				48
49		1440:0					49
50		1450:0	11-1-7/H				50
51		1460:0					51
52		1465:0					52
53		1470:0	18				53
54		1475:0					54
55		1480:0	1.065				55
56		1485:0	PI610				56
57		1490:0	PI610				57
58		1495:0	PI610				58
59		1500:0	PI610				59
60		1505:0	PI610				60
61		1510:0	PI610				61
62		1515:0	PI610				62
63		1520:0	PI610				63
64		1525:0	PI610				64
65		1530:0	PI610				65
66		1535:0	PI610				66
67		1540:0	PI610				67
68		1545:0	PI610				68
69						LOG(190F7270:285:5207)	69
						1525:540,445F)	
						105E-TABLE 1	

DYNAMICS

INPUT DATA (CARD IMAGES)

LINE NUMBER	TYPE	LOC	FORM	DELTA X	DELTA Y	DELTA Z	RADIUS	ADDITIONAL DATA	LINE NUMBER
14	17	10	113			137	149		100
70	1000	1315		159=1	113=3=172	1461=6			70
71	1000	1460		144=6	136=2=378	150=0			71
72	1000	1555		169=3	113=3=172	1461=9			72

DYNALLEX

STEARNS - ROGER CORP

PAGE 4

PROJECT - 10MW SOLAR PILOT PLANT - DOE - C-21700
 JOB - RECVR FW-HTNS TO TOWER (T/W*FW=02-A-473)

DATE 2/12/80

 * EDITED PIPING SYSTEM DESCRIPTION *

EXPLANATORY NOTES

IN THE EDITED PIPING SYSTEM DESCRIPTIONS:

- (1) POINT LOCATION NUMBER SUFFIXES N, M AND F IDENTIFY THE NEAR POINT, THE MID POINT AND THE FAR POINT RESPECTIVELY OF A PIPING ELEMENT IN THE DIRECTION IN WHICH THE LINE IS TRAVERSED. FRACTIONAL NODE NUMBERS APPEARING IN THE FOLLOWING REPORTS IDENTIFY THOSE NODES AT WHICH THE PROGRAM HAS INTRODUCED EVENLY SPACED LUMP POINTS AND ARE DETERMINED FROM THE MAXIMUM LUMP SPACING CRITERIA ENTERED BY THE USER. IF FRACTIONAL NODE NUMBERS ARE ASSIGNED TO MORE THAN ONE ELEMENT ORIGINATING AT THE SAME BRANCH POINT, A LETTER WILL PRECEDE THE FRACTIONAL PORTION OF THE NUMBER TO UNIQUELY IDENTIFY EACH POINT (E.G. 2.A1). LETTERS ARE ASSIGNED TO ELEMENTS ALPHABETICALLY IN THE ORDER OF THEIR APPEARANCE IN THE INPUT DATA.
- (2) AMBIENT TEMPERATURE IS ASSUMED TO BE 70 DEGREES FAHRENHEIT.
- (3) THE MAXIMUM ALLOWABLE DIFFERENCE IN LOOP CLOSURE CALCULATIONS IS ASSUMED TO BE .25 INCHES.
- (4) THE MAXIMUM ALLOWABLE DIFFERENCE BETWEEN THE CALCULATED AND INPUT COORDINATES OF USER DESIGNATED CHECK POINTS IS ASSUMED TO BE .25 INCHES.
- (5) IN ORDER TO MAKE IT POSSIBLE IN CERTAIN SITUATIONS TO PERFORM INDEPENDENT WEIGHT AND THERMAL ANALYSES IN THE SAME RUN AND APPLY THE CODE STRESS CALCULATIONS CORRECTLY, THE PROGRAM MAKES CERTAIN ASSUMPTIONS. IF THE INPUT DATA SPECIFIES IMPOSED MOVEMENTS ON ARCHES (ARC) OR DISPLACEMENTS OR ROTATIONS ON RIGID RESTRAINTS (RAD,RAR) THESE ARE ASSUMED BY THE PROGRAM TO BE THERMAL EFFECTS AND INCLUDED ONLY IN THOSE LOADING CASES WHICH INCLUDE THERMAL. ALTERNATELY, IF THE INPUT DATA SPECIFIES FORCES AND MOMENTS (FOR,ROM) OR IMPOSED DISPLACEMENTS OR ROTATIONS ON FLEXIBLE RESTRAINTS (RAD,RAK) THESE ARE ASSUMED TO BE WEIGHT EFFECTS AND INCLUDED ONLY IN THOSE LOADING CASES WHICH INCLUDE WEIGHT. IF THESE ASSUMPTIONS ARE INVALID FOR A PARTICULAR SITUATION, THE USER CAN ACCURATELY MODEL THE MOST GENERAL SITUATION BY USING THE AUXILIARY SUPPORT MOVEMENTS (ASM) AND THE AUXILIARY CONCENTRATED LOADS (ACL) FEATURE OF THE PROGRAM AS AN ALTERNATE METHOD OF SPECIFYING THESE EFFECTS.
- (6) A POINT IDENTIFIED AS A TENTATIVE HANGEN LOCATION IS ASSUMED TO BE FREE TO MOVE IN THE VERTICAL DIRECTION FOR THE INITIAL THERMAL LOADING CASE AND FULLY RESTRAINED IN THE VERTICAL DIRECTION FOR THE INITIAL WEIGHT LOADING CASE.
- (7) STRESS INTENSIFICATION FACTORS SPECIFIED AT THE TANGENT-INTERSECTION POINT OF A BEND OR MITER WILL BE APPLIED TO THE NEAR, MID AND FAR POINTS OF THE BEND OR MITER.
- (8) THE TABLE OF CONTENTS APPEARS AT THE END OF THIS REPORT.

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE WALL		TEMP (DEG)	DIST. LOADS (LBS PER FT)		
			X	Y	Z				DIAMETER (IN)	THICK (IN)		MATL	WT.	UNIF
		>-190N	0.00	0.00	-20.83				4.500	.674	LC3	440	27.6	8.0
	BEND	(190M	0.00	-.15	-21.19	.50	.79	90.000						
		>-190F	0.00	-.50	-21.33									
		(* TENTATIVE WELDER AT POINT 190F = SEE NOTE (9) ABOVE. (WELDER LENGTH NOT SPECIFIED.												
	STRAIGHT	(					16.97							
		>-195N	0.00	-19.47	-21.33									
	BEND	(195M	0.00	-19.82	-21.48	.50	.79	90.000						
		>-195F	0.00	-19.97	-21.83		8.67							
	STRAIGHT	(
		>-205N	0.00	-19.97	-30.50									
	BEND	(205M	0.00	-20.12	-30.85	.50	.79	90.000						
		>-205F	0.00	-20.47	-31.00									
		(* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 205F (IN DIRECTION Y												
	STRAIGHT	(					1.98							
	HR PT	>-210	0.00	-22.45	-31.00									
		(* WELDING TEE AT POINT 210												
	STRAIGHT	(					6.00							
		>-220	6.00	-22.45	-31.00									
	STRAIGHT	(					10.00							
		>-225	16.00	-22.45	-31.00									

* NOTES PERTAINING TO POINT 225 APPEAR ON THE FOLLOWING PAGE

DYNALLEX

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 8

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (DEG)	DIST. LOADS (LBS PER FT)		
			X	Y	Z							MATL (PAIR)	PSI	WT. UNIF
		>255A	29.17	-25.94	-62.75				4.500	.674	LCS	440.	27.6	8.0
	BEND	(255M	29.31	-26.24	-62.75	.50	.79	90.000						
		>255F	29.67	-26.44	-62.75									
	STRAIGHT	(					3.33							
		>260	33.00	-26.44	-62.75									
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 260											
		(	IN DIRECTION Y											
	STRAIGHT	(					6.00							
		>265	39.00	-26.44	-62.75									
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 265											
		(	IN DIRECTION Y											
171	STRAIGHT	(					13.00							
		>270	52.00	-26.44	-62.75									
		(	* TENTATIVE HANGER AT POINT 270 - SEE NOTE (9) ABOVE.											
		(	HANGER LENGTH NOT SPECIFIED.											
	STRAIGHT	(					4.75							
DR PT		>275	56.75	-26.44	-62.75									
		(	* WELDING TEE AT POINT 275											
	STRAIGHT	(					1.00							
TERM		--280	57.75	-26.44	-62.75									
DR PT		--275	56.75	-26.44	-62.75									

* NOTES PERTAINING TO POINT 275 APPEAR ON THE FOLLOWING PAGE

DYNALLEX

FITTED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 9

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE WALL		TEMP (DEG)	DIST. LOADS (LBS PER FT)		
			1	2	3				DIAMETER (IN)	THICK (IN)		PRESS (PSI)	WT. UNIF	
HR PT		--275	56.75	-26.44	-62.75				4.500	.674	LCS	440	27.61	8.01
	STRAIGHT						5.50							
		>285	56.75	-20.94	-62.75									
	STRAIGHT						7.14							
HR PT		>290	56.75	-13.80	-62.75									
172	STRAIGHT						.54							
		>295N	56.75	-13.86	-62.75									
	BEND	>295E	50.88	-13.10	-62.69	.50	.79	90.000						
	STRAIGHT						1.57							
		>300N	58.63	-12.96	-61.88									
	BEND	>300E	58.95	-13.10	-61.73	.50	.79	90.000						
		>305	59.08	-13.86	-61.67									
	RIGID						1.33		N/A	N/A		N/A	N/A	
	STRAIGHT						.50							
ANCHR		>315	59.08	-13.29	-61.67									

* NOTES PERTAINING TO POINT 315 APPEAR ON THE FOLLOWING PAGE

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

POINT TYPE	ELEMENT DESIGNATION	POINT LUC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE WALL		TEMP (DEG)	DIST. LOADS (LBS PER FT)		
			X	Y	Z				DIAMETER (IN)	THICK (IN)		MATE (PAIR)	PRESS (PSI)	WT. UNIT
ANCHR		--315	59.08	-15.29	-61.67				4.500	.674	LCS	400	27.61	8.01
* CONTROL COORDINATES OF POINT 315, IN FEET :														
X = 59.08, Y = -15.29, Z = -61.67														
RESULTANT DIFFERENCE IS ZERO														
* IMPOSED MOVEMENT OF ANCHOR 315, IN INCHES :														
DELTA X = 0.00, DELTA Y = .18, DELTA Z = 0.00														
BR PT		--290	56.75	-13.80	-62.75									
* WELDING TEE AT POINT 290														
STRAIGHT	-					.50								
		>-500H	56.75	-13.80	-63.25									
	HEND	-	500H	56.75	-13.95	-63.60	.50	.79	90.000					
173	STRAIGHT	-	>-500F	56.75	-14.30	-63.75	.50							
		>-505	56.75	-14.80	-63.75									
RIGID	-					1.33			N/A	N/A		N/A	N/A	
* HEIGHT OF ELEMENT = 250. POUNDS														
STRAIGHT	-	>-510	56.75	-16.14	-63.75		5.16							
		>-515N	56.75	-21.29	-63.75									
	HEND	-	515N	56.90	-21.65	-63.75	.50	.79	90.000					
STRAIGHT	-	>-515F	57.25	-21.79	-63.75		1.50							
		>-520	56.75	-21.79	-63.75									
* TENTATIVE HANGER AT POINT 520 - SEE NOTE (9) ABOVE.														
* HANGER LENGTH NOT SPECIFIED.														
STRAIGHT	-					7.00								
		>-525	65.75	-21.79	-63.75									

* NOTES PERTAINING TO POINT 525 APPEAR ON THE FOLLOWING PAGE

DYNALFALEX

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (DEG)	DIST. LOADS (LBS PER FT)	
			X	Y	Z							WT.	UNIT
		>525	65.75	-21.79	-63.75				4.500	.674	440	27.6	8.0
		(	* TENTATIVE HANGER AT POINT 525 - SEE NOTE (9) ABOVE.										
		(	HANGER LENGTH NOT SPECIFIED.										
	STRAIGHT	(				1.50							
		>530N	67.25	-21.79	-63.75								
		(	* TENTATIVE HANGER AT POINT 530 - SEE NOTE (9) ABOVE.										
		(	HANGER LENGTH NOT SPECIFIED.										
	BEND	(	530N	67.60	-21.65	-63.75	.50	.79	90.000				
		>530F	67.75	-21.29	-63.75								
	STRAIGHT	(				5.50							
		>535N	67.75	-15.79	-63.75								
		(	* TENTATIVE HANGER AT POINT 535 - SEE NOTE (9) ABOVE.										
		(	HANGER LENGTH NOT SPECIFIED.										
	BEND	(	535N	67.75	-15.44	-63.60	.50	.79	90.000				
		>535F	67.75	-15.29	-63.29								
	STRAIGHT	(				.50							
174		>540	67.75	-15.29	-62.75								
		(	* TENTATIVE HANGER AT POINT 540 - SEE NOTE (9) ABOVE.										
		(	HANGER LENGTH NOT SPECIFIED.										
	STRAIGHT	(				.50							
		>545N	67.75	-15.29	-62.25								
		(	* TENTATIVE HANGER AT POINT 545 - SEE NOTE (9) ABOVE.										
		(	HANGER LENGTH NOT SPECIFIED.										
	BEND	(	545N	67.90	-15.29	-61.90	.50	.79	90.000				
		>545F	68.25	-15.29	-61.75								
	STRAIGHT	(				.50							
		>550N	68.75	-15.29	-61.75								
		(	* TENTATIVE HANGER AT POINT 550 - SEE NOTE (9) ABOVE.										
		(	HANGER LENGTH NOT SPECIFIED.										
	BEND	(	550N	69.10	-15.15	-61.75	.50	.79	90.000				
		>550F	69.25	-14.79	-61.75								
	STRAIGHT	(				1.50							
ANCHR		--555	69.25	-13.29	-61.75								

* NOTES PERTAINING TO POINT 555 APPEAR ON THE FOLLOWING PAGE

DYNALLEX

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 10

POINT TYPE	ELEMENT DESIGNATION	POINT LUC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE WALL		TEMP (DEG)	DIST. LOADS (LBS PER FT)	
			X	Y	Z				DIAMETER (IN)	THICK (IN)		MATL (PARR)	PRESS (PSI)	WT. UNIT
ANCHR		--555	69.25	-13.29	-61.75				4.500	.674	LCS: 440	27.61	6.0
			* CONTROL COORDINATES OF POINT 555, IN FEET :										
			X = 69.25, Y = -13.29, Z = -61.75										
			* RESULTANT DIFFERENCE IS ZERO										
			* IMPOSED MOVEMENT OF ANCHOR 555, IN INCHES :										
			DELTA X = 0.00, DELTA Y = -.07, DELTA Z = 0.00										
BR PT		--210	0.00	-22.45	-31.00								
			* WELDING TEE AT POINT 210										
	STRAIGHT						1.00						
			* STRESS INTENSIFICATION SPECIFIED AT POINT 400										
			* STRESS INTENSIFICATION FACTOR = 2.00										
175		>400	1.00	-22.45	-31.00								
	STRAIGHT						3.00		2.875	.522		13.11	3.7
			* A UNIFORM DISTRIBUTED LOAD OF 3.69 PLF IS ACTING										
			IN THE -Y DIRECTION.										
		>405	-4.00	-22.45	-31.00								
			* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 405										
			IN DIRECTION Y										
	STRAIGHT						6.30						
		>410	12.50	-22.45	-31.00								

* NOTES PERTAINING TO POINT 410 APPEAR ON THE FOLLOWING PAGE

DYNALLEX

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 14

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (DEG)	DIST. LOADS (LBS PER FT)		
			X	Y	Z							WT.	UNIF	
		>440	-44.50	-25.04	-36.00				2.075	.522	LCS	440.	13.1	3.7
	STRAIGHT - (	>445N	-44.50	-25.04	-45.69		9.69						13.1	
	BEND - (	445M	-44.50	-25.13	-45.91	.31	.49	90.000						
		>445F	-44.50	-25.35	-46.00									
		(* TENTATIVE HANGER AT POINT 445F - SEE NOTE (9) ABOVE. HANGER LENGTH NOT SPECIFIED.												
	STRAIGHT - (						10.53							
		>450N	-44.50	-35.89	-46.00									
	BEND - (	450M	-44.50	-36.11	-46.09	.31	.49	90.000						
		>450F	-44.50	-36.20	-46.31									
	STRAIGHT - (						3.69						13.1	
	ANCHR	=460	-44.50	-36.20	-50.00									
		* CONTROL COORDINATES OF POINT 460, IN FEET :												
		X = -44.50, Y = -36.20, Z = -50.00												
		RESULTANT DIFFERENCE IS ZERO												

177

DYNALOX

LOADING - EXCESS THERMAL

PAGE 15

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

CNC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)				
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT	
ANCHORS:									
170	-24.	-201.	43.	219.	-532.	480.	-265.	764.	
315	-150.	-76.	-71.	182.	436.	-376.	-529.	782.	
555	221.	101.	6.	243.	221.	-382.	441.	638.	
178 460	-43.	-14.	-18.	49.	9.	-384.	371.	538.	
RESTRAINTS:									
175	0.	336.	0.	336.	0.	0.	0.	0.	
205F	0.	129.	0.	129.	0.	0.	0.	0.	
225	0.	-107.	0.	107.	0.	0.	0.	0.	
235	0.	51.	0.	51.	0.	0.	0.	0.	
240	0.	-102.	0.	102.	0.	0.	0.	0.	
245	0.	334.	0.	334.	0.	0.	0.	0.	
260	0.	-317.	0.	317.	0.	0.	0.	0.	
265	0.	40.	0.	40.	0.	0.	0.	0.	

DYNAFLEX

LOADING - STRESS THERMAL

PAGE 10

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED) -								
405	0.	-227.	0.	227.	0.	0.	0.	0.
410	0.	52.	0.	52.	0.	0.	0.	0.
415	0.	-27.	0.	27.	0.	0.	0.	0.
420	0.	34.	0.	34.	0.	0.	0.	0.
430F	0.	-6.	0.	6.	0.	0.	0.	0.

DYNAFLEX

LOADING - THERMAL

PAGE 17

* INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *

THE MAXIMUM STRESS OF 5992. OCCURS AT POINT 400

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE
ANSI B31.1 - 1977
PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (**) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE HEADING BELOW) ARE
AUTOMATICALLY CALCULATED AND APPLIED AT BENDS, ELBOWS, MITERS AND ADMISSIBLE TYPES OF TEES
(AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED
STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS
UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY
REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE
MODULUS IS USED FOR THE BRANCH LEG AT REDUCED
OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK.
THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

LOADING - STRESS-THERMAL

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT FLM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)		SIF	SECTION MODULUS (IN ³)	EXPANSION STRESS PSI
		AXIAL	SHEAR	TORSION	IN-PLANE BENDING			
ARCUR	170	83.	203.	265.	480.	1.00	6.79	1950.
STR - (	>= 175	83.	203.	265.	1075.	1.00	6.79	2009.
STR - (	>= 1900	83.	130.	265.	98.	1.00	6.79	1274.
BEND - (	190M	154.	47.	260.	108.	1.00	6.79	1332.
STR - (	>= 190F	135.	87.	112.	690.	1.00	6.79	1312.
STR - (	>= 195R	135.	87.	112.	876.	1.00	6.79	1634.
BEND - (	195M	154.	47.	120.	284.	1.00	6.79	1656.
STR - (	>= 195F	83.	138.	249.	120.	1.00	6.79	1601.
STR - (	>= 203R	83.	138.	249.	366.	1.00	6.79	1004.
BEND - (	203M	154.	47.	30.	473.	1.00	6.79	1056.
STR - (	>= 203F	135.	87.	300.	303.	1.00	6.79	1059.
STR - (	>= 210	244.	67.	360.	166.	1.00	6.79	980.
STR - (	>= 210	71.	99.	186.	777.	1.00	6.79	2063.
STR - (	>= 220	71.	99.	186.	392.	1.00	6.79	1030.
STR - (	>= 225	71.	71.	186.	248.	1.00	6.79	844.
STR - (	>= 230N	71.	71.	186.	34.	1.00	6.79	1902.
BEND - (	230M	75.	52.	180.	1072.	1.00	6.79	1922.
STR - (	>= 230F	64.	77.	50.	170.	1.00	6.79	1892.
STR - (	>= 235	64.	77.	50.	76.	1.00	6.79	1501.
STR - (	>= 240	64.	73.	50.	280.	1.00	6.79	560.
STR - (	>= 245	64.	241.	50.	919.	1.00	6.79	2200.
STR - (	>= 250M	64.	241.	50.	47.	1.00	6.79	1977.

LOADING = SPICE-THERMAL

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEMENT TYPE	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)			SIF	SECTION MODULUS (IN ³)	EXPANSION STRESS PSI
	AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	PLANE PLANE			
MEMB - (250M)	69.	261.	50.	1116.	1.00	1.00	1.00	6.79	1977.
MEMB - (250M)	223.	150.	764.	146.	849.	1.00	1.00	6.79	2035.
STR - (250F)	252.	95.	1151.	161.	85.	1.00	1.00	6.79	2059.
MEMB - (255M)	252.	95.	1151.	296.	31.	1.00	1.00	6.79	2101.
MEMB - (255M)	228.	143.	843.	284.	770.	1.00	1.00	6.79	2061.
STR - (255F)	71.	260.	63.	206.	1119.	1.00	1.00	6.79	2014.
STR - (260)	71.	260.	63.	633.	906.	1.00	1.00	6.79	1955.
STR - (265)	71.	92.	63.	234.	321.	1.00	1.00	6.79	1019.
STR - (270)	71.	69.	63.	91.	312.	1.00	1.00	6.79	504.
STR - (275)	71.	69.	63.	211.	616.	1.00	1.00	6.79	1156.
STR - (275)	0.	0.	0.	0.	0.	1.00	1.00	6.79	0.
STR - (280)	0.	0.	0.	0.	0.	1.00	1.00	6.79	0.
STR - (275)	25.	95.	616.	211.	63.	1.00	1.00	6.79	1156.
STR - (285)	25.	95.	616.	177.	287.	1.00	1.00	6.79	1242.
STR - (290)	25.	95.	616.	747.	691.	1.00	1.00	6.79	2091.
STR - (290)	76.	166.	374.	623.	929.	1.00	1.00	6.79	2004.
STR - (295M)	76.	166.	374.	1102.	175.	1.00	1.00	6.79	2179.
MEMB - (295M)	171.	64.	141.	1210.	388.	1.00	1.00	6.79	2250.
MEMB - (295F)	166.	76.	175.	1207.	374.	1.00	1.00	6.79	2254.
STR - (300M)	166.	76.	175.	1088.	373.	1.00	1.00	6.79	2057.
MEMB - (300M)	64.	171.	349.	1037.	142.	1.00	1.00	6.79	1973.
MEMB - (305)	76.	166.	376.	966.	173.	1.00	1.00	6.79	1859.

LOADING - STRESS-THERMAL

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE	LOC. NO.	FUNCTIONS (POUNDS)	MOMENTS (FOOT-POUNDS)	SIF	SECTION MODULUS (IN ³)	EXPANSION STRESS PSI
		AXIAL	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	
PIG10 - (	>= 305	75.	375.	968.	175.	1.00 1.00 6.79 1659.
STR - (	>= 310	75.	375.	608.	472.	1.00 1.00 6.79 1508.
ANCHP	= 315	75.	375.	529.	436.	1.00 1.00 6.79 1362.
BK PY	= 290	5.	243.	123.	242.	1.00 1.00 6.79 2605.
STR - (	>= 500	6.	243.	73.	132.	1.00 1.00 6.79 2650.
BEND - (	>= 500M	75.	1078.	38.	1154.	1.00 1.00 6.79 2791.
STR - (	>= 500P	101.	221.	25.	1500.	1.00 1.00 6.79 2651.
PIG10 - (	>= 505	101.	221.	22.	1340.	1.00 1.00 6.79 2456.
STR - (	>= 510	101.	221.	22.	1096.	1.00 1.00 6.79 1930.
BEND - (	>= 510M	101.	221.	22.	71.	1.00 1.00 6.79 150.
STR - (	>= 510P	95.	227.	65.	134.	1.00 1.00 6.79 212.
BEND - (	>= 515F	221.	101.	74.	202.	1.00 1.00 6.79 302.
STR - (	>= 520	221.	101.	74.	354.	1.00 1.00 6.79 638.
STR - (	>= 525	221.	101.	74.	1061.	1.00 1.00 6.79 1679.
BEND - (	>= 530M	221.	101.	74.	1212.	1.00 1.00 6.79 2147.
STR - (	>= 530P	227.	89.	68.	1215.	1.00 1.00 6.79 2153.
STR - (	>= 535F	101.	221.	50.	1152.	1.00 1.00 6.79 2041.
BEND - (	>= 535M	101.	221.	50.	35.	1.00 1.00 6.79 152.
STR - (	>= 535P	76.	230.	110.	48.	1.00 1.00 6.79 241.
BEND - (	>= 535M	6.	243.	171.	62.	1.00 1.00 6.79 352.
STR - (	>= 540	6.	243.	171.	135.	1.00 1.00 6.79 407.
STR - (	>= 545M	6.	243.	171.	163.	1.00 1.00 6.79 666.

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE	LUC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)		SIF	SECTION MODULUS (IN ³)	EXPANSION STRESS PSI	
		AXIAL	SHEAR	TORSION	BENDING				IN-PLANE BENDING	OUT-OF- PLANE
BEND	5	243.	171.	183.	281.	1.00	1.00	6.79	686.
SIR	151.	122.	265.	358.	44.	1.00	1.00	6.79	792.
SIR	221.	101.	239.	121.	388.	1.00	1.00	6.79	829.
BEND	101.	101.	234.	70.	385.	1.00	1.00	6.79	805.
SIR	227.	85.	108.	87.	455.	1.00	1.00	6.79	800.
SIR	101.	221.	382.	130.	231.	1.00	1.00	6.79	821.
SIR	101.	221.	382.	461.	221.	1.00	1.00	6.79	1127.
SIR	43.	129.	2.	494.	377.	1.00	1.00	6.79	1120.
SIR	43.	189.	2.	306.	378.	2.00	2.00	1.95	5992.
SIR	43.	189.	2.	259.	323.	1.00	1.00	1.95	2548.
SIR	43.	43.	2.	74.	166.	1.00	1.00	1.95	1118.
SIR	43.	23.	2.	39.	9.	1.00	1.00	1.95	243.
SIR	43.	27.	2.	80.	148.	1.00	1.00	1.95	1040.
SIR	43.	27.	2.	69.	308.	1.00	1.00	1.95	1960.
SIR	43.	27.	2.	213.	420.	1.00	1.00	1.95	2698.
BEND	44.	25.	300.	213.	300.	1.00	1.00	1.95	2922.
SIR	20.	47.	426.	206.	4.	1.00	1.00	1.95	2911.
SIR	14.	47.	426.	121.	40.	1.00	1.00	1.95	2736.
BEND	23.	43.	214.	43.	377.	1.00	1.00	1.95	2699.
SIR	14.	43.	106.	42.	412.	1.00	1.00	1.95	2636.
SIR	14.	45.	104.	23.	211.	1.00	1.00	1.95	1466.
SIR	14.	45.	106.	156.	204.	1.00	1.00	1.95	1717.

DYNAFLEX

LOADING - FREE THERMAL

PAGE 22

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	EXPANSION STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
		>= 445R	18.	45.	108.	156.	204.	1.00	1.00	1.95	1717.
	BEND	(445R	23.	43.	225.	158.	78.	1.00	1.00	1.95	1756.
		(445F	14.	47.	218.	94.	155.	1.00	1.00	1.95	1744.
	STR	(450R	14.	47.	218.	40.	358.	1.00	1.00	1.95	2389.
		(450R	23.	43.	103.	43.	416.	1.00	1.00	1.95	2653.
	BEND	(450F	18.	45.	371.	41.	231.	1.00	1.00	1.95	2703.
	STR	(460	18.	45.	371.	9.	389.	1.00	1.00	1.95	3312.
	ANCHR										

DYNAFLEX

LOADING - STRESS THERMAL

PAGE 23

 * INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES *

EXPLANATORY NOTES

THE FORCES AND MOMENTS AT ANY POINT SHOWN BELOW REPRESENT THE ACTION OF THE FAR END OF THE BRANCH ACTING ON THE NEAR END OF THE BRANCH.

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
ANCHOR		-- 170	-28.	-201.	83.	-532.	480.	-265.
	STRAIGHT --(	>- 175	-28.	-201.	83.	1075.	258.	-265.
	STRAIGHT --(	>- 190H	-28.	135.	83.	-663.	-98.	-265.
	HEND --(	190H	-28.	135.	83.	-699.	-108.	-261.
		>- 190F	-28.	135.	83.	-690.	-112.	-251.
	STRAIGHT --(	>- 195N	-28.	135.	83.	876.	-112.	275.
	HEND --(	195H	-28.	135.	83.	885.	-116.	285.
		>- 195F	-28.	135.	83.	850.	-126.	289.
	STRAIGHT --(	>- 205H	-28.	135.	83.	-324.	-366.	289.
	HEND --(	205H	-28.	135.	83.	-360.	-376.	293.
		>- 205F	-28.	135.	83.	-351.	-380.	303.
BRANCH PT.		-- 210	-28.	260.	83.	-188.	-380.	358.
BRANCH PT.		-- 210	-71.	76.	64.	-186.	-777.	852.
	STRAIGHT --(	>- 220	-71.	76.	64.	-186.	-392.	396.
	STRAIGHT --(	>- 225	-71.	-31.	64.	-186.	248.	-364.
	STRAIGHT --(	>- 230H	-71.	-31.	64.	-186.	1060.	34.
	HEND --(	230H	-71.	-31.	64.	-181.	1072.	45.
		>- 230F	-71.	-31.	64.	-170.	1057.	50.

DYNAFLEX

LOADING - STRESS THERMAL

PAGE 24

INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
		>= 230F	-71.	-31.	64.	-170.	1057.	50.
	STRAIGHT = (	>= 235	-71.	-31.	64.	-76.	645.	50.
	STRAIGHT = (	>= 240	-71.	19.	64.	-260.	173.	50.
	STRAIGHT = (	>= 245	-71.	252.	64.	919.	-839.	50.
	STRAIGHT = (	>= 250N	-71.	252.	64.	-67.	-1116.	50.
	BEAD = (	250M	-71.	252.	64.	-146.	-1141.	60.
	STRAIGHT = (	>= 250F	-71.	252.	64.	-161.	-1151.	85.
	STRAIGHT = (	>= 255H	-71.	252.	64.	31.	-1151.	296.
	BEAD = (	255M	-71.	252.	64.	54.	-1142.	284.
	STRAIGHT = (	>= 255F	-71.	252.	64.	63.	-1119.	206.
187	STRAIGHT = (	>= 260	-71.	252.	64.	63.	-906.	-633.
	STRAIGHT = (	>= 265	-71.	-66.	64.	63.	-521.	-239.
	STRAIGHT = (	>= 270	-71.	-25.	64.	63.	312.	91.
BRANCH PT.		-- 275	-71.	-25.	64.	63.	616.	211.
BRANCH PT.	STRAIGHT = (	-- 275	-0.	-0.	-0.	-0.	0.	0.
TERMINAL		-- 280	-0.	-0.	-0.	-0.	-0.	0.
BRANCH PT.	STRAIGHT = (	-- 275	-71.	-25.	64.	63.	616.	211.
	STRAIGHT = (	>= 285	-71.	-25.	64.	-289.	616.	-177.
BRANCH PT.	STRAIGHT = (	-- 290	-71.	-25.	64.	-747.	616.	-681.
BRANCH PT.	STRAIGHT = (	-- 290	150.	76.	71.	-623.	374.	929.
	STRAIGHT = (	>= 295H	150.	76.	71.	-648.	374.	981.
	BEAD = (	295M	150.	76.	71.	-668.	374.	1024.
	STRAIGHT = (	>= 295F	150.	76.	71.	-667.	374.	1021.

MEMBER

LOADING - STRESS-THERMAL

INTERNAL FORCES AND MOMENTS ORIENTED TO X-Y AND Z AXES (CONTINUED)

MEMBER DESIGNATION	ELEMENT NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)			
		X	Y	Z	X	Y	Z	
MEMBER 295F	STRAIGHT	>= 295F	150.	76.	71.	-667.	374.	1021.
		>= 300N	150.	76.	71.	-617.	375.	913.
		MEMBER 300M	150.	76.	71.	-995.	376.	867.
MEMBER 305	STRAIGHT	>= 305	150.	76.	71.	-566.	376.	804.
		>= 310	150.	76.	71.	-472.	376.	604.
		ANCHOR	150.	76.	71.	-436.	376.	529.
MEMBER 290	STRAIGHT	>= 290	-221.	-101.	-6.	-123.	242.	-1611.
		>= 500N	-221.	-101.	-6.	-73.	132.	-1611.
		MEMBER 500M	-221.	-101.	-6.	-38.	54.	-1578.
MEMBER 506F	STRAIGHT	>= 506F	-221.	-101.	-6.	-25.	22.	-1500.
		>= 505	-221.	-101.	-6.	-29.	22.	-1390.
		>= 510	-221.	-101.	-6.	-37.	22.	-1096.
MEMBER 515N	STRAIGHT	>= 515N	-221.	-101.	-6.	-71.	22.	41.
		>= 515M	-221.	-101.	-6.	-73.	21.	134.
		>= 515F	-221.	-101.	-6.	-74.	19.	202.
MEMBER 520	STRAIGHT	>= 520	-221.	-101.	-6.	-74.	9.	354.
		>= 525	-221.	-101.	-6.	-74.	-37.	1061.
		>= 530N	-221.	-101.	-6.	-74.	-46.	1212.
MEMBER 530M	STRAIGHT	>= 530M	-221.	-101.	-6.	-73.	-49.	1215.
		>= 530F	-221.	-101.	-6.	-71.	-50.	1152.
		>= 535F	-221.	-101.	-6.	-35.	-50.	-61.
MEMBER 535M	STRAIGHT	>= 535M	-221.	-101.	-6.	-48.	-17.	-139.
		>= 535F	-221.	-101.	-6.	-62.	61.	-171.

DYNAPLEX

LOADING = WIND THERMAL

PAGE 26

INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES (CONTINUED)

JOINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
	STRAIGHT	>- 535F	-221.	-101.	-6.	-82.	61.	-171.
	STRAIGHT	>- 540	-221.	-101.	-6.	-133.	171.	-171.
	STRAIGHT	>- 545N	-221.	-101.	-6.	-183.	281.	-171.
	BEND	{ 545H	-221.	-101.	-6.	-219.	358.	-156.
	STRAIGHT	>- 545F	-221.	-101.	-6.	-234.	388.	-121.
	STRAIGHT	>- 550N	-221.	-101.	-6.	-234.	385.	-70.
	BEND	{ 550H	-221.	-101.	-6.	-233.	383.	-67.
	STRAIGHT	>- 550F	-221.	-101.	-6.	-231.	382.	-130.
ANCHOR	STRAIGHT	-- 555	-221.	-101.	-6.	-221.	382.	-461.
BRANCH PT.	STRAIGHT	-- 210	43.	188.	18.	-2.	397.	-494.
	STRAIGHT	>- 400	43.	188.	18.	-2.	378.	-306.
	STRAIGHT	>- 405	43.	188.	18.	-2.	323.	259.
	STRAIGHT	>- 410	43.	-39.	18.	-2.	166.	-74.
	STRAIGHT	>- 415	43.	13.	18.	-2.	9.	39.
	STRAIGHT	>- 420	43.	20.	18.	-2.	-148.	-80.
	STRAIGHT	>- 425	43.	20.	18.	-2.	-306.	89.
	STRAIGHT	>- 430N	43.	20.	18.	-2.	-420.	213.
	BEND	{ 430H	43.	20.	18.	-0.	-424.	213.
	STRAIGHT	>- 430F	43.	20.	18.	4.	-426.	206.
	STRAIGHT	>- 435N	43.	14.	18.	40.	-426.	121.
	BEND	{ 435H	43.	14.	18.	43.	-422.	112.
	STRAIGHT	>- 435F	43.	14.	18.	42.	-412.	108.
	STRAIGHT	>- 440	43.	14.	18.	-23.	-211.	108.

DYNAFLEX

LOADING - STRESS THERMAL

PAGE 27

INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES (CONTINUED)

JOINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
	STRAIGHT - (	>- 440	43.	14.	18.	-23.	-211.	108.
		>- 445H	43.	14.	18.	-156.	204.	108.
	BEND - (	445H	43.	14.	18.	-156.	214.	104.
		>- 445F	43.	14.	18.	-155.	218.	94.
	STRAIGHT - (	>- 450H	43.	14.	18.	40.	218.	-358.
	BEND - (	450H	43.	14.	18.	43.	222.	-367.
		>- 450F	43.	14.	18.	41.	231.	-371.
	STRAIGHT - (	-- 460	43.	14.	18.	-9.	389.	-371.

180

LOADING - SPRESS INTERNAL

DISPLACEMENTS AND ROTATIONS

POINT DESIGNATION	ELEMENT	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
ANCHOR	STRAIGHT - (	176	.000	.000	.000	.000	.000	.000
	STRAIGHT - (	175	.053	.000	.243	.042	.057	.053
	STRAIGHT - (	190N	.253	.279	.037	.093	.077	.139
	BEND - (	190N	.263	.281	.033	.085	.076	.141
	STRAIGHT - (	190F	.276	.273	.063	.077	.075	.149
	STRAIGHT - (	193N	.300	.307	.040	.112	.022	.140
	BEND - (	193N	.315	.316	.041	.122	.021	.136
	STRAIGHT - (	193F	.320	.312	.076	.132	.019	.133
	STRAIGHT - (	203N	.323	.003	1.142	.176	.022	.070
	BEND - (	203N	.324	.006	1.156	.172	.026	.067
	STRAIGHT - (	203F	.328	.000	1.173	.168	.030	.064
BRANCH PT.	STRAIGHT - (	210	.332	.061	1.242	.157	.049	.051
	STRAIGHT - (	210	.332	.061	1.242	.157	.049	.051
	STRAIGHT - (	220	.760	.074	1.132	.129	.117	.021
	STRAIGHT - (	223	.061	.000	.031	.063	.131	.024
	STRAIGHT - (	230N	.072	.010	.071	.023	.029	.016
	BEND - (	230N	.053	.011	.078	.022	.041	.016
	STRAIGHT - (	230F	.062	.010	.090	.020	.053	.015
	STRAIGHT - (	235	.113	.000	.763	.013	.109	.011
	STRAIGHT - (	240	.443	.000	1.074	.010	.202	.000

DYNAFLEX

LOADING - THERMAL

PAGE 29

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT			
			X	Y	Z	X AXIS	Y AXIS	Z AXIS	
		>- 240	-.443	-.000	-1.074	-.018	.202	.000	
	STRAIGHT - (	>- 245	-.982	.000	-1.514	.073	.110	.018
	STRAIGHT - (	>- 250N	-1.043	.079	-1.634	.105	.036	.023
	BEND - (	250N	-1.044	.082	-1.648	.104	.023	.024
		>- 250F	-1.043	.074	-1.660	.102	.012	.026	
	STRAIGHT - (	>- 255N	-1.024	-.018	-1.722	.098	-.075	.037
	BEND - (	255N	-1.017	-.027	-1.727	.098	-.087	.040
		>- 255F	-1.005	-.029	-1.723	.098	-.099	.043	
	STRAIGHT - (	>- 260	-.903	-.000	-1.630	.104	-.164	.029
	STRAIGHT - (	>- 265	-.719	.000	-1.367	.113	-.247	-.021
182	STRAIGHT - (	>- 270	-.320	-.102	-.610	.134	-.274	-.040
BRANCH PT.	STRAIGHT - (	-- 275	-.174	-.136	-.356	.141	-.231	-.026
BRANCH PT.		-- 275	-.174	-.136	-.356	.141	-.231	-.026	
TERMINAL	STRAIGHT - (	-- 240	-.143	-.142	-.308	.141	-.231	-.026
BRANCH PT.		-- 275	-.174	-.136	-.356	.141	-.231	-.026	
	STRAIGHT - (	>- 285	-.149	.033	-.197	.129	-.146	-.024
BRANCH PT.	STRAIGHT - (	-- 290	-.077	.251	-.049	.058	-.035	-.084
BRANCH PT.		-- 290	-.077	.251	-.049	.058	-.035	-.084	
	STRAIGHT - (	>- 295N	-.072	.262	-.045	.054	-.032	-.077
	BEND - (	295N	-.063	.270	-.038	.046	-.028	-.066
		>- 295F	-.052	.269	-.031	.038	-.024	-.054	
	STRAIGHT - (	>- 300N	-.010	.254	-.005	.017	-.013	-.025
		BEND - (300N	-.001	.248	-.000	.011	-.009	-.015

DYNAPLEX

LOADING = FREE THERMAL

PAGE 30

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	BEAD = (	300H	-.001	.248	-.000	.011	-.009	-.015
	>=	305	.002	.236	.001	.004	-.005	-.006
	RIGID = (
	>=	310	.000	.195	.000	.004	-.005	-.005
	STRAIGHT = (
ANCHOR	--	315	-.000	.180	-.000	.000	-.000	-.000
	STRAIGHT = (
BRANCH PT.	--	290	-.077	.251	-.049	.058	-.035	-.084
	STRAIGHT = (
	>=	500H	-.074	.257	-.064	.057	-.034	-.104
	BEAD = (	500H	-.075	.257	-.077	.056	-.032	-.120
	>=	500F	-.084	.248	-.085	.056	-.031	-.137
	STRAIGHT = (
	>=	505	-.049	.233	-.091	.056	-.030	-.151
	RIGID = (
	>=	510	-.141	.192	-.107	.056	-.030	-.151
	STRAIGHT = (
183	>=	515H	-.343	.033	-.164	.050	-.028	-.204
	BEAD = (	515H	-.354	.016	-.167	.049	-.027	-.203
	>=	515F	-.349	-.003	-.167	.049	-.027	-.201
	STRAIGHT = (
	>=	520	-.303	-.065	-.158	.046	-.027	-.193
	STRAIGHT = (
	>=	525	-.084	-.289	-.118	.033	-.029	-.097
	STRAIGHT = (
	>=	530H	-.042	-.315	-.109	.030	-.030	-.064
	BEAD = (	530H	-.030	-.315	-.106	.029	-.030	-.050
	>=	530F	-.022	-.305	-.103	.029	-.031	-.037
	STRAIGHT = (
	>=	535H	-.026	-.137	-.073	.023	-.038	.021
	BEAD = (	535H	-.029	-.126	-.067	.022	-.038	.020
	>=	535F	-.032	-.124	-.056	.022	-.038	.019
	STRAIGHT = (
	>=	540	-.036	-.126	-.040	.021	-.037	.016
	STRAIGHT = (
	>=	545H	-.040	-.128	-.025	.019	-.034	.014

DYNAPLEX

LOADING - GENERAL THERMAL

PAGE 31

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		>- 545N	-.040	-.128	-.025	.019	-.034	.014
	BEND - (	545H	-.038	-.129	-.013	.017	-.031	.013
		>- 545F	-.028	-.128	-.007	.015	-.026	.011
	STRAIGHT - (
		>- 550N	-.013	-.127	-.004	.012	-.023	.010
	BEND - (	550H	-.002	-.122	-.002	.009	-.018	.010
		>- 550F	.002	-.111	-.001	.007	-.014	.009
	STRAIGHT - (
ANCHOR		-- 555	.000	-.065	.000	.000	-.000	.000
BRANCH PT.		-- 210	-.952	-.061	-1.242	.157	-.049	-.051
	STRAIGHT - (
		>- 400	-.982	-.049	-1.251	.157	-.042	-.059
	STRAIGHT - (
		>- 405	-1.074	-.000	-1.242	.156	.069	-.066
	STRAIGHT - (
		>- 410	-1.335	.000	-.902	.154	.288	.016
	STRAIGHT - (
		>- 415	-1.596	-.000	-.298	.152	.367	.000
	STRAIGHT - (
		>- 420	-1.857	.000	.320	.149	.304	-.010
	STRAIGHT - (
		>- 425	-2.117	.052	.701	.147	.100	-.014
	STRAIGHT - (
		>- 430H	-2.307	.015	.686	.145	-.136	.084
	BEND - (	430H	-2.312	.009	.677	.145	-.149	.091
		>- 430F	-2.311	-.000	.667	.144	-.164	.097
	STRAIGHT - (
		>- 435H	-2.263	-.060	.607	.149	-.279	.131
	BEND - (	435H	-2.251	-.064	.597	.150	-.292	.134
		>- 435F	-2.235	-.060	.588	.151	-.305	.137
	STRAIGHT - (
		>- 440	-1.851	.043	.444	.156	-.459	.207
	STRAIGHT - (
		>- 445N	-.844	.340	.147	.064	-.463	.350
	BEND - (	445H	-.416	.340	.139	.060	-.456	.354

DYNAFLEX

LOADING - SPACE THERMAL

PAGE 32

DISPLACEMENTS AND ROTATIONS (CONTINUED)

PHYSICAL DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	BEND - (	445H	-.816	.340	.139	.060	-.456	.354
	>- 445F		-.791	.334	.133	.055	-.449	.357
	STRAIGHT - (	450H	-.072	.011	.122	-.009	-.134	.211
	>- 450F		-.060	.004	.120	-.008	-.127	.200
	BEND - (	450H	-.060	.004	.120	-.008	-.127	.200
	>- 450F		-.051	.001	.113	-.006	-.121	.188
	STRAIGHT - (	460	-.000	-.000	-.000	.000	-.000	.000
	ANCHOR							

186

DYAFLEX

LOADING - RESTRAINEDS - MOUNT (YCMIP)

PAGE 33

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LINC. (ft.)	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)				
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT	
ANCHORS:									
170	2.	-75.	3.	75.	-12.	-33.	-9.	37.	
315	-21.	-292.	-7.	292.	-185.	32.	-44.	193.	
555	22.	9.	5.	25.	-71.	-3.	-51.	88.	
197 460	-3.	5.	-1.	6.	-27.	-30.	-7.	41.	
RESTRAINTS:									
175	0.	-475.	0.	475.	0.	0.	0.	0.	
190F	0.	-1083.	0.	1083.	0.	0.	0.	0.	
205F	0.	-639.	0.	639.	0.	0.	0.	0.	
225	0.	-619.	0.	619.	0.	0.	0.	0.	
235	0.	-489.	0.	489.	0.	0.	0.	0.	
240	0.	-354.	0.	354.	0.	0.	0.	0.	
245	0.	-532.	0.	532.	0.	0.	0.	0.	
260	0.	-280.	0.	280.	0.	0.	0.	0.	

LOADING - RESTRAINED WEIGHT (YOURIP)

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)				
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
265	0.	-327.	0.	327.	0.	0.	0.	0.
270	0.	-414.	0.	414.	0.	0.	0.	0.
285	0.	-887.	0.	887.	0.	0.	0.	0.
520	0.	-439.	0.	439.	0.	0.	0.	0.
525	0.	-249.	0.	249.	0.	0.	0.	0.
540	0.	-325.	0.	325.	0.	0.	0.	0.
405	0.	1.	0.	1.	0.	0.	0.	0.
410	0.	-170.	0.	170.	0.	0.	0.	0.
415	0.	-95.	0.	95.	0.	0.	0.	0.
420	0.	-252.	0.	252.	0.	0.	0.	0.
430F	0.	-265.	0.	265.	0.	0.	0.	0.
445F	0.	-389.	0.	389.	0.	0.	0.	0.

DYNAFLEX

LOADING - UNRESTRAINED WEIGHT (YLRIP)

PAGE 35

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*****
* INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *
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THE MAXIMUM STRESS OF 2451. OCCURS AT POINT 400

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE
ANSI H31.1 - 1977
PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (***) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE HEADING BELOW) ARE
AUTOMATICALLY CALCULATED AND APPLIED AT BENDS, ELBOWS, MITERS AND ADMISSIBLE TYPES OF TEES
(AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED
STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS
UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY
REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE
MODULUS IS USED FOR THE BRANCH LEG AT REDUCED
OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK.
THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

199

LOADING - RESTRAINED RIGHT (YURIP)

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE	L/C NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)			SIF	SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
		AXIAL	SHEAR	RESULTANT	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING			
ANCHP	170	3.	75.	9.	12.	33.	1.00	1.00	6.79	65.
STR - (	>= 175	3.	266.	9.	347.	21.	1.00	1.00	6.79	967.
STR - (	>= 190H	3.	190.	9.	59.	1.	1.00	1.00	6.79	105.
BEND - (	190H	146.	142.	7.	126.	6.	1.00	1.00	6.79	226.
STR - (	>= 190F	3.	157.	1.	157.	10.	1.00	1.00	6.79	276.
STR - (	>= 195H	3.	101.	1.	101.	39.	1.00	1.00	6.79	191.
BEND - (	195H	124.	128.	26.	75.	27.	1.00	1.00	6.79	147.
STR - (	>= 195F	3.	164.	39.	15.	0.	1.00	1.00	6.79	75.
STR - (	>= 203H	3.	144.	39.	75.	13.	1.00	1.00	6.79	148.
BEND - (	203H	114.	110.	18.	20.	30.	1.00	1.00	6.79	82.
STR - (	>= 203F	3.	172.	14.	3.	40.	1.00	1.00	6.79	75.
HR PT	210	397.	3.	14.	43.	3.	1.00	1.00	6.79	81.
HR PT	210	2.	254.	36.	430.	15.	1.00	1.00	6.79	763.
STR - (	>= 220	2.	41.	36.	452.	6.	1.00	1.00	6.79	602.
STR - (	>= 225	2.	304.	36.	919.	10.	1.00	1.00	6.79	1624.
STR - (	>= 230H	2.	145.	38.	86.	29.	1.00	1.00	6.79	176.
STR - (	>= 230H	2.	159.	15.	30.	35.	1.00	1.00	6.79	65.
STR - (	>= 230F	2.	173.	10.	43.	29.	1.00	1.00	6.79	94.
STR - (	>= 235	2.	269.	10.	725.	24.	1.00	1.00	6.79	1276.
STR - (	>= 240	2.	226.	10.	340.	8.	1.00	1.00	6.79	600.
STR - (	>= 245	2.	243.	10.	749.	17.	1.00	1.00	6.79	1323.
STR - (	>= 250H	2.	110.	10.	45.	24.	1.00	1.00	6.79	91.

LOADING - RESTRAINED BEAM (YCRIF)
 INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT FLEN TYPE	LUC NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)		SIF	SECTION		LONGITUDINAL STRESS - PSI	
		AXIAL	SHEAR	TORSION	IN-PLANE BENDING		OUT-OF-PLANE BENDING	MODULUS (IN 3)		
BEND - (	>= 250R	2.	110.	10.	45.	24.	1.00	1.00	6.79	91.
STH - (	>= 250R	67.	69.	10.	8.	25.	1.00	1.00	6.79	49.
BEND - (	>= 250F	82.	2.	25.	6.	11.	1.00	1.00	6.79	49.
STH - (	>= 255N	24.	2.	25.	16.	11.	1.00	1.00	6.79	56.
BEND - (	>= 255N	24.	26.	25.	12.	9.	1.00	1.00	6.79	52.
STH - (	>= 255F	2.	52.	12.	3.	24.	1.00	1.00	6.79	47.
BEND - (	>= 260	2.	110.	12.	373.	14.	1.00	1.00	6.79	661.
STH - (	>= 265	2.	224.	12.	353.	9.	1.00	1.00	6.79	624.
BEND - (	>= 270	2.	234.	12.	445.	11.	1.00	1.00	6.79	786.
STH - (	>= 275	2.	7.	12.	11.	10.	1.00	1.00	6.79	43.
BEND - (	>= 275	0.	30.	0.	10.	0.	1.00	1.00	6.79	31.
STH - (	>= 280	0.	0.	0.	0.	0.	1.00	1.00	6.79	0.
BEND - (	>= 275	28.	2.	10.	7.	12.	1.00	1.00	6.79	40.
STH - (	>= 285	224.	2.	10.	2.	3.	1.00	1.00	6.79	33.
BEND - (	>= 290	410.	2.	10.	8.	15.	1.00	1.00	6.79	44.
STH - (	>= 290	111.	22.	25.	222.	25.	1.00	1.00	6.79	396.
BEND - (	>= 295N	78.	22.	25.	10.	214.	1.00	1.00	6.79	391.
STH - (	>= 295N	45.	75.	110.	80.	154.	1.00	1.00	6.79	376.
BEND - (	>= 295F	21.	71.	145.	57.	26.	1.00	1.00	6.79	358.
STH - (	>= 300N	21.	15.	145.	10.	31.	1.00	1.00	6.79	345.
BEND - (	>= 300N	16.	15.	154.	4.	114.	1.00	1.00	6.79	345.
STH - (	>= 305	13.	22.	32.	1.	191.	1.00	1.00	6.79	303.

DYNAFLEX

LOADING - RESTRAINED WEIGHT (YONIF)

PAGE 30

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	RIGID - (	>= 305	13.	22.	32.	1.	191.	1.00	1.00	6.79	343.
	STR - (	>= 310	274.	22.	32.	54.	182.	1.00	1.00	6.79	340.
	ANCHR	-- 315	292.	22.	32.	44.	185.	1.00	1.00	6.79	341.
	BR PT	-- 290	5.	300.	10.	230.	43.	1.00	1.00	6.79	413.
	STR - (	>= 500N	5.	283.	10.	85.	32.	1.00	1.00	6.79	161.
	BEND - (	500M	193.	187.	27.	12.	8.	1.00	1.00	6.79	53.
	STR - (	>= 500F	254.	23.	21.	21.	49.	1.00	1.00	6.79	101.
	RIGID - (	>= 503	236.	23.	21.	34.	46.	1.00	1.00	6.79	107.
	STR - (	>= 510	25.	23.	21.	62.	40.	1.00	1.00	6.79	136.
202	STR - (	>= 515N	208.	23.	21.	177.	14.	1.00	1.00	6.79	316.
	BEND - (	515M	173.	141.	6.	153.	23.	1.00	1.00	6.79	274.
	STR - (	>= 515F	22.	236.	11.	76.	19.	1.00	1.00	6.79	139.
	STR - (	>= 520	22.	150.	11.	318.	11.	1.00	1.00	6.79	562.
	STR - (	>= 523	22.	99.	11.	130.	24.	1.00	1.00	6.79	240.
	BEND - (	530M	22.	98.	11.	48.	31.	1.00	1.00	6.79	103.
	STR - (	>= 530F	70.	23.	34.	61.	14.	1.00	1.00	6.79	156.
	BEND - (	535M	126.	23.	34.	41.	42.	1.00	1.00	6.79	120.
	STR - (	>= 535F	95.	105.	57.	63.	14.	1.00	1.00	6.79	152.
	STR - (	>= 535M	5.	155.	53.	116.	25.	1.00	1.00	6.79	228.
	STR - (	>= 540	5.	155.	53.	197.	11.	1.00	1.00	6.79	361.
	STR - (	>= 545M	5.	148.	53.	124.	0.	1.00	1.00	6.79	239.

DYNALLEX

LOADING = RESTRAINED WEIGHT (YORIP)

PAGE 39

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
			AXIAL	SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
		> 545N	5.	138.	55.	124.	0.	1.00	1.00	6.79	239.
	BEND	(545N	19.	123.	51.	7.	80.	1.00	1.00	6.79	152.
		> 545F	22.	108.	61.	6.	8.	1.00	1.00	6.79	110.
	STR	(550N	22.	91.	61.	55.	6.	1.00	1.00	6.79	147.
	BEND	(550N	70.	39.	47.	62.	41.	1.00	1.00	6.79	182.
		> 550F	63.	23.	5.	84.	64.	1.00	1.00	6.79	187.
	STR	(555	9.	23.	5.	51.	71.	1.00	1.00	6.79	155.
	ANCHR										
	BR PT	> 210	5.	143.	55.	387.	30.	1.00	1.00	6.79	688.
	STR	(100	3.	108.	35.	262.	28.	2.00	2.00	1.95	2451. **
	STR	(405	3.	57.	35.	14.	24.	1.00	1.00	1.95	276.
203	STR	(410	3.	84.	35.	140.	12.	1.00	1.00	1.95	891.
	STR	(419	3.	59.	35.	34.	1.	1.00	1.00	1.95	299.
	STR	(420	3.	107.	35.	334.	11.	1.00	1.00	1.95	2070.
	STR	(425	3.	2.	35.	291.	23.	1.00	1.00	1.95	1807.
	STR	(430N	3.	102.	35.	19.	32.	1.00	1.00	1.95	313.
	BEND	(430N	77.	75.	47.	42.	2.	1.00	1.00	1.95	388.
		> 430F	110.	4.	32.	51.	35.	1.00	1.00	1.95	427.
	STR	(435N	122.	4.	32.	44.	32.	1.00	1.00	1.95	390.
	BEND	(435N	82.	84.	9.	21.	53.	1.00	1.00	1.95	356.
		> 435F	1.	114.	45.	5.	31.	1.00	1.00	1.95	329.
	STR	(440	1.	35.	45.	352.	16.	1.00	1.00	1.95	2189.
	STR	(445N	1.	128.	45.	100.	16.	1.00	1.00	1.95	680.

DYNAPLEX

LOADING - RESTRAINTS WEIGHT (YUNIF)

PAGE 40

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
		AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	>- 445N	1.	128.	43.	100.	16.	1.00	1.00	1.95	680.
BEND	(445N	95.	93.	42.	129.	19.	1.00	1.00	1.95	643.
	>- 445F	252.	4.	17.	42.	141.	1.00	1.00	1.95	912.
STR	(450N	75.	4.	17.	126.	8.	1.00	1.00	1.95	786.
	>- 450N	49.	51.	17.	119.	7.	1.00	1.00	1.95	744.
BEND	(450N	1.	67.	7.	104.	18.	1.00	1.00	1.95	652.
STR	(450F	1.	6.	7.	27.	30.	1.00	1.00	1.95	253.
ANCHR	-- 460									

LOADING - RESTRAINTS WEIGHT (YOUNG)

 * INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES *

EXPLANATORY NOTES

THE FORCES AND MOMENTS AT ANY POINT SHOWN BELOW REPRESENT THE ACTION OF THE FAR END OF THE BRANCH ACTING ON THE NEAR END OF THE BRANCH.

POINT DESIGNATION ANCHOR	ELEMENT NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
		X	Y	Z	X	Y	Z
STRAIGHT - (	170	2.	-75.	3.	-12.	-33.	-9.
>- 175		2.	-266.	3.	-547.	-21.	-9.
STRAIGHT - (	190N	2.	190.	3.	-59.	-1.	-9.
>- 190M		2.	204.	3.	-128.	-1.	-9.
STRAIGHT - (	190F	2.	216.	3.	-157.	-1.	-10.
>- 195H		2.	-192.	3.	-101.	-1.	-39.
BEND - (	195M	2.	-178.	3.	-73.	-0.	-39.
>- 195F		2.	-164.	3.	-13.	0.	-39.
STRAIGHT - (	205H	2.	144.	3.	73.	13.	-39.
>- 205M		2.	158.	3.	20.	14.	-40.
STRAIGHT - (	205F	2.	172.	3.	-3.	14.	-40.
BRANCH PT. -- 210		2.	-397.	3.	3.	14.	-43.
BRANCH PT. -- 210		-2.	-254.	2.	38.	-15.	-430.
STRAIGHT - (	220	-2.	-41.	2.	38.	-6.	452.
STRAIGHT - (	225	-2.	-304.	2.	38.	10.	-919.
STRAIGHT - (	230N	-2.	145.	2.	38.	29.	88.
BEND - (	230M	-2.	159.	2.	16.	30.	34.
>- 230F		-2.	173.	2.	-43.	29.	10.

DYNAFLEX

LOADING - RESTRAINED WEIGHT (YORIF)

PAGE 42

INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
		>- 230F	-2.	173.	2.	-43.	29.	10.
	STRAIGHT - (	>- 235	-2.	-209.	2.	-723.	24.	10.
	STRAIGHT - (	>- 240	-2.	-226.	2.	-340.	8.	10.
	STRAIGHT - (	>- 245	-2.	283.	2.	-749.	-17.	10.
		>- 250H	-2.	-110.	2.	-45.	-24.	10.
	WEND - (	250H	-2.	-96.	2.	-8.	-24.	11.
		>- 250F	-2.	-82.	2.	6.	-25.	11.
	STRAIGHT - (	>- 255H	-2.	24.	2.	11.	-25.	16.
	WEND - (	255H	-2.	38.	2.	11.	-24.	12.
208		>- 255F	-2.	52.	2.	12.	-24.	-3.
	STRAIGHT - (	>- 260	-2.	-110.	2.	12.	-19.	-373.
	STRAIGHT - (	>- 265	-2.	-224.	2.	12.	-9.	-353.
	STRAIGHT - (	>- 270	-2.	238.	2.	12.	11.	-445.
	BRANCH PT.	-- 275	-2.	-7.	2.	12.	18.	-11.
	BRANCH PT.	-- 275	0.	-36.	0.	0.	-0.	-18.
	STRAIGHT - (	-- 280	0.	0.	0.	0.	0.	-0.
	TERMINAL	-- 280	0.	0.	0.	0.	0.	-0.
	BRANCH PT.	-- 275	-2.	28.	2.	12.	18.	7.
	STRAIGHT - (	>- 245	-2.	224.	2.	3.	18.	-2.
	STRAIGHT - (	-- 290	-2.	-410.	2.	-8.	18.	-15.
	BRANCH PT.	-- 290	21.	-111.	7.	222.	-25.	-25.
	BRANCH PT.	-- 290	21.	-98.	7.	219.	-25.	-18.
		>- 295H	21.	-84.	7.	212.	-25.	1.
	WEND - (	295H	21.	-71.	7.	199.	-26.	29.
		>- 295F	21.	-71.	7.	199.	-26.	29.

DYNAFLEX

LOADING - RESTRAINED WEIGHT (YOUNG)

PAGE 43

INTERNAL FORCES AND MOMENTS ORIENTED TO X-Y AND Z AXES (CONTINUED)

JOINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
	STRAIGHT	>- 295F	21.	-71.	7.	199.	-26.	29.
		>- 300H	21.	-15.	7.	171.	-31.	90.
	BEND	(300H	21.	-1.	7.	171.	-32.	89.
	RIGID	>- 305	21.	13.	7.	173.	-32.	82.
		>- 310	21.	274.	7.	182.	-32.	54.
	STRAIGHT	(315	21.	292.	7.	185.	-32.	44.
ANCHOR		-- 290	-22.	-299.	-5.	-230.	43.	10.
BRANCH PT.	STRAIGHT	>- 500N	-22.	-282.	-5.	-85.	32.	10.
	BEND	(500H	-22.	-268.	-5.	12.	24.	13.
	STRAIGHT	>- 500F	-22.	-254.	-5.	49.	21.	21.
207	RIGID	>- 505	-22.	-236.	-5.	46.	21.	32.
	STRAIGHT	>- 510	-22.	25.	-5.	40.	21.	62.
	BEND	(515H	-22.	208.	-5.	14.	21.	177.
	STRAIGHT	>- 515H	-22.	222.	-5.	12.	20.	153.
	BEND	(515F	-22.	236.	-5.	11.	19.	76.
	STRAIGHT	>- 520	-22.	-150.	-5.	11.	11.	-318.
	STRAIGHT	>- 525	-22.	99.	-5.	11.	-24.	-138.
	BEND	(530N	-22.	-97.	-5.	11.	-31.	48.
	STRAIGHT	>- 530N	-22.	-83.	-5.	12.	-33.	77.
	BEND	(530F	-22.	-70.	-5.	14.	-34.	81.
	STRAIGHT	>- 535H	-22.	126.	-5.	41.	-34.	-42.
	BEND	(535H	-22.	140.	-5.	63.	-30.	-50.
	STRAIGHT	>- 535F	-22.	154.	-5.	116.	-23.	-53.

LOADING - RESTRAINED WEIGHT (UNIT)

INTERNAL FORCES AND MOMENTS ORIENTED TO X Y AND Z AXES (CONTINUED)

POINT DESIGNATION	ELEMENT NO.	LOC.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
			X	Y	Z	X	Y	Z
>= 535F	(		-22.	154.	-5.	116.	-23.	-53.
STRAIGHT - (
>= 540	(		-22.	-154.	-5.	197.	-11.	-53.
STRAIGHT - (
>= 545M	(		-22.	-136.	-5.	124.	-0.	-53.
BEND - (
>= 545M	(		-22.	-122.	-5.	79.	7.	-35.
STRAIGHT - (
>= 545F	(		-22.	-108.	-5.	61.	6.	6.
STRAIGHT - (
>= 550N	(		-22.	-90.	-5.	61.	6.	55.
BEND - (
>= 550M	(		-22.	-76.	-5.	62.	4.	82.
STRAIGHT - (
>= 550F	(		-22.	-63.	-5.	64.	3.	84.
STRAIGHT - (
-- 555	(		-22.	-9.	-5.	71.	3.	51.
ANCHOR								
BRANCH PT.								
-- 210	(		3.	-143.	1.	-35.	30.	387.
STRAIGHT - (
>= 400	(		3.	-108.	1.	-35.	28.	262.
STRAIGHT - (
>= 405	(		3.	-57.	1.	-35.	24.	14.
STRAIGHT - (
>= 410	(		3.	-84.	1.	-35.	12.	140.
STRAIGHT - (
>= 415	(		3.	59.	1.	-35.	1.	34.
STRAIGHT - (
>= 420	(		3.	107.	1.	-35.	-11.	334.
STRAIGHT - (
>= 425	(		3.	-2.	1.	-35.	-23.	-291.
STRAIGHT - (
>= 430N	(		3.	102.	1.	-35.	-32.	19.
STRAIGHT - (
BEND - (			3.	106.	1.	-35.	-32.	42.
>= 430F	(		3.	110.	1.	-35.	-32.	51.
STRAIGHT - (
>= 435U	(		3.	-122.	1.	-32.	-32.	44.
BEND - (			3.	-114.	1.	-21.	-32.	44.
>= 435F	(		3.	-114.	1.	5.	-31.	43.
STRAIGHT - (
>= 440	(		3.	-35.	1.	352.	-16.	43.

LOADING - RESTRAINED RIGHT (YORIF)

INTERNAL FORCES AND MOMENTS ORIENTED TO X-Y AND Z AXES (CONTINUED)

ELEMNT DESIGNATION	CNC. NO.	FORCES (POUNDS)			MOMENTS (FOOT-POUNDS)		
		X	Y	Z	X	Y	Z
STRAIGHT - (
>= 440	3.	-35.	1.	352.	-16.	43.	
>= 445N	3.	126.	1.	-100.	16.	43.	
BEND - (
>= 445M	3.	132.	1.	-129.	17.	43.	
STRAIGHT - (
>= 405F	3.	-252.	1.	-141.	17.	42.	
>= 450N	3.	-75.	1.	-126.	17.	6.	
BEND - (
>= 450M	3.	-71.	1.	-119.	17.	7.	
STRAIGHT - (
>= 450F	3.	-67.	1.	-104.	18.	7.	
ANCHOR	3.	-5.	1.	27.	30.	7.	

DYNAMFLEX LOADING - RESTRAINTS WEIGHT (YUNIT)

 * DISPLACEMENTS AND ROTATIONS *

POINT DESIGNATION	ELEMENT	LUC.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
ANCHOR	STRAIGHT - (	>= 170	.000	-.000	.000	.000	-.000	.000
	STRAIGHT - (	>= 175	.004	-.000	.000	.014	-.004	-.002
	(	>= 190R	.020	-.003	.000	.032	-.007	-.005
	BEND - (	>= 190M	.020	-.001	-.001	.031	-.007	-.005
	(	>= 190F	.020	-.000	-.003	.029	-.007	-.005
	STRAIGHT - (	>= 193M	.013	-.001	-.018	.018	-.007	-.014
	(	>= 193N	.014	-.001	-.016	.019	-.007	-.014
	BEND - (	>= 193F	.014	-.003	-.016	.020	-.007	-.014
210	STRAIGHT - (	>= 203M	.001	-.002	-.016	.022	-.006	-.023
	(	>= 203N	.001	-.001	-.017	.023	-.006	-.023
	BEND - (	>= 203F	.003	-.000	-.018	.023	-.006	-.024
	(	>= 210	.013	-.000	-.028	.023	-.005	-.026
BRANCH PT.	STRAIGHT - (	>= 210	.013	-.000	-.028	.023	-.005	-.026
	(	>= 220	.013	-.035	-.020	.029	-.006	-.012
	STRAIGHT - (	>= 223	.013	-.000	-.007	.038	-.006	-.000
	(	>= 230M	.013	-.035	-.004	.051	-.001	-.015
	BEND - (	>= 230F	.013	-.032	-.004	.051	-.001	-.016
	(	>= 230R	.013	-.028	-.004	.051	-.001	-.016
	STRAIGHT - (	>= 235	.013	-.000	-.004	.030	-.001	-.017
	(	>= 240	.019	-.000	-.004	.018	-.004	-.019

LOADING - RESTRAINTS WEIGHT (YORIF)
 DISPLACEMENTS AND ROTATIONS (CONTINUED)

PROJECT DESIGNATION	ELEMENT NO.	LOC.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
STRAIGHT	>= 240		-.019	-.000	.004	-.018	.004	.019
STRAIGHT	>= 245		-.030	-.000	.004	-.001	.003	.023
STRAIGHT	>= 250H		-.032	-.015	.004	-.027	.001	.024
BEND	(250H		-.031	-.017	.005	-.028	.001	.024
STRAIGHT	>= 250F		-.029	-.018	.007	-.028	.001	.024
STRAIGHT	>= 255H		-.014	-.018	.024	-.027	-.001	.025
BEND	(255H		-.012	-.017	.026	-.027	-.002	.025
STRAIGHT	>= 255F		-.012	-.016	.027	-.027	-.002	.025
STRAIGHT	>= 260		-.012	-.000	.028	-.026	-.003	.015
STRAIGHT	>= 265		-.012	-.000	.033	-.024	-.005	-.015
STRAIGHT	>= 270		-.012	-.000	.047	-.020	-.005	.011
STRAIGHT	-- 275		-.012	-.000	.051	-.019	-.003	-.004
BRANCH PT.	-- 275		-.012	-.000	.051	-.019	-.003	-.004
TERMINAL	-- 280		-.012	-.001	.052	-.019	-.003	-.004
BRANCH PT.	-- 275		-.012	-.000	.051	-.019	-.003	-.004
BRANCH PT.	>= 285		-.007	-.000	.030	-.018	-.001	-.004
BRANCH PT.	-- 290		-.001	-.000	.003	-.019	.003	-.005
BRANCH PT.	-- 290		-.001	-.000	.003	-.019	.003	-.005
STRAIGHT	>= 295H		-.001	-.000	.001	-.017	.002	-.005
BEND	(295H		-.000	-.000	.000	-.015	.002	-.005
STRAIGHT	>= 300H		.000	-.000	-.000	-.013	.002	-.005
BEND	(300H		.000	-.000	-.001	-.005	.001	-.002
STRAIGHT	>= 300H		.000	-.000	-.001	-.004	.001	-.001

LOADING - RESTRAINED HEIGHT (YOUTH)
 DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT NO.	LOC.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
HEAD - (	500H		.000	-.000	-.001	-.004	.001	-.001
>=	305		.000	-.000	-.001	-.002	.000	-.000
RIGID - (	310		.000	-.000	-.000	-.002	.000	-.000
STRAIGHT - (	315		-.000	-.000	-.000	-.000	.000	-.000
ANCHOR								
BRANCH PT.								
STRAIGHT - (	290		-.001	-.000	.003	-.019	.003	-.005
>=	500N		-.001	-.002	.003	-.020	.003	-.005
LEAD - (	500H		-.002	-.004	.003	-.020	.003	-.005
>=	500F		-.002	-.004	.005	-.020	.004	-.005
STRAIGHT - (	505		-.003	-.004	.007	-.020	.004	-.004
MIGID - (	510		-.004	-.004	.012	-.020	.004	-.004
STRAIGHT - (	515H		-.003	-.004	.032	-.017	.007	.008
HEAD - (	515H		-.002	-.004	.033	-.017	.007	.010
>=	515F		-.002	-.003	.033	-.017	.007	.011
STRAIGHT - (	520		-.002	-.000	.030	-.016	.007	.008
STRAIGHT - (	525		-.002	-.000	.020	-.014	.007	-.004
STRAIGHT - (	530N		-.002	-.001	.018	-.014	.006	-.005
HEAD - (	530H		-.002	-.002	.017	-.014	.005	-.004
>=	530F		-.002	-.002	.016	-.013	.005	-.003
STRAIGHT - (	535H		-.001	-.002	.002	-.010	.000	-.001
HEAD - (	535H		-.000	-.002	.001	-.010	.000	-.001
>=	535F		-.000	-.001	.001	-.009	-.000	-.002
STRAIGHT - (	540		-.000	-.000	.001	-.007	-.000	-.003
STRAIGHT - (	545H		-.001	.001	.001	-.006	-.000	-.003

LOADING - RESTRAINTS - HEIGHT (YOUNG)
 DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
		X	Y	Z	X AXIS	Y AXIS	Z AXIS
>= 545P	(	-.001	.001	.001	-.066	-.000	-.003
HEAD - (	545A	-.001	.001	.001	-.005	-.000	-.004
>= 545F	(	-.001	.001	.001	-.004	-.000	-.004
>= 550N	(	-.001	.000	.001	-.003	-.000	-.004
HEAD - (	550H	-.000	.000	.000	-.003	-.000	-.003
>= 550F	(	-.000	.000	.000	-.002	-.000	-.002
ANCHOR	--	.000	.000	.000	-.000	-.000	-.000
BRANCH PT.	--	-.013	-.000	-.020	.023	-.005	-.026
>= 400	(	-.013	.005	-.029	.022	-.005	-.019
>= 405	(	-.013	.000	-.029	.008	.004	.020
>= 410	(	-.013	-.000	-.006	-.033	.020	-.001
>= 415	(	-.013	-.000	.036	-.074	.026	-.014
>= 420	(	-.013	-.000	.080	-.115	.021	.060
>= 425	(	-.013	-.126	.105	-.156	.006	-.012
>= 430N	(	-.013	-.009	.102	-.186	-.012	-.135
HEAD - (	430H	-.016	-.003	.105	-.187	-.013	-.134
>= 430F	(	-.022	-.000	.113	-.188	-.014	-.133
>= 435N	(	-.075	-.000	.192	-.195	-.023	-.123
HEAD - (	435H	-.080	-.004	.201	-.196	-.024	-.122
>= 435F	(	-.081	-.013	.205	-.196	-.025	-.120
>= 440	(	-.051	-.169	.205	-.093	-.036	-.093
>= 445N	(	.028	-.011	.205	.171	-.036	-.035
HEAD - (	445H	.029	-.003	.202	.167	-.036	-.033

LOADING - RESTRAINED WEIGHT (VORIF)
 DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
HEAD - (	445H		.029	-.003	.202	.167	-.036	-.033
>=	445F		.028	-.000	.194	.163	-.035	-.032
STRAIGHT - (	450H		-.004	-.000	.001	.015	-.010	-.004
>=	450H		-.004	.000	.000	.011	-.010	-.004
STRAIGHT - (	450F		-.004	.000	-.000	.008	-.009	-.004
>=	460		-.000	.000	-.000	-.000	-.000	-.000
ANCHOR								

DYNALLEX

PAGE 31

HANGER DESIGN DATA

EXPLANATORY NOTES:

- (1) ALL MOVEMENTS SHOWN BELOW REFER TO THE INITIAL EXPANSION LOADING CASE WHEREIN TENTATIVE HANGER LOCATIONS HAVE NOT BEEN VERTICALLY RESTRAINED AND ALL WEIGHT EFFECTS HAVE BEEN SUPPRESSED.
- (2) THE WEIGHT REACTIONS SHOWN BELOW REFER TO THE WEIGHT LOADING CASE WHEREIN TENTATIVE HANGER LOCATIONS HAVE BEEN RIGIDLY RESTRAINED IN THE VERTICAL DIRECTION AND ALL THERMAL EFFECTS INCLUDING IMPOSED ANCHOR MOVEMENTS HAVE BEEN SUPPRESSED.
- (3) IN THE FOLLOWING TABLE VSH DENOTES A VARIABLE SPRING HANGER AND CSH DENOTES A CONSTANT SUPPORT HANGER.
- (4) THE SUPPORT LOADS IN THE INSTALLED CONDITION HAVE BEEN CALCULATED TO PRODUCE THE CORRECT WEIGHT BALANCE IN THE OPERATING CONDITION.
- (5) IF THE FREE VERTICAL MOVEMENT EXCEEDS THE MAXIMUM RIGID SUPPORT DISPLACEMENT CRITERION OF .10 IN , A VARIABLE SPRING IS SELECTED. IF A VARIABLE SPRING HANGER CANNOT BE FOUND WHICH SATISFIES BOTH THE LOAD VARIATION CRITERION SELECTED BY THE USER AND THE WORKING RANGE OF THE SPRINGS LISTED IN SPRING TABLE (1) OF THE USER'S MANUAL, A CONSTANT SUPPORT HANGER IS RECOMMENDED.
- (6) THE NOMINAL ROD DIAMETER FOR RIGID HANGERS IS TAKEN FROM ANSI-B31.1 - 1977 TABLE 121.2.2(A), (CARRYING CAPACITIES OF THREADED ASTM A 107 HOT ROLLED CARBON STEEL) ASSUMING A ROD TEMPERATURE OF 650 DEGREES FAHRENHEIT. A MINIMUM 1/2 IN. DIAMETER ROD WILL BE SELECTED FOR ALL PIPE WHICH IS NOMINALLY 2-1/2 IN. OR LARGER.
- (8) THE SO-CALLED "THEORETICAL" SPRING INSTALLATION LOAD SHOWN BELOW PRESUPPOSES THAT THE HANGER LOCATION IS RESTRAINED AGAINST VERTICAL MOVEMENT WHILE THE SPRING IS SET TO THE COLD LOAD.

DYNAFLEX

PAGE 52

HANGER DESIGN DATA TABLE

HANGER LOC. NO.	FREE SUPPORT LOAD (POUNDS)	VERTICAL MOVEMENT (INCHES)	HORIZONTAL MOVEMENT (INCHES)		TYPE	PRELIMINARY HANGER SELECTION SPECIFICATION	SWING	
			X	Z			LENGTH (FEET)	ANGLE (DEG)
100F	1083.	.27	-.28	-.66	VSH	1 - SHORT RANGE SPRING. SPRING RATE = 400 LBS/IN THEORETICAL SPRING INSTALLATION LOAD = 1192 LBS SPRING LOAD IN THE OPERATING CONDITION = 1083 LBS	N/A	N/A
270	414.	-.10	-.32	-.61	VSH	1 - SHORT RANGE SPRING. SPRING RATE = 168 LBS/IN THEORETICAL SPRING INSTALLATION LOAD = 397 LBS SPRING LOAD IN THE OPERATING CONDITION = 414 LBS	N/A	N/A
2A5	887.	.03	-.15	-.20	RIGID	REQUIRED MINIMUM CROSS SECTIONAL ROOT AREA = .13 SQ IN BASED ON AN ALLOWABLE STRESS OF 9000 PSI	N/A	N/A
520	439.	-.07	-.30	-.16	RIGID	REQUIRED MINIMUM CROSS SECTIONAL ROOT AREA = .13 SQ IN BASED ON AN ALLOWABLE STRESS OF 9000 PSI	N/A	N/A
525	249.	-.29	-.09	-.12	VSH	1 - SHORT RANGE SPRING. SPRING RATE = 94 LBS/IN THEORETICAL SPRING INSTALLATION LOAD = 222 LBS SPRING LOAD IN THE OPERATING CONDITION = 249 LBS	N/A	N/A
216 540	323.	-.13	-.04	-.04	VSH	1 - SHORT RANGE SPRING. SPRING RATE = 126 LBS/IN THEORETICAL SPRING INSTALLATION LOAD = 309 LBS SPRING LOAD IN THE OPERATING CONDITION = 323 LBS	N/A	N/A
405F	389.	.33	-.79	.13	VSH	1 - SHORT RANGE SPRING. SPRING RATE = 168 LBS/IN THEORETICAL SPRING INSTALLATION LOAD = 445 LBS SPRING LOAD IN THE OPERATING CONDITION = 389 LBS	N/A	N/A

DYNAFLEX

PAGE 53

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* * * * *
*   STATIC SOLUTION ACCURACY CHECKS   *
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EACH BASIC STATIC SOLUTION COMPRISING EACH LOAD OR LOADING COMBINATION SPECIFIED IN THIS RUN HAS BEEN SUBJECTED TO EQUILIBRIUM AND COMPATIBILITY CHECKS FOR ALL POINTS IN THE SYSTEM:

LOADING = FREE THERMAL

STATIC EQUILIBRIUM AND COMPATIBILITY HAVE BEEN SATISFIED FOR THIS BASIC STATIC SOLUTION AT ALL POINTS IN THE SYSTEM.

LOADING = RESTRAINED WEIGHT (*UNIF)

STATIC EQUILIBRIUM AND COMPATIBILITY HAVE BEEN SATISFIED FOR THIS BASIC STATIC SOLUTION AT ALL POINTS IN THE SYSTEM.

217

DYNAFLEX

TABLE OF CONTENTS

218

INPUT DATA - (CARD IMAGES)	1
EDITED PIPING SYSTEM DESCRIPTION	4
LOADING - FREE THERMAL	
FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS	15
INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS	17
INTERNAL FORCES AND MOMENTS ORIENTED TO X-Y AND Z AXES	23
DISPLACEMENTS AND ROTATIONS	28
LOADING - RESTRAINED WEIGHT (+UNIF)	
FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS	33
INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS	35
INTERNAL FORCES AND MOMENTS ORIENTED TO X-Y AND Z AXES	41
DISPLACEMENTS AND ROTATIONS	46
HANGER DESIGN DATA TABLE	51
STATIC SOLUTION ACCURACY CHECKS	53


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FOREWORD

THE FOLLOWING REPORT WAS GENERATED BY THE DYNAFLEX PIPING ANALYSIS PROGRAM. THE PROGRAM ACCOMMODATES THE WIDEST RANGE OF PRACTICAL SITUATIONS ENCOUNTERED IN MODERN PIPING SYSTEMS INCLUDING DYNAMIC AS WELL AS THERMAL, HEIGHT AND PRESSURE EFFECTS.

FOR FURTHER INFORMATION OR PROMPT ASSISTANCE IN USING THE DYNAFLEX PROGRAM, PLEASE CONTACT YOUR LOCAL COMPUTER CENTER REPRESENTATIVE OR:

ENGINEERING SERVICES MANAGER
 ADION COMPUTING CORPORATION
 1 METRO PLAZA
 505 THORNTON STREET
 EDISON, N.J. 08817

219

THE STRESS FORMULATION OF
 ANSI B31.1 - 1977
 INCLUDING THE LATEST MANDATORY UPDATES
 HAS BEEN APPLIED IN THIS ANALYSIS

THE TABLE OF CONTENTS APPEARS AT THE END OF THIS REPORT.

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*****
*
*
* STEARNS - ROGER CAMP *
*
*
* JOHN SOLAR PILOT PLANT - DUE - G-21700 *
*
* REC'D FROM THE TU (UEN)(A-FW-02-A-2) *
*
*
* 2/29/80 *
*
*
*****

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DYNAFLEX

STEARNS - ROGER COMP

PAGE 1

PROJECT - 10MW SULAR MILID PLANT - DOE - C-21700
 JOB - RECVM FW-RTMS TO TOWER(X-FW-02-A-2)

DATE 2/24/80

INPUT DATA - (CARD IMAGES)

LINE NUMBER	STYLOID:FRMID	DELTA X	DELTA Y	DELTA Z	RADIUS	ADDITIONAL DATA	LINE NUMBER
1	170175					STEARNS - ROGER COMP	1
2	170175					2/24/80, PNOJ, 100, 50	2
3	170175					BLAH PLOT PLANT - DOE	3
4	170175					C-21700, JOBLECVM F	4
5	170175					RTMS TO TOWER(X-FW-	5
6	170175					02-A-2)	6
7	170175					RTMS TO TOWER(X-FW-	7
8	170175					02-A-2)	8
9	170175					RTMS TO TOWER(X-FW-	9
10	170175					02-A-2)	10
11	170175					RTMS TO TOWER(X-FW-	11
12	170175					02-A-2)	12
13	170175					RTMS TO TOWER(X-FW-	13
14	170175					02-A-2)	14
15	170175					RTMS TO TOWER(X-FW-	15
16	170175					02-A-2)	16
17	170175					RTMS TO TOWER(X-FW-	17
18	170175					02-A-2)	18
19	170175					RTMS TO TOWER(X-FW-	19
20	170175					02-A-2)	20
21	170175					RTMS TO TOWER(X-FW-	21
22	170175					02-A-2)	22
23	170175					RTMS TO TOWER(X-FW-	23
24	170175					02-A-2)	24
25	170175					RTMS TO TOWER(X-FW-	25
26	170175					02-A-2)	26
27	170175					RTMS TO TOWER(X-FW-	27
28	170175					02-A-2)	28
29	170175					RTMS TO TOWER(X-FW-	29
30	170175					02-A-2)	30
31	170175					RTMS TO TOWER(X-FW-	31

INPUT DATA - (CARD IMAGES)

LINE NUMBER	TYPE	LOC	FORM	DELTA X	DELTA Y	DELTA Z	RADIUS	ADDITIONAL DATA	LINE NUMBER
31		14		17	110	113	125	149	160
32									
33									
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71									

DYNAFLEX

STEARNS - ROGER CORP

PAGE 4

PROJECT - 10MW SOLAR PILEU PLANT - DOE - C-21700
 JOB - RECVR FN-HTR'S TO TOWER(X-FW-02-A-2)

DATE 2/29/80

 *
 * EDITED PIPING SYSTEM DESCRIPTION *
 * ----- *
 *
 * *****

EXPLANATORY NOTES

IN THE EDITED PIPING SYSTEM DESCRIPTION:

- 223
- (1) POINT LOCATION NUMBER SUFFIXES N, H AND F IDENTIFY THE NEAR POINT, THE MID POINT AND THE FAR POINT RESPECTIVELY OF A PIPING ELEMENT IN THE DIRECTION IN WHICH THE LINE IS TRAVERSED. FRACTIONAL NODE NUMBERS APPEARING IN THE FOLLOWING REPORTS IDENTIFY THOSE NODES AT WHICH THE PROGRAM HAS INTRODUCED EVENLY SPACED LUMP POINTS AND ARE DETERMINED FROM THE MAXIMUM LUMP SPACING CRITERIA ENTERED BY THE USER. IF FRACTIONAL NODE NUMBERS ARE ASSIGNED TO MORE THAN ONE ELEMENT ORIGINATING AT THE SAME BRANCH POINT, A LETTER WILL PRECEDE THE FRACTIONAL PORTION OF THE NUMBER TO UNIQUELY IDENTIFY EACH POINT (E.G. 2.5A). LETTERS ARE ASSIGNED TO ELEMENTS ALPHABETICALLY IN THE ORDER OF THEIR APPEARANCE IN THE INPUT DATA.
 - (2) AMBIENT TEMPERATURE IS ASSUMED TO BE 70 DEGREES FAHRENHEIT.
 - (3) THE MAXIMUM ALLOWABLE DIFFERENCE IN LOOP CLOSURE CALCLLATIONS IS ASSUMED TO BE .25 INCHES.
 - (4) THE MAXIMUM ALLOWABLE DIFFERENCE BETWEEN THE CALCULATED AND INPUT COORDINATES OF USER DESIGNATED CHECK POINTS IS ASSUMED TO BE .25 INCHES.
 - (5) IN ORDER TO MAKE IT POSSIBLE IN CERTAIN SITUATIONS TO PERFORM INDEPENDENT WEIGHT AND THERMAL ANALYSES IN THE SAME RUN AND APPLY THE CODE STRESS CALCULATIONS CORRECTLY, THE PROGRAM MAKES CERTAIN ASSUMPTIONS. IF THE INPUT DATA SPECIFIES IMPOSED MOVEMENTS ON ANCHORS (ANC) OR DISPLACEMENTS OR ROTATIONS ON RIGID RESTRAINTS (RAD, RAR) THESE ARE ASSUMED BY THE PROGRAM TO BE THERMAL EFFECTS AND INCLUDED ONLY IN THOSE LOADING CASES WHICH INCLUDE THERMAL. ALTERNATELY, IF THE INPUT DATA SPECIFIES FORCES AND MOMENTS (FOR, FOM) OR IMPOSED DISPLACEMENTS OR ROTATIONS ON FLEXIBLE RESTRAINTS (RAD, RAR) THESE ARE ASSUMED TO BE WEIGHT EFFECTS AND INCLUDED ONLY IN THOSE LOADING CASES WHICH INCLUDE WEIGHT. IF THESE ASSUMPTIONS ARE INVALID FOR A PARTICULAR SITUATION, THE USER CAN ACCURATELY MODEL THE MOST GENERAL SITUATION BY USING THE AUXILIARY SUPPORT MOVEMENTS (ASM) AND THE AUXILIARY CONCENTRATED LOADS (ACL) FEATURE OF THE PROGRAM AS AN ALTERNATE METHOD OF SPECIFYING THESE EFFECTS.
 - (14) STRESS INTENSIFICATION FACTORS SPECIFIED AT THE TANGENT INTERSECTION POINT OF A BEND OR FITER WILL BE APPLIED TO THE NEAR, MID AND FAR POINTS OF THE BEND OR FITER.
 - (15) THE TABLE OF CONTENTS APPEARS AT THE END OF THIS REPORT.

DYNAFLEX

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 5

GENERAL DATA

COORDINATES OF ALL POINTS OF THE SYSTEM ARE WITH RESPECT TO POINT 170, WHICH IS THE ORIGIN

MATERIALS USED (TEMPERATURE DEPENDENT PROPERTIES ARE SHOWN AT POINT OF TEMPERATURE CHANGE)

LCS - LOW CARBON STEEL

YOUNG'S MODULUS AT AMBIENT TEMPERATURE = 27,900,000. PSI

POISSON'S RATIO = .30

DENSITY = 490. POUNDS PER CUBIC FOOT

SHOCK AND SPECTRUM DATA

MODE CUTOFF SET AT 20

FREQUENCY CUTOFF SET AT 33.00 CPS

SPECTRUM 1		SPECTRUM 2	
(LOGARITHMIC INTERPOLATION)		(LOGARITHMIC INTERPOLATION)	
FREQUENCY	G	FREQUENCY	G
CPS		CPS	
.10	.01	.10	.01
.25	.04	.25	.06
2.50	.64	2.50	.64
9.00	.53	9.00	.53
33.00	.13	33.00	.13

FREQUENCY

G

FREQUENCY

G

CPS

CPS

.10

.01

.10

.01

.25

.04

.25

.06

2.50

.64

2.50

.64

9.00

.53

9.00

.53

33.00

.13

33.00

.13

SHOCK SPECIFICATIONS

SHOCK 1 CONSISTS OF :

100.00 PERCENT OF SPECTRUM 1 IN THE X DIRECTION.

THE GLOBAL COMPONENTS OF THIS SHOCK ARE ASSUMED TO ACT INDEPENDENTLY

THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE ARE COMBINED USING

THE CLOSELY SPACED FREQUENCY (CSF) METHOD.

CLOSELY SPACED MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND

THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

DYNAFLEX

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 6

SHOCK 2 CONSISTS OF :

100.00 PERCENT OF SPECTRUM 1 IN THE Z DIRECTION.

THE GLOBAL COMPONENTS OF THIS SHOCK ARE ASSUMED TO ACT INDEPENDENTLY

THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE ARE COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD.

CLOSELY SPACED MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

SHOCK 3 CONSISTS OF :

100.00 PERCENT OF SPECTRUM 2 IN THE Y DIRECTION.

THE GLOBAL COMPONENTS OF THIS SHOCK ARE ASSUMED TO ACT INDEPENDENTLY

THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE ARE COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD.

CLOSELY SPACED MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

SHOCK 4 CONSISTS OF :

100.00 PERCENT OF SPECTRUM 1 IN THE X DIRECTION AND
100.00 PERCENT OF SPECTRUM 2 IN THE Y DIRECTION AND
100.00 PERCENT OF SPECTRUM 1 IN THE Z DIRECTION.

THE GLOBAL COMPONENTS OF THIS SHOCK ARE ASSUMED TO ACT INDEPENDENTLY

THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE ARE COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD.

CLOSELY SPACED MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

225

LOADING CONDITIONS ANALYZED

- SHOCK 1
- SHOCK 2
- SHOCK 3
- SHOCK 4

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (DEG) MATERIAL	DIST. LOADS (LBS PER FT)	
			X	Y	Z							WT.	UNIF
ANCHR		170	0.00	0.00	0.00								

* NOTES PERTAINING TO POINT 170 APPEAR ON THE FOLLOWING PAGE

DYNAFILE

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 7

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (FAHR)	PRESS (PSI)	DIST. LOADS (LBS-PER-FT)	
			X	Y	Z								WT.	UNIF.
ANCHR		--170	0.00	0.00	0.00									
	STRAIGHT	(					4.00		4.500	.674	LESS 440.		27.6	0.0
	(
	(
	(
	(
	(
	(
	(
		>-170.1	0.00	0.00	-4.00									
	STRAIGHT	(					4.00							
	(
	(
	(
	(
	(
	(
		>-175	0.00	0.00	-8.00									
	(
	(
	(
	(
	(
	(
		>-170.1	0.00	0.00	-4.00									
	STRAIGHT	(					4.00							
	(
	(
	(
	(
	(
	(
		>-175	0.00	0.00	-8.00									
	(
	(
	(
	(
	(
		>-175.1	0.00	0.00	-12.28									
	STRAIGHT	(					4.28							
	(
	(
	(
	(
	(
	(
		>-175.2	0.00	0.00	-16.56									
	STRAIGHT	(					4.28							
	(
	(
	(
	(
	(
	(
		>-190N	0.00	0.00	-20.83									
	(
	(
	(
	(
	(
		>-190N	0.00	0.00	-20.83									
	(
	(
	(
	(
	(
		>-190F	0.00	-0.50	-21.33									
	STRAIGHT	(					4.74							
	(
	(
	(
	(
	(
	(
		>-190F.1	0.00	-5.24	-21.33									
	STRAIGHT	(					4.74							
	(
	(
	(
	(
	(
		>-190F.2	0.00	-9.98	-21.33									
	STRAIGHT	(					4.74							
	(
	(
	(
	(
		>-190F.3	0.00	-14.73	-21.33									
	STRAIGHT	(					4.74							
	(
	(
	(
	(
		>-195N	0.00	-19.47	-21.33									
	(
	(
	(
	(
	(
		>-195N	0.00	-19.47	-21.33									
	(
	(
	(
	(
		>-195F	0.00	-19.97	-21.83									
	STRAIGHT	(					4.33							
	(
	(
	(
	(
		>-195F.1	0.00	-19.97	-26.17									
	(

226

DYNAFLEX EDITED PIPING SYSTEM DESCRIPTION (CONTINUED) PAGE 8

POINT TYPE	ELEMENT DESIGNATION NO.	POINT COORDINATES (FT) X Y Z	HAZIOS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER THICK (IN)	WALL (IN)	TEMP (DEG) PRESS-PIPE (PSI) UNIF	DIST. LOADS (LBS-FT)
STRAIGHT	>-195F.1	0.00 -19.97 -26.17		4.33			4.508 .674	LCS: 400. ; 27.6; 8.0;	
BEND	>-205M	0.00 -19.97 -30.50			90.000				
STRAIGHT	>-205F	0.00 -20.12 -30.85	.50						
STRAIGHT	>-205F	0.00 -20.47 -31.00							
POINT	>-210	0.00 -22.45 -31.00							
STRAIGHT	>-210.1	3.00 -22.45 -31.00		3.00					
STRAIGHT	>-220	6.00 -22.45 -31.00		5.00					
STRAIGHT	>-220.1	11.00 -22.45 -31.00		5.00					
STRAIGHT	>-225	16.00 -22.45 -31.00							
POINT	>-225.1	20.22 -22.45 -31.00							
STRAIGHT	>-225.2	24.44 -22.45 -31.00		4.22					
BEND	>-230M	24.67 -22.45 -31.00			90.000				
STRAIGHT	>-230M	29.02 -22.45 -31.15	.50						
STRAIGHT	>-230F	24.17 -22.45 -31.50		3.00					
STRAIGHT	>-235	24.17 -22.45 -34.50							

NOTES PERTAINING TO POINT 235 APPEAR ON THE FOLLOWING PAGE

DYNAFLEX

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

PAGE 9

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE WALL		TEMP (DEG)	DIST. LOADS (LBS PER FT)		
			X	Y	Z				DIAMETER (IN)	THICK (IN)		MATL	PRESS (PSI)	WT.	UNIT
		>-235	29.17	-22.45	-34.50				4.500	.674	LCS	440.	27.6	8.0
		(
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 235											
		(	IN DIRECTION Y											
	STRAIGHT	-					4.75							
		(
	STRAIGHT	>-235.1	29.17	-22.45	-39.25		4.75							
		(
	STRAIGHT	>-240	29.17	-22.45	-44.00									
		(
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 240											
		(	IN DIRECTION Y											
	STRAIGHT	-					4.78							
		(
	STRAIGHT	>-240.1	29.17	-22.45	-48.78		4.78							
		(
	STRAIGHT	>-240.2	29.17	-22.45	-53.56		4.78							
		(
228	STRAIGHT	>-245	29.17	-22.45	-58.33									
		(
		(	* RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 245											
		(	IN DIRECTION Y											
	STRAIGHT	-					3.92							
		(
		>-250N	29.17	-22.45	-62.25									
		(
	UEND	-	250N	29.17	-22.59	-62.60	.50	.79	90.000					
		(
	STRAIGHT	>-250F	29.17	-22.95	-62.75		2.99							
		(
		>-255N	29.17	-25.94	-62.75									
		(
	HEND	-	255N	29.31	-26.29	-62.75	.50	.79	90.000					
		(
	STRAIGHT	>-255F	29.67	-26.44	-62.75		3.33							
		(
		>-260	33.00	-26.44	-62.75									

* NOTES PERTAINING TO POINT 260 APPEAR ON THE FOLLOWING PAGE

POINT TYPE DESIGNATION	COORDINATES (FT) X Y Z	RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER THICK (IN) (IN)	WALL MATERIAL (PSI)	TEMP (DEG) (FAMR)	DIST. LOADS (LBS-PER FT)
>285.1	56.75 -17.37 -62.75				4.500	674	LC83 440	27.61 d.01
STRAIGHT - (			3.57					
OR PT	56.75 -13.00 -62.75							
(* FELDING TEE AT POINT 290								
STRAIGHT - (			.34					
>295N	56.75 -13.46 -62.75							
BEND - (	56.88 -13.10 -62.69	.50	.79	90.000				
>295F	57.20 -12.96 -62.54		1.57					
>300N	58.63 -12.96 -61.80							
BEND - (	58.95 -13.10 -61.73	.50	.79	90.000				
>305	59.08 -13.46 -61.67							
(* POINT 305 IS EQUIVALENT TO POINT 300F								
RIGID - (			1.33		N/A	N/A		N/A
(* WEIGHT OF ELEMENT = 250. POUNDS								
>310	59.08 -14.79 -61.67		.50					
ANCHR	59.08 -15.29 -61.67							
(* CONTROL COORDINATES OF POINT 315, IN FEET -								
X = 59.08, Y = -15.29, Z = -61.67								
REQUIRED DIFFERENCE IS ZERO								
(* IMPOSED MOVEMENT OF ANCHOR 315, IN INCHES -								
DELTA X = 0.00, DELTA Y = .18, DELTA Z = 0.00								
OR PT	56.75 -13.00 -62.75							

* NOTES PERTAINING TO POINT 290 APPLN IN THE FOLLOWING PAGE

POINT TYPE	ELEMENT DESIGNATION	LOC. NO.	COORDINATES (FT)		RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE WALL		TEMP (DEG)	PRESSURE (PSI)	UNIF	DIST. LOADS (LBS PER FT)
			X	Y				DIAMETER (IN)	THICK (IN)				
HR PT		290	56.75	-13.80	-62.75								
(		WELDING TEE AT POINT 290											
(
STRAIGHT					.50								
(
(
BEND					.79	90.000							
(
(
STRAIGHT					.50								
(
(
WELD					1.33								
(
(
STRAIGHT					2.58								
(
(
STRAIGHT					2.58								
(
(
BEND					.79	90.000							
(
(
STRAIGHT					1.50								
(
(
STRAIGHT					3.50								
(
(
STRAIGHT					3.50								
(
(
STRAIGHT					1.50								
(
(
BEND					.79	90.000							
(
(
STRAIGHT					2.75								
(
(
STRAIGHT					2.75								
(
(
BEND					.79	90.000							
(
(

POINT TYPE	ELEMENT DESIGNATION	POINT LOC. NO.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	TEMP (FAHR)	DIST. LOADS (LBS-PER-FT)		
			X	Y	Z							WT.	UNIF	
	BEND - (	535H	67.75	-15.44	-63.60	.50	.79	90.000	4.500	.674	LCS	440.	27.61	8.0
	(
	>535F		67.75	-15.29	-63.25									
	STRAIGHT - (						.50							
	>540		67.75	-15.29	-62.75									
	STRAIGHT - (						.50							
	>545N		67.75	-15.29	-62.25									
	(
	BEND - (	545H	67.90	-15.24	-61.90	.50	.79	90.000						
	(
	>545F		60.25	-15.29	-61.75									
	STRAIGHT - (						.50							
	>550N		68.75	-15.29	-61.75									
	(
	BEND - (	550H	69.10	-15.15	-61.75	.50	.79	90.000						
	(
232	>550F		69.25	-14.79	-61.75									
	STRAIGHT - (						1.50							
	ANCHR	--555	69.25	-13.29	-61.75									
	(
	(	* IMPOSED MOVEMENT OF ANCHOR 555, IN INCHES :												
	(	DELTA X = 0.00, DELTA Y = -.07, DELTA Z = 0.00												
	(	* CONTROL COORDINATES OF POINT 555, IN FEET :												
	(	X = 69.25, Y = -13.29, Z = -61.75												
	(	RESULTANT DIFFERENCE IS ZERO												
	(
	BR PT	--210	0.00	-22.45	-31.00									
	(
	(	* WELDING TEE AT POINT 210												
	(
	STRAIGHT - (						1.00							
	(
	(	* STRESS INTENSIFICATION SPECIFIED AT POINT 400												
	(	STRESS INTENSIFICATION FACTOR = 2.00												
	(
	>400		-1.00	-22.45	-31.00									

* NOTES PERTAINING TO POINT 400 APPEAR ON THE FOLLOWING PAGE

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

POINT TYPE DESIGNATION NO.	POINT LOC.	COORDINATES (FT)			RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE WALL		TEMP (F)	DIST. LOADS (LBS-PER-FT)
		X	Y	Z				DIAMETER THICK (IN)	MAIL (PSI)			WT. UNIF
>400		-1.00	-22.45	-31.00				4.500	.674	LCS: 440.0	27.61 8.03
STRAIGHT - (					3.00			2.875	.502		13.11 3.71
(
(
(
>405		-4.00	-22.45	-31.00							
(
(
(
(
>405.1		-0.75	-22.45	-31.00							
STRAIGHT - (					4.25						
(
>410		-12.50	-22.45	-31.00							
(
(
(
>410.1		-16.75	-22.45	-31.00							
STRAIGHT - (					4.25						
(
>415		-21.00	-22.45	-31.00							
(
(
>415.1		-25.25	-22.45	-31.00							
STRAIGHT - (					4.25						
(
>420		-29.50	-22.45	-31.00							
STRAIGHT - (

* NOTES PERTAINING TO POINT 420 APPEAR ON THE FOLLOWING PAGE

EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

DIST. LOADS
(LBS-PEM-FT)

POINT ELEMENT TYPE DESIGNATION NO.	POINT ELEM. NO.	X	Y	Z	RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	MALL THICK (IN)	TEMP (FARK)	UNIF WT.	
>-420	(	-29.50	-22.45	-31.00				2.875	.523	LC81 490.	13.11 3.73
((RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 420										
((IN DIRECTION Y										
STRAIGHT - (	(					4.25					
STRAIGHT - (	(	-420.1	-33.75	-22.45	-31.00	4.25					
>-425	(	-36.00	-22.45	-31.00		3.69					13.11
>-425.1	(	-41.09	-22.45	-31.00		3.09					
>-430N	(	-44.19	-22.45	-31.00							
BEND - (	(	-44.41	-22.54	-31.00	.31	.49	90.000				
>-430F	(	-44.50	-22.76	-31.00							
((RIGID RESTRAINT AGAINST DISPLACEMENT AT POINT 430F										
((IN DIRECTION X										
STRAIGHT - (	(					1.97					
>-435N	(	-44.50	-24.73	-31.00							
>-435N	(	-44.50	-24.45	-31.00	.31	.49	90.000				
>-435F	(	-44.50	-25.04	-31.31		4.69					13.11
>-440	(	-44.50	-25.04	-36.00		4.04					14.11
>-440.1	(	-44.50	-25.04	-40.44		4.04					
>-445N	(	-44.50	-25.04	-45.69							
BEND - (	(	-44.50	-25.13	-45.91	.31	.49	90.000				
>-445F	(	-44.50	-25.35	-46.00		3.51					
>-445F.1	(	-44.50	-24.86	-46.00		3.51					
>-445F.2	(	-44.50	-32.38	-46.00							

DYNALOX EDITED PIPING SYSTEM DESCRIPTION (CONTINUED)

POINT TYPE	COORDINATES (FT)	RADIUS (FT)	LENGTH (FT)	ANGLE (DEG)	OUTSIDE DIAMETER (IN)	WALL THICK (IN)	MATL	TEMP (F)	PHES (PSI)	UNIF	DIST. LOADS (LBS PER FT)	
STRAIGHT - (	-44.50	-32.18	-46.00		2.875	.522	LCS	440.0			13.11	3.71
	-44.50	-35.89	-46.00	5.51								
HEND - (	-44.50	-36.11	-46.00	90.000								
	-44.50	-36.20	-46.51	3.69							13.11	
STRAIGHT - (	-44.50	-36.20	-50.00									
ANCHR												

* CONTROL COORDINATES OF POINT 460 IN FEET
 X = -44.50, Y = -36.20, Z = -50.00
 RESULTANT DIFFERENCE IS ZERO

DYNAFLEX

PAGE 17

 *
 * LUMPED DYNAMIC MODEL *
 * ----- *
 *

EXPLANATORY NOTES:

- (1) THE MASS OF THE SYSTEM IS LUMPED AT THE POINTS SHOWN BELOW. FRACTIONAL LOCATION NUMBERS, IF ANY, RESULT FROM ADDITIONAL MASS POINTS LOCATED BY THE PROGRAM BASED ON THE MAXIMUM LUMP SPACING CRITERION GIVEN IN THE INPUT DATA.
- (2) THE MASS AT A POINT IS A COMBINATION OF DISTRIBUTED MASS LUMPED IN A LINEAR FASHION PLUS ANY ADDITIONAL CONCENTRATED MASS INPUT BY THE USER (SHOWN IN PARENTHESES).
- (3) ROTATIONAL DEGREES OF FREEDOM ARE NOT INCLUDED IN THE MODEL UNLESS SPECIFICALLY ADDED BY THE USER. ALL THREE DISPLACEMENT DEGREES OF FREEDOM ARE AUTOMATICALLY DELETED AT ANCHORS. THE DEGREE OF FREEDOM ASSOCIATED WITH A RIGID RESTRAINT OR SPOONER ORIENTED IN THE X, Y OR Z DIRECTION IS ALSO DELETED.

238

LUC. NO.	DISPLACEMENT FREEDOM			ROTATIONAL FREEDOM			
	WEIGHT (POUNDS)	DIRECTION		MOMENT OF INERTIA (LB-IN-K-IN)			
				X	Y	Z	
170	71.			0.	0.	0.	
170.1	142.	X	Y	Z	0.	0.	0.
175	147.	X		Z	0.	0.	0.
175.1	152.	X	Y	Z	0.	0.	0.
175.2	152.	X	Y	Z	0.	0.	0.
190N	90.	X	Y	Z	0.	0.	0.
190F	90.	X	Y	Z	0.	0.	0.
190F.1	168.	X	Y	Z	0.	0.	0.
190F.2	168.	X	Y	Z	0.	0.	0.
190F.3	168.	X	Y	Z	0.	0.	0.
195N	91.	X	Y	Z	0.	0.	0.
195F	91.	X	Y	Z	0.	0.	0.
195F.1	154.	X	Y	Z	0.	0.	0.

DYNAPLEX

LUMPED DYNAMIC MODEL (CONTINUED)

PAGE 18

LOC. NO.	DISPLACEMENT FREEDOM			ROTATIONAL FREEDOM			
	WEIGHT (POUNDS)	DIRECTION			MOMENT OF INERTIA (Lb - IN - IN)		
		X	Y	Z	X	Y	Z
205N	91.	X	Y	Z	0.	0.	0.
205F	49.	X		Z	0.	0.	0.
210	106.	X	Y	Z	0.	0.	0.
210.1	107.	X	Y	Z	0.	0.	0.
220	142.	X	Y	Z	0.	0.	0.
220.1	178.	X	Y	Z	0.	0.	0.
225	164.	X		Z	0.	0.	0.
225.1	150.	X	Y	Z	0.	0.	0.
225.2	150.	X	Y	Z	0.	0.	0.
230N	89.	X	Y	Z	0.	0.	0.
230F	67.	X	Y	Z	0.	0.	0.
235	136.	X		Z	0.	0.	0.
235.1	169.	X	Y	Z	0.	0.	0.
240	169.	X		Z	0.	0.	0.
240.1	170.	X	Y	Z	0.	0.	0.
240.2	170.	X	Y	Z	0.	0.	0.
245	154.	X		Z	0.	0.	0.
250N	84.	X	Y	Z	0.	0.	0.
250F	67.	X	Y	Z	0.	0.	0.
255N	67.	X	Y	Z	0.	0.	0.
255F	73.	X	Y	Z	0.	0.	0.
260	112.	X		Z	0.	0.	0.
260.1	107.	X	Y	Z	0.	0.	0.

237

DYNAFLEX

LUMPED DYNAMIC MODEL (CONTINUED)

PAGE 19

DISPLACEMENT FREEDOM

ROTATIONAL FREEDOM

MOMENT-OF INERTIA (LB - IN - IN)

LUC.
NO.

WEIGHT
(POUNDS)

DIRECTION

X

Y

Z

265

130.

X

Z

0.

0.

0.

265.1

154.

X

Y

Z

0.

0.

0.

265.2

154.

X

Y

Z

0.

0.

0.

270

161.

X

Y

Z

0.

0.

0.

275

151.

X

Y

Z

0.

0.

0.

280

18.

X

Y

Z

0.

0.

0.

275.1

98.

X

Y

Z

0.

0.

0.

285

112.

X

Y

Z

0.

0.

0.

285.1

127.

X

Y

Z

0.

0.

0.

238

290

78.

X

Y

Z

0.

0.

0.

2954

20.

X

Y

Z

0.

0.

0.

295F

42.

X

Y

Z

0.

0.

0.

300N

42.

X

Y

Z

0.

0.

0.

305

144.

X

Y

Z

0.

0.

0.

310

139.

X

Y

Z

0.

0.

0.

315

9.

0.

0.

0.

500N

23.

X

Y

Z

0.

0.

0.

500F

23.

X

Y

Z

0.

0.

0.

505

139.

X

Y

Z

0.

0.

0.

510

176.

X

Y

Z

0.

0.

0.

510.1

92.

X

Y

Z

0.

0.

0.

515N

69.

X

Y

Z

0.

0.

0.

515F

41.

X

Y

Z

0.

0.

0.

DYNAFLEX

LUMPED DYNAMIC MODEL (CONTINUED)

PAGE 20

LUC. NO.	DISPLACEMENT FREEDOM			ROTATIONAL FREEDOM			
	WEIGHT (POUNDS)	DIRECTION			MOMENT OF INERTIA (Lb-IN-K-IN)		
		X	Y	Z	X	Y	Z
520	89.	X	Y	Z	0.	0.	0.
520.1	124.	X	Y	Z	0.	0.	0.
525	89.	X	Y	Z	0.	0.	0.
530N	41.	X	Y	Z	0.	0.	0.
530F	63.	X	Y	Z	0.	0.	0.
530F.1	98.	X	Y	Z	0.	0.	0.
535N	63.	X	Y	Z	0.	0.	0.
535F	23.	X	Y	Z	0.	0.	0.
540	18.	X	Y	Z	0.	0.	0.
545N	23.	X	Y	Z	0.	0.	0.
545F	23.	X	Y	Z	0.	0.	0.
550N	23.	X	Y	Z	0.	0.	0.
550F	41.	X	Y	Z	0.	0.	0.
555	27.				0.	0.	0.
400	43.	X	Y	Z	0.	0.	0.
405	61.	X		Z	0.	0.	0.
405.1	71.	X	Y	Z	0.	0.	0.
410	71.	X		Z	0.	0.	0.
410.1	71.	X	Y	Z	0.	0.	0.
415	71.	X		Z	0.	0.	0.
415.1	71.	X	Y	Z	0.	0.	0.
420	71.	X		Z	0.	0.	0.
420.1	71.	X	Y	Z	0.	0.	0.

239

LUMPED DYNAMIC MODEL (CONTINUED)

LUC. NO.	WEIGHT (POUNDS)	DISPLACEMENT FREEDOM	DIRECTION	ROTATIONAL FREEDOM	MOMENT OF INERTIA (LB-IN ²)
425	62.	X	Y	Z	0.
425.1	52.	X	Y	Z	0.
430N	30.	X	Y	Z	0.
430F	21.	X	Y	Z	0.
435N	21.	X	Y	Z	0.
435F	44.	X	Y	Z	0.
440	80.	X	Y	Z	0.
440.1	81.	X	Y	Z	0.
445N	45.	X	Y	Z	0.
445F	34.	X	Y	Z	0.
445F.1	59.	X	Y	Z	0.
445F.2	59.	X	Y	Z	0.
4504	34.	X	Y	Z	0.
450F	35.	X	Y	Z	0.
460	31.	X	Y	Z	0.

240

NUMBER OF DYNAMIC DEGREES OF FREEDOM = 2667 TOTAL MASS OF SYSTEM = 6637. POUNDS

 * FREQUENCIES, PERIODS OF VIBRATION AND MASS PARTICIPATION FACTORS *

MODE NO.	FREQUENCY (CPS)	PERIOD (SECONDS)	MASS PARTICIPATION FACTORS		
			X	Y	Z
1	.40620	2.44977	.250069574	.00602276	1.74775361
2	.48578	2.05855	2.17375048	.00779146	2.22639959
3	1.02410	.97647	.21824152	.04012102	2.15686820
4	1.46890	.68078	.63677976	.14254171	.01282520
5	1.79558	.55642	1.95245363	.09060232	.28197578
6	1.88633	.53013	.90034357	.00944639	.00850684
7	1.97155	.50722	.56457424	.21214159	.77921562
8	2.06368	.48457	.04049996	.18733042	1.42997246
9	2.47415	.40418	.22641504	1.55701647	.27829652
10	2.52867	.39546	.65789199	.58940299	.00466747
11	3.17994	.31447	.05269740	.08389304	.10407616
12	3.78109	.26447	.22466547	.08616842	.49234996
13	4.61331	.21676	.07801812	.12934500	.78740271
14	4.78971	.20878	.06366269	.45686150	.64880930
15	5.69279	.17566	.07156736	.10156066	.32031305
16	6.57167	.15217	.32674297	.12486525	.01086030
17	7.58342	.13167	1.28978961	.68001433	.08765601
18	7.76354	.12881	.24054963	.46942317	.07181407
19	7.83826	.12758	.69953842	.27889430	.03525336
20	9.29983	.10753	.44510632	.23610004	.09990314

NOTE:

SECTION 3.7.2 OF THE U.S. NUCLEAR REGULATORY COMMISSION STANDARD REVIEW PLAN DATED JUNE, 1975 STATES THAT AN ADEQUATE NUMBER OF DEGREES OF FREEDOM IN DYNAMIC MODELING MAY BE TAKEN EQUAL TO TWICE THE NUMBER OF MODES WITH FREQUENCIES LESS THAN 33 CPS.

FOR THIS ANALYSIS THE RATIO OF DYNAMIC DEGREES OF FREEDOM TO FREQUENCIES LESS THAN 33 CPS = 13.30

THE CHLO PLASTIC MODEL WAS USED IN CALCULATING THE NATURAL FREQUENCIES OF THE SYSTEM IN THIS ANALYSIS.

DYNAPLEX

MODE ORTHOGONALITY CHECK

ON DIAGONAL TERMS MAX. = 1.00000 MIN. = 1.00000

OFF DIAGONAL TERMS MAX. = 1.45237 x 10⁻¹³ MIN. = -2.44297 x 10⁻¹³

GENERAL NOTES FOR THIS LOADING:

- (1) THE SPECIFICATIONS FOR THE SHOCK LOAD INCLUDING SPECTRUM INTERPOLATION RULES APPEAR IN THE EDITED PIPING SYSTEM DESCRIPTION.
- (2) THE GLOBAL COMPONENTS OF THE SHOCK HAVE BEEN ASSUMED TO ACT INDEPENDENTLY.
- (3) THE ABSOLUTE VALUE OF THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE HAVE BEEN COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD. MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)				
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT	
ANCHORS:									
170	258.	272.	236.	443.	720.	4291.	1221.	4514.	
243	315.	528.	283.	630.	1345.	2156.	1525.	2963.	
555	361.	159.	41.	397.	416.	600.	1423.	1600.	
460	126.	74.	228.	270.	1057.	936.	959.	1707.	
RESTRAINTS:									
175	0.	548.	0.	548.	0.	0.	0.	0.	
205F	0.	380.	0.	380.	0.	0.	0.	0.	

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 25

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RETRAINTS (CONTINUED)								
225	0.	96.	0.	96.	0.	0.	0.	0.
235	0.	36.	0.	36.	0.	0.	0.	0.
240	0.	30.	0.	30.	0.	0.	0.	0.
245	0.	105.	0.	105.	0.	0.	0.	0.
260	0.	407.	0.	407.	0.	0.	0.	0.
265	0.	745.	0.	745.	0.	0.	0.	0.
405	0.	357.	0.	357.	0.	0.	0.	0.
410	0.	28.	0.	28.	0.	0.	0.	0.
415	0.	23.	0.	23.	0.	0.	0.	0.
420	0.	59.	0.	59.	0.	0.	0.	0.

244

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 26

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED)								
430F	0.	100.	0.	100.	0.	0.	0.	0.

245

DYNAFLEX

LOADING + SHOCK LOADING NO. 1

PAGE 27

 * INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *

THE MAXIMUM STRESS OF 10,509, OCCURS AT POINT 460

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE
 ANSI H31.1 - 1977
 PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (**) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE HEADING BELOW) ARE
 AUTOMATICALLY CALCULATED AND APPLIED AT JOINTS, ELBOWS, FITTINGS AND ADMISSIBLE TYPES OF TEES
 (AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED
 STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS
 UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY
 REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE
 MODULUS IS USED FOR THE BRANCH LEG AT REDUCED
 OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK.
 THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 28

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN- PLANE	OUT-OF- PLANE		
ANCHR		-- 170	236.	375.	1221.	720.	4291.	1.00	1.00	6.79	7943.
	STR - (	>- 170.1	236.	372.	1221.	367.	3308.	1.00	1.00	6.79	6263.
	STR - (	>- 175	236.	371.	1221.	1453.	2376.	1.00	1.00	6.79	5372.
	STR - (	>- 175.1	236.	353.	1221.	493.	1521.	1.00	1.00	6.79	3554.
	STR - (	>- 175.2	236.	328.	1221.	1149.	1055.	1.00	1.00	6.79	3499.
	STR - (	>- 190N	236.	328.	1221.	2282.	1147.	1.00	1.00	6.79	5001.
	BEND - (	190M	350.	178.	1175.	2343.	1141.	1.00	1.00	6.79	5050.
		>- 190F	265.	279.	1180.	1164.	2302.	1.00	1.00	6.79	5011.
	STR - (	>- 190F.1	265.	279.	1180.	645.	1268.	1.00	1.00	6.79	3265.
	STR - (	>- 190F.2	260.	276.	1180.	427.	595.	1.00	1.00	6.79	2453.
247	STR - (	>- 190F.3	259.	276.	1180.	940.	1159.	1.00	1.00	6.79	3360.
	STR - (	>- 195N	260.	270.	1180.	1644.	2068.	1.00	1.00	6.79	5111.
	BEND - (	195M	329.	170.	1437.	2098.	1393.	1.00	1.00	6.79	5122.
		>- 195F	206.	308.	1718.	2034.	1161.	1.00	1.00	6.79	5131.
	STR - (	>- 195F.1	201.	308.	1718.	889.	1150.	1.00	1.00	6.79	3975.
	STR - (	>- 205N	192.	307.	1718.	334.	1475.	1.00	1.00	6.79	4044.
	BEND - (	205M	317.	175.	772.	396.	2172.	1.00	1.00	6.79	4131.
		>- 205F	271.	240.	1526.	373.	1777.	1.00	1.00	6.79	4190.
	STR - (
HR PT		-- 210	265.	238.	1526.	2010.	187.	1.00	1.00	6.79	4471.
HR PT		-- 210	136.	205.	167.	854.	1999.	1.00	1.00	6.79	3051.
	STR - (	>- 210.1	137.	203.	167.	651.	1789.	1.00	1.00	6.79	3577.
	STR - (	>- 220	149.	200.	167.	447.	1725.	1.00	1.00	6.79	3161.

LOADING - SHOCK LOADING NO. 1

DYNAFLEX

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)		IN-PLANE BENDING	OUT-OF-PLANE BENDING	PLANE PLANE (IN (3))	SECTION MODULUS	LONGITUDINAL STRESS PSI
		AXIAL	RESULANT SHEAR	TORSION	IN-PLANE BENDING					
SIR	> 220	139.	200.	167.	447.	1725.	1.00	1.00	6.79	3161.
SIR	> 220.1	145.	194.	167.	104.	1904.	1.00	1.00	6.79	3382.
SIR	> 225	153.	172.	167.	246.	2288.	1.00	1.00	6.79	4077.
SIR	> 225.1	153.	172.	167.	137.	2705.	1.00	1.00	6.79	4793.
SIR	> 225.2	161.	159.	167.	69.	3229.	1.00	1.00	6.79	5713.
SIR	> 230N	178.	132.	167.	3757.	95.	1.00	1.00	6.79	6645.
WEND	> 230M	199.	114.	130.	3774.	144.	1.00	1.00	6.79	6686.
SIR	> 230F	130.	140.	107.	3751.	168.	1.00	1.00	6.79	6636.
SIR	> 235	107.	148.	107.	196.	3372.	1.00	1.00	6.79	5970.
SIR	> 235.1	92.	182.	107.	100.	2839.	1.00	1.00	6.79	5021.
SIR	> 240	81.	170.	107.	62.	2482.	1.00	1.00	6.79	4390.
SIR	> 240.1	77.	161.	107.	49.	2230.	1.00	1.00	6.79	3945.
SIR	> 240.2	81.	174.	107.	135.	2131.	1.00	1.00	6.79	5777.
SIR	> 245	91.	217.	107.	217.	2190.	1.00	1.00	6.79	3893.
SIR	> 250N	98.	236.	107.	219.	2398.	1.00	1.00	6.79	4258.
WEND	> 250M	112.	229.	1739.	246.	1693.	1.00	1.00	6.79	4309.
SIR	> 250F	90.	260.	2438.	24.	251.	1.00	1.00	6.79	4330.
SIR	> 255N	90.	260.	2436.	724.	397.	1.00	1.00	6.79	4547.
WEND	> 255M	234.	199.	1473.	804.	1468.	1.00	1.00	6.79	4571.
SIR	> 255F	260.	142.	443.	826.	2387.	1.00	1.00	6.79	4531.
SIR	> 260	244.	144.	443.	737.	2034.	1.00	1.00	6.79	3901.
SIR	> 260.1	365.	430.	443.	600.	1714.	1.00	1.00	6.79	3501.

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 30

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN- PLANE	OUT-OF- PLANE		
	STR	>- 260.1	365.	430.	443.	600.	1714.	1.00	1.00	6.79	3301.
	STR	>- 265	365.	430.	443.	1740.	1400.	1.00	1.00	6.79	4021.
	STR	>- 265.1	417.	368.	443.	279.	1038.	1.00	1.00	6.79	2053.
	STR	>- 265.2	542.	363.	443.	1165.	1003.	1.00	1.00	6.79	2826.
	STR	>- 270	610.	355.	443.	2560.	1395.	1.00	1.00	6.79	5209.
BR PT	STR	-- 275	610.	355.	443.	4029.	2073.	1.00	1.00	6.79	6043.
BR PT	STR	-- 275	8.	3.	0.	2.	3.	1.00	1.00	6.79	6.
TERM	STR	-- 280	8.	3.	0.	0.	0.	1.00	1.00	6.79	0.
BR PT	STR	-- 275	308.	704.	2073.	4029.	443.	1.00	1.00	6.79	8042.
249	STR	>- 275.1	307.	737.	2073.	2163.	59.	1.00	1.00	6.79	5293.
	STR	>- 285	306.	762.	2073.	290.	550.	1.00	1.00	6.79	3824.
	STR	>- 285.1	305.	775.	2073.	2457.	1205.	1.00	1.00	6.79	6065.
BR PT	STR	-- 290	305.	775.	2073.	1867.	5132.	1.00	1.00	6.79	10319.
BR PT	STR	-- 290	280.	563.	1783.	1625.	2591.	1.00	1.00	6.79	6254.
	STR	>- 295N	281.	576.	1783.	2735.	1949.	1.00	1.00	6.79	6717.
BEND	STR	295M	436.	468.	1334.	2880.	2371.	1.00	1.00	6.79	7002.
	STR	>- 295F	483.	423.	2093.	2903.	1836.	1.00	1.00	6.79	7106.
	STR	>- 300N	482.	423.	2093.	2739.	2063.	1.00	1.00	6.79	7097.
BEND	STR	300M	348.	537.	2763.	2640.	1047.	1.00	1.00	6.79	7000.
	STR	>- 305	283.	576.	2156.	2460.	1949.	1.00	1.00	6.79	6726.
RIGID	STR	>- 310	283.	562.	2156.	1787.	1431.	1.00	1.00	6.79	5555.
ANCHR	STR	-- 315	283.	562.	2156.	1525.	1345.	1.00	1.00	6.79	5235.

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN ³)	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
ANCHR		-- 315	283.	562.	2156.	1525.	1345.	1.00	1.00	6.79	5235.
BR PT		-- 290	38.	398.	2582.	306.	438.	1.00	1.00	6.79	4657.
	STR -	>- 500N	37.	396.	2582.	292.	349.	1.00	1.00	6.79	4631.
	BEND -	500M	182.	354.	1806.	306.	1813.	1.00	1.00	6.79	4552.
		>- 500F	230.	325.	320.	311.	2439.	1.00	1.00	6.79	4380.
	STR -	>- 505	228.	324.	320.	2298.	301.	1.00	1.00	6.79	4134.
	RIGID -	>- 510	204.	301.	320.	1936.	278.	1.00	1.00	6.79	3501.
	STR -	>- 510.1	198.	290.	320.	1291.	248.	1.00	1.00	6.79	2391.
	STR -	>- 515N	193.	283.	320.	806.	241.	1.00	1.00	6.79	1590.
250	BEND -	515M	173.	296.	379.	735.	125.	1.00	1.00	6.79	1478.
		>- 515F	279.	193.	243.	655.	313.	1.00	1.00	6.79	1353.
	STR -	>- 520	279.	188.	243.	388.	299.	1.00	1.00	6.79	966.
	STR -	>- 520.1	292.	180.	243.	362.	281.	1.00	1.00	6.75	916.
	STR -	>- 525	309.	174.	243.	952.	301.	1.00	1.00	6.79	1816.
		>- 530N	318.	173.	243.	1206.	324.	1.00	1.00	6.79	2247.
	BEND -	530M	342.	118.	158.	1219.	378.	1.00	1.00	6.79	2272.
		>- 530F	169.	321.	334.	1132.	241.	1.00	1.00	6.79	2129.
	STR -	>- 530F.1	164.	356.	334.	233.	265.	1.00	1.00	6.79	659.
	STR -	>- 535N	162.	360.	334.	333.	765.	1.00	1.00	6.79	1588.
	BEND -	535M	133.	373.	768.	332.	578.	1.00	1.00	6.79	1756.
		>- 535F	42.	393.	943.	317.	266.	1.00	1.00	6.79	1819.
	STR -	>- 540	41.	394.	943.	320.	329.	1.00	1.00	6.79	1852.

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
		AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
STR - (	>- 540	41.	394.	943.	320.	329.	1.00	1.00	6.79	1852.
STR - (	>- 545N	41.	394.	943.	463.	354.	1.00	1.00	6.79	1958.
BEND - (	545M	272.	291.	846.	571.	620.	1.00	1.00	6.79	2110.
STR - (	>- 545F	360.	165.	402.	613.	863.	1.00	1.00	6.79	2001.
STR - (	>- 550N	361.	164.	402.	784.	607.	1.00	1.00	6.79	1890.
BEND - (	550M	368.	149.	258.	781.	688.	1.00	1.00	6.79	1895.
STR - (	>- 550F	159.	364.	600.	884.	405.	1.00	1.00	6.79	2018.
ANCP	-- 555	159.	364.	600.	1423.	416.	1.00	1.00	6.79	2826.
HR PT	-- 210	105.	343.	56.	1156.	817.	1.00	1.00	6.79	2503.
STR - (	>- 400	101.	343.	56.	824.	751.	2.00	2.00	1.95	10310.
STR - (	>- 405	95.	87.	56.	173.	575.	1.00	1.00	1.95	3714.
STR - (	>- 405.1	89.	76.	56.	68.	502.	1.00	1.00	1.95	3135.
STR - (	>- 410	84.	53.	56.	39.	545.	1.00	1.00	1.95	3381.
STR - (	>- 410.1	80.	35.	56.	30.	669.	1.00	1.00	1.95	4139.
STR - (	>- 415	77.	40.	56.	32.	735.	1.00	1.00	1.95	4544.
STR - (	>- 415.1	75.	49.	56.	56.	717.	1.00	1.00	1.95	4439.
STR - (	>- 420	75.	69.	56.	141.	639.	1.00	1.00	1.95	4040.
STR - (	>- 420.1	75.	69.	56.	28.	570.	1.00	1.00	1.95	3533.
STR - (	>- 425	76.	68.	56.	180.	590.	1.00	1.00	1.95	3810.
STR - (	>- 425.1	79.	60.	56.	285.	616.	1.00	1.00	1.95	4193.
STR - (	>- 430N	81.	55.	56.	390.	661.	1.00	1.00	1.95	4735.
BEND - (	430M	76.	67.	482.	392.	460.	1.00	1.00	1.95	4759.

251

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 33

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT ELEM TYPE TYPE	LDC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULES (IN (3))	LONGITUDINAL STRESS PSI
		AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
HEND - (	430M	76.	67.	482.	392.	460.	1.00	1.00	1.95	4759.
>-	430F	36.	95.	665.	384.	59.	1.00	1.00	1.95	4742.
STR - (	435N	93.	101.	665.	131.	309.	1.00	1.00	1.95	4587.
HEND - (	435M	92.	101.	416.	136.	599.	1.00	1.00	1.95	4570.
>-	435F	53.	126.	304.	130.	641.	1.00	1.00	1.95	4442.
STR - (	440	107.	119.	304.	375.	319.	1.00	1.00	1.95	3563.
STR - (	440.1	151.	113.	304.	752.	310.	1.00	1.00	1.95	5346.
STR - (	445N	151.	113.	304.	1086.	591.	1.00	1.00	1.95	7839.
HEND - (	445M	174.	119.	550.	1085.	389.	1.00	1.00	1.95	7865.
252 STR - (	445F	76.	197.	611.	1053.	279.	1.00	1.00	1.95	7688.
>-	445F.1	75.	219.	611.	106.	372.	1.00	1.00	1.95	4452.
STR - (	445F.2	74.	259.	611.	487.	389.	1.00	1.00	1.95	5371.
>-	450N	73.	260.	611.	1186.	920.	1.00	1.00	1.95	9978. **
HEND - (	450M	204.	178.	584.	1231.	970.	1.00	1.00	1.95	10299. **
>-	450F	228.	146.	959.	1240.	627.	1.00	1.00	1.95	10395. **
STR - (	460	228.	146.	959.	1057.	936.	1.00	1.00	1.95	10509. ***

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 34

 * DISPLACEMENTS AND ROTATIONS *
 * ----- *
 * *****

EXPLANATORY NOTES:

VALUES IN PARENTHESES ARE ACCELERATIONS (IN PER SECOND SQUARED)

DISPLACEMENTS (INCHES)

ROTATIONS (DEGREES) ABOUT

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
ANCHOR		170	.000	.000	.000	.000	.000	.000
	STRAIGHT -(		(.0)	(.0)	(.0)			
	> 170.1		.129	.012	.000	.014	.294	.123
	STRAIGHT -(		(19.6)	(2.0)	(.0)			
	> 175		.472	.000	.000	.057	.512	.246
	STRAIGHT -(		(59.6)	(.0)	(.0)			
	> 175.1		1.006	.091	.000	.130	.668	.377
	STRAIGHT -(		(103.0)	(16.0)	(.0)			
	> 175.2		1.645	.208	.000	.126	.751	.508
	STRAIGHT -(		(142.5)	(40.5)	(.0)			
	> 190N		2.328	.289	.000	.150	.776	.640
	(		(186.2)	(65.3)	(.0)			
	BEND -(	190N	2.394	.293	.005	.166	.776	.652
	(		(188.9)	(67.2)	(.8)			
	> 190F		2.440	.295	.018	.185	.776	.665
	STRAIGHT -(		(187.6)	(67.9)	(2.7)			
	> 190F.1		2.435	.295	.272	.318	.783	.743
	STRAIGHT -(		(150.0)	(67.9)	(26.0)			
	> 190F.2		3.254	.295	.616	.370	.809	.761
	STRAIGHT -(		(109.7)	(67.9)	(44.0)			
	> 190F.3		3.928	.295	.963	.330	.853	.713
	STRAIGHT -(		(74.7)	(67.9)	(55.7)			
	> 195N		4.464	.295	1.223	.214	.926	.596
	(		(76.4)	(67.9)	(63.9)			
	BEND -(	195N	4.518	.290	1.236	.197	.933	.578
	(		(76.9)	(67.1)	(64.4)			
	> 195F		4.575	.279	1.241	.182	.941	.561
	STRAIGHT -(		(75.2)	(65.1)	(64.6)			
	> 195F.1		5.146	.152	1.241	.146	.992	.373
	STRAIGHT -(		(51.0)	(36.5)	(64.6)			
	> 205N		5.776	.016	1.241	.151	1.032	.186

253

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X-AXIS	Y-AXIS	Z-AXIS
		> 205N	5.776	.016	1.241	.151	1.032	.166
	(		(52.4)	(3.8)	(64.6)			
	BEND - (	205M	5.833	.005	1.241	.150	1.037	.166
	(		(53.9)	(1.1)	(64.4)			
		> 205F	5.864	.000	1.241	.149	1.041	.149
	STRAIGHT - (		(54.9)	(.0)	(64.1)			
BRANCH PT.		-- 210	5.898	.000	1.247	.144	1.066	.076
	(		(56.8)	(.0)	(63.9)			
BRANCH PT.	STRAIGHT - (	210	5.898	.000	1.247	.144	1.066	.076
	(		(56.8)	(.0)	(63.9)			
		> 210.1	5.898	.033	1.837	.131	1.102	.032
	STRAIGHT - (		(56.8)	(4.0)	(62.5)			
		> 220	5.898	.043	2.511	.119	1.117	.001
	STRAIGHT - (		(56.8)	(5.5)	(74.8)			
		> 220.1	5.898	.027	3.643	.098	1.094	.026
	STRAIGHT - (		(56.8)	(3.8)	(87.7)			
		> 225	5.898	.000	4.709	.077	1.009	.019
	STRAIGHT - (		(56.8)	(.0)	(83.7)			
		> 225.1	5.898	.010	5.508	.060	.913	.005
	STRAIGHT - (		(56.8)	(1.8)	(69.3)			
		> 225.2	5.898	.011	6.181	.042	.816	.006
	STRAIGHT - (		(56.8)	(2.6)	(56.2)			
		> 230N	5.898	.013	6.764	.025	.752	.009
	(		(56.8)	(3.8)	(56.4)			
	BEND - (	230M	5.888	.012	6.740	.024	.749	.010
	(		(56.2)	(3.8)	(56.7)			
		> 230F	5.862	.011	6.754	.022	.747	.010
	STRAIGHT - (		(54.7)	(3.4)	(56.8)			
		> 235	5.592	.000	6.754	.012	.762	.016
	STRAIGHT - (		(49.0)	(.0)	(56.8)			
		> 235.1	5.026	.005	6.754	.002	.847	.026
	STRAIGHT - (		(74.1)	(2.3)	(56.8)			
		> 240	4.306	.000	6.754	.007	.941	.038
	STRAIGHT - (		(103.0)	(.0)	(56.8)			
		> 240.1	3.482	.007	6.754	.006	1.014	.051
	STRAIGHT - (		(131.2)	(5.8)	(56.8)			
		> 240.2	2.617	.010	6.754	.002	1.057	.063
	STRAIGHT - (		(153.0)	(7.8)	(56.8)			
		> 245	1.822	.000	6.754	.018	1.066	.076
	STRAIGHT - (		(169.0)	(.0)	(56.8)			
		> 250N	1.407	.020	6.754	.028	1.055	.087
	(		(177.0)	(14.8)	(56.8)			
	BEND - (	250M	1.388	.022	6.754	.029	1.052	.087
	(		(177.2)	(16.5)	(56.8)			
		> 250F	1.376	.023	6.754	.030	1.050	.087

254

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 36

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		> 250F	1.376	.023	6.754	.030	1.050	.087
	STRAIGHT - (		(176.4)	(17.3)	(56.6)			
		> 255N	1.335	.023	6.759	.040	1.051	.067
	(		(170.1)	(17.3)	(58.2)			
	BEND - (	255M	1.331	.021	6.731	.042	1.054	.058
	(		(169.7)	(16.3)	(58.4)			
		> 255F	1.329	.017	6.660	.045	1.057	.049
	STRAIGHT - (		(169.5)	(14.1)	(58.1)			
		> 260	1.329	.000	5.966	.076	1.082	.016
	STRAIGHT - (		(169.5)	(.0)	(55.5)			
		> 260.1	1.329	.011	5.310	.166	1.105	.011
	STRAIGHT - (		(169.5)	(2.8)	(58.0)			
		> 265	1.329	.000	4.631	.138	1.122	.056
	STRAIGHT - (		(169.5)	(.0)	(61.3)			
		> 265.1	1.329	.098	3.632	.186	1.122	.139
	STRAIGHT - (		(169.5)	(13.5)	(57.9)			
		> 265.2	1.329	.216	2.645	.234	1.083	.102
	STRAIGHT - (		(169.5)	(28.6)	(42.8)			
		> 270	1.329	.247	1.718	.282	.997	.055
	STRAIGHT - (		(169.5)	(31.8)	(34.2)			
255	BRANCH PT.	-- 275	1.329	.064	.848	.335	.840	.357
			(169.4)	(31.9)	(52.9)			
	BRANCH PT.	-- 275	1.329	.064	.848	.335	.840	.357
	STRAIGHT - (		(169.4)	(31.9)	(52.9)			
	TERMINAL	-- 280	1.329	.035	.695	.335	.840	.357
			(169.4)	(40.0)	(58.0)			
	BRANCH PT.	-- 275	1.329	.064	.848	.335	.840	.357
	STRAIGHT - (		(169.4)	(31.9)	(52.9)			
		> 275.1	1.071	.064	.651	.345	.697	.522
	STRAIGHT - (		(136.1)	(31.9)	(40.8)			
		> 285	.747	.064	.455	.330	.554	.585
	STRAIGHT - (		(101.0)	(31.9)	(24.3)			
		> 285.1	.327	.064	.229	.269	.368	.508
	STRAIGHT - (		(62.9)	(31.9)	(15.2)			
	BRANCH PT.	-- 290	.039	.064	.067	.164	.183	.250
			(16.8)	(31.9)	(15.6)			
	BRANCH PT.	-- 290	.039	.064	.067	.164	.183	.250
	STRAIGHT - (		(16.8)	(31.9)	(15.6)			
		> 295N	.027	.064	.056	.153	.164	.233
	(		(10.8)	(31.9)	(16.7)			
	BEND - (	295M	.021	.058	.042	.134	.150	.201
	(		(4.4)	(24.4)	(16.8)			
		> 295F	.019	.045	.029	.116	.129	.168
	STRAIGHT - (		(1.5)	(23.7)	(14.7)			
		> 300N	.069	.006	.004	.049	.071	.076

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 37

DISPLACEMENTS AND ROTATIONS (CONTINUED)

PRINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X-AXIS	Y-AXIS	Z-AXIS
		> 300N	.009	.006	.004	.049	.071	.076
	(		(3.8)	(3.4)	(5.0)			
	BEND - (	300N	.067	.091	.005	.032	.048	.045
	(		(3.5)	(.7)	(3.2)			
		> 305	.005	.000	.004	.014	.027	.016
	RIGID - (		(2.6)	(.0)	(2.1)			
		> 310	.001	.000	.001	.013	.027	.016
	STRAIGHT - (		(.3)	(.0)	(.3)			
ANCHOR		> 315	.000	.000	.000	.000	.000	.000
	(		(.0)	(.0)	(.0)			
BRANCH PT.		> 290	.039	.064	.067	.164	.183	.250
	STRAIGHT - (		(16.8)	(31.9)	(15.6)			
		> 500N	.052	.073	.067	.162	.180	.220
	(		(21.3)	(33.8)	(15.6)			
	BEND - (	500N	.066	.081	.072	.159	.177	.197
	(		(27.7)	(35.1)	(15.2)			
		> 500F	.077	.084	.083	.157	.174	.172
	STRAIGHT - (		(37.3)	(35.7)	(14.1)			
		> 505	.088	.084	.099	.155	.170	.153
	RIGID - (		(50.0)	(35.7)	(12.9)			
256		> 510	.122	.084	.142	.155	.170	.152
	STRAIGHT - (		(84.5)	(35.7)	(11.1)			
		> 510.1	.175	.084	.223	.145	.152	.084
	STRAIGHT - (		(149.6)	(35.7)	(14.6)			
		> 515N	.198	.084	.298	.134	.133	.043
	(		(197.0)	(35.8)	(23.1)			
	BEND - (	515N	.200	.083	.304	.132	.131	.037
	(		(200.9)	(34.3)	(24.5)			
		> 515F	.200	.081	.298	.129	.128	.032
	STRAIGHT - (		(202.2)	(31.6)	(25.3)			
		> 520	.200	.075	.262	.121	.120	.026
	STRAIGHT - (		(202.2)	(27.1)	(26.4)			
		> 520.1	.200	.065	.185	.100	.103	.024
	STRAIGHT - (		(202.2)	(37.6)	(28.5)			
		> 525	.200	.045	.121	.081	.086	.049
	STRAIGHT - (		(202.2)	(40.4)	(31.3)			
		> 530N	.200	.027	.097	.073	.080	.077
	(		(202.1)	(28.3)	(33.6)			
	BEND - (	530N	.197	.021	.090	.071	.078	.090
	(		(200.6)	(23.6)	(33.3)			
		> 530F	.190	.019	.082	.064	.076	.103
	STRAIGHT - (		(193.9)	(21.2)	(31.1)			
		> 530F.1	.120	.019	.047	.057	.056	.136
	STRAIGHT - (		(125.6)	(21.3)	(13.4)			
		> 535N	.044	.019	.019	.045	.062	.121

DYNAFLEX

LOADING - SHOCK LOADING NO. 1

PAGE 38

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X-AXIS	Y-AXIS	Z-AXIS
		> 539N	.044	.019	.019	.045	.062	.121
	(		(45.9)	(21.3)	(10.0)			
	BEND - (	535M	.034	.018	.016	.042	.062	.112
	(		(35.1)	(20.9)	(10.6)			
		> 535F	.027	.017	.015	.039	.060	.102
	STRAIGHT - (		(27.5)	(20.1)	(10.8)			
		> 540	.021	.017	.015	.037	.058	.091
	STRAIGHT - (		(21.7)	(19.4)	(10.8)			
		> 545N	.015	.017	.015	.034	.054	.079
	(		(16.1)	(19.0)	(10.8)			
	BEND - (	545M	.011	.015	.014	.030	.048	.069
	(		(12.5)	(16.4)	(9.3)			
		> 545F	.010	.011	.010	.026	.042	.060
	STRAIGHT - (		(11.2)	(11.3)	(6.3)			
		> 550N	.010	.005	.006	.021	.036	.052
	(		(11.2)	(5.1)	(2.7)			
	BEND - (	550M	.009	.001	.004	.017	.029	.043
	(		(9.6)	(1.3)	(1.1)			
		> 550F	.006	.000	.002	.012	.023	.033
	STRAIGHT - (		(6.5)	(.0)	(.8)			
ANCHOR		-- 555	.000	.000	.000	.000	.000	.000
			(.0)	(.0)	(.0)			
BRANCH PT.		-- 210	5.898	.000	1.247	.144	1.066	.076
	STRAIGHT - (		(56.8)	(.0)	(63.9)			
		> 400	5.898	.014	1.078	.144	1.062	.057
	STRAIGHT - (		(56.8)	(1.5)	(64.9)			
		> 405	5.898	.000	.748	.139	.988	.046
	STRAIGHT - (		(56.8)	(.0)	(70.6)			
		> 405.1	5.898	.013	.939	.134	.872	.008
	STRAIGHT - (		(56.8)	(1.7)	(100.1)			
		> 410	5.898	.000	1.533	.140	.700	.014
	STRAIGHT - (		(56.8)	(.0)	(139.9)			
		> 410.1	5.898	.006	2.007	.154	.485	.002
	STRAIGHT - (		(56.8)	(2.7)	(158.0)			
		> 415	5.898	.000	2.267	.174	.354	.013
	STRAIGHT - (		(56.8)	(.0)	(168.4)			
		> 415.1	5.898	.011	2.290	.196	.376	.006
	STRAIGHT - (		(56.8)	(9.0)	(153.7)			
		> 420	5.898	.000	2.103	.221	.580	.038
	STRAIGHT - (		(56.8)	(.0)	(102.3)			
		> 420.1	5.898	.051	1.803	.248	.776	.064
	STRAIGHT - (		(56.8)	(38.1)	(83.1)			
		> 425	5.898	.093	1.450	.276	.936	.019
	STRAIGHT - (		(56.8)	(60.2)	(123.4)			
		> 425.1	5.898	.082	1.353	.297	1.043	.057

GENERAL NOTES FOR THIS LOADING:

- (1) THE SPECIFICATIONS FOR THE SHOCK LOAD INCLUDING SPECTRUM INTERPOLATION RULES APPEAR IN THE EDITED PIPING SYSTEM DESCRIPTION.
- (2) THE GLOBAL COMPONENTS OF THE SHOCK HAVE BEEN ASSUMED TO ACT INDEPENDENTLY
- (3) THE ABSOLUTE VALUE OF THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE HAVE BEEN COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD. MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SSS.

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
ANCHORS:								
170	165.	352.	392.	552.	934.	2896.	1099.	3230.
315	163.	72.	347.	426.	2566.	2066.	524.	3291.
555	105.	57.	157.	197.	1460.	605.	446.	1641.
460	104.	84.	194.	236.	862.	766.	838.	1391.
RESTRAINTS:								
175	0.	789.	0.	789.	0.	0.	0.	0.
205F	0.	475.	0.	475.	0.	0.	0.	0.

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LINC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED)								
275	0.	74.	0.	74.	0.	0.	0.	0.
235	0.	26.	0.	26.	0.	0.	0.	0.
240	0.	35.	0.	35.	0.	0.	0.	0.
245	0.	199.	0.	199.	0.	0.	0.	0.
240	0.	343.	0.	343.	0.	0.	0.	0.
265	0.	268.	0.	268.	0.	0.	0.	0.
405	0.	287.	0.	287.	0.	0.	0.	0.
410	0.	21.	0.	21.	0.	0.	0.	0.
415	0.	20.	0.	20.	0.	0.	0.	0.
420	0.	54.	0.	54.	0.	0.	0.	0.

260

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 42

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LIC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED)								
430F	0.	82.	0.	82.	0.	0.	0.	0.

 *
 * INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *
 * ----- *
 *

THE MAXIMUM STRESS OF 12,380. OCCURS AT POINT 400

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE
ANSI B31.1 -- 1977
PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (**) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE HEADING BELOW) ARE
AUTOMATICALLY CALCULATED AND APPLIED AT BENDS, ELBOWS, MITERS AND ADMISSIBLE TYPES OF TEES
(AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED
STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS
UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY
REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE
MODULUS IS USED FOR THE BRANCH LEG AT REDUCED
OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK.
THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

262

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 44

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL: STRESS PSI	
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		:	:
ANCHR		-- 170	392.	389.	1099.	934.	2890.	1.00	1.00	6.79	:	5705.
	STR	>- 170.1	392.	389.	1099.	476.	2259.	1.00	1.00	6.79	:	4518.
	STR	>- 175	392.	468.	1099.	1885.	1656.	1.00	1.00	6.79	:	4839.
	STR	>- 175.1	392.	464.	1099.	293.	1090.	1.00	1.00	6.79	:	2783.
	STR	>- 175.2	392.	459.	1099.	1909.	770.	1.00	1.00	6.79	:	4123.
	STR	>- 190N	392.	459.	1099.	3753.	937.	1.00	1.00	6.79	:	7104.
	BEND	(190M	580.	157.	1282.	3848.	672.	1.00	1.00	6.79	:	7263.
		>- 190F	429.	418.	982.	1027.	3775.	1.00	1.00	6.79	:	7122.
	STR	>- 190F.1	426.	409.	982.	366.	1935.	1.00	1.00	6.79	:	3887.
	STR	>- 190F.2	426.	409.	982.	362.	363.	1.00	1.00	6.79	:	1957.
	STR	>- 190F.3	424.	389.	982.	915.	1695.	1.00	1.00	6.79	:	3819.
	STR	>- 195N	422.	344.	982.	3294.	1412.	1.00	1.00	6.79	:	6572.
	BEND	(195M	528.	134.	838.	3551.	1537.	1.00	1.00	6.79	:	6678.
		>- 195F	326.	436.	1460.	3249.	1005.	1.00	1.00	6.79	:	6539.
	STR	>- 195F.1	309.	436.	1460.	1426.	1265.	1.00	1.00	6.79	:	4242.
	STR	>- 205N	269.	435.	1460.	428.	1599.	1.00	1.00	6.79	:	3899.
	BEND	(205M	484.	164.	697.	534.	2079.	1.00	1.00	6.79	:	3986.
		>- 205F	422.	288.	1639.	501.	1491.	1.00	1.00	6.79	:	4013.
	STR	>- 210	212.	280.	1639.	1615.	121.	1.00	1.00	6.79	:	4070.
BR pT		-- 210	77.	164.	102.	686.	1985.	1.00	1.00	6.79	:	3714.
	STR	>- 210.1	76.	159.	102.	523.	1666.	1.00	1.00	6.79	:	3090.
	STR	>- 220	79.	154.	102.	359.	1438.	1.00	1.00	6.79	:	2625.

263

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 45

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
	STR	> 220	79.	154.	102.	359.	1438.	1.00	1.00	6.79	2625.
	STR	> 220.1	85.	144.	102.	85.	1336.	1.00	1.00	6.79	2372.
	STR	> 225	94.	125.	102.	192.	1555.	1.00	1.00	6.79	2774.
	STR	> 225.1	94.	125.	102.	116.	1075.	1.00	1.00	6.79	3324.
	STR	> 225.2	104.	117.	102.	60.	2244.	1.00	1.00	6.79	3970.
	STR	> 230N	123.	104.	102.	2618.	82.	1.00	1.00	6.79	4632.
	BEND	230M	138.	91.	97.	2638.	94.	1.00	1.00	6.79	4666.
	STR	> 230F	102.	124.	90.	2624.	101.	1.00	1.00	6.79	4642.
	STR	> 235	97.	135.	90.	119.	2408.	1.00	1.00	6.79	4261.
264	STR	> 235.1	101.	134.	90.	75.	2140.	1.00	1.00	6.79	3787.
	STR	> 240	112.	133.	90.	84.	1995.	1.00	1.00	6.79	3531.
	STR	> 240.1	127.	137.	90.	48.	1958.	1.00	1.00	6.79	3463.
	STR	> 240.2	127.	137.	90.	169.	2050.	1.00	1.00	6.79	3638.
	STR	> 245	166.	260.	90.	287.	2286.	1.00	1.00	6.79	4074.
	STR	> 250N	177.	262.	90.	1036.	2593.	1.00	1.00	6.79	4435.
	BEND	250M	267.	169.	1869.	1089.	1844.	1.00	1.00	6.79	5022.
	STR	> 250F	216.	239.	2638.	57.	1070.	1.00	1.00	6.79	5030.
	STR	> 255N	217.	244.	2638.	458.	724.	1.00	1.00	6.79	4900.
	BEND	255M	210.	250.	2031.	500.	1792.	1.00	1.00	6.79	4866.
	STR	> 255F	151.	290.	694.	504.	2564.	1.00	1.00	6.79	4776.
	STR	> 260	153.	295.	694.	806.	2089.	1.00	1.00	6.79	4142.
	STR	> 260.1	162.	261.	694.	437.	1727.	1.00	1.00	6.79	3377.

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)		SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI	
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE			OUT-OF PLANE
		>- 260.1	162.	261.	694.	437.	1727.	1.00	1.00	6.79	3377.
	STR - (
		>- 265	162.	261.	694.	571.	1464.	1.00	1.00	6.79	3035.
	STR - (
		>- 265.1	181.	196.	694.	99.	1280.	1.00	1.00	6.79	2578.
	STR - (
		>- 265.2	195.	205.	694.	389.	1267.	1.00	1.00	6.79	2643.
	STR - (
		>- 270	210.	240.	694.	848.	1404.	1.00	1.00	6.79	3146.
	STR - (
BR PT		-- 275	210.	240.	694.	1334.	1849.	1.00	1.00	6.79	4210.
BR PT		-- 275	3.	10.	0.	0.	10.	1.00	1.00	6.79	18.
	STR - (
TERM		-- 280	3.	10.	0.	0.	0.	1.00	1.00	6.79	0.
BR PT		-- 275	102.	361.	1850.	1334.	694.	1.00	1.00	6.79	4212.
	STR - (
		>- 275.1	101.	392.	1850.	711.	172.	1.00	1.00	6.79	3515.
	STR - (
		>- 285	101.	417.	1850.	89.	956.	1.00	1.00	6.79	3682.
	STR - (
		>- 285.1	100.	431.	1850.	810.	2154.	1.00	1.00	6.79	5216.
	STR - (
BR PT		-- 290	100.	431.	1850.	3406.	1688.	1.00	1.00	6.79	7469.
BR PT		-- 290	71.	420.	1555.	3054.	864.	1.00	1.00	6.79	6244.
	STR - (
		>- 295N	71.	420.	1555.	1712.	2839.	1.00	1.00	6.79	6469.
	BEND - (	295M	181.	386.	1852.	1791.	2795.	1.00	1.00	6.79	6716.
		>- 295F	233.	357.	3011.	1821.	1628.	1.00	1.00	6.79	6850.
	STR - (
		>- 300N	233.	357.	3011.	1811.	1945.	1.00	1.00	6.79	7095.
	BEND - (	300M	163.	394.	3310.	1777.	1389.	1.00	1.00	6.79	7076.
		>- 305	72.	420.	2066.	1697.	2839.	1.00	1.00	6.79	6889.
	RIGID - (
		>- 310	72.	420.	2066.	607.	2696.	1.00	1.00	6.79	6096.
	STR - (
ANCHR		-- 315	72.	420.	2066.	528.	2506.	1.00	1.00	6.79	5813.

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 47

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	FLEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULES (IN (3))	LONGITUDINAL STRESS PSI	
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN- PLANE	OUT-OF- PLANE		:	:
ANCHR		-- 315	72.	420.	2066.	528.	2506.	1.00	1.00	6.79	:	5813.
HR pT		-- 290	157.	115.	878.	1093.	428.	1.00	1.00	6.79	:	2589.
	STR	>- 500N	156.	115.	878.	1075.	409.	1.00	1.00	6.79	:	2557.
	BEND	(500M	93.	170.	632.	1042.	713.	1.00	1.00	6.79	:	2494.
		>- 500F	66.	182.	395.	988.	832.	1.00	1.00	6.79	:	2386.
	STR	(505	65.	182.	395.	786.	918.	1.00	1.00	6.79	:	2247.
	RIGID	>- 510	54.	159.	395.	663.	747.	1.00	1.00	6.79	:	1897.
	STR	(:	
	STR	>- 510.1	52.	143.	395.	424.	485.	1.00	1.00	6.79	:	1335.
		>- 515N	51.	129.	395.	200.	335.	1.00	1.00	6.79	:	981.
		(:	
266	BEND	(515M	37.	134.	330.	168.	387.	1.00	1.00	6.79	:	946.
		>- 515F	97.	100.	321.	144.	383.	1.00	1.00	6.79	:	919.
	STR	(:	
	STR	>- 520	97.	89.	321.	96.	358.	1.00	1.00	6.79	:	867.
		>- 520.1	98.	77.	321.	159.	314.	1.00	1.00	6.79	:	842.
	STR	(:	
	STR	>- 525	100.	89.	321.	314.	310.	1.00	1.00	6.79	:	964.
		>- 530N	102.	125.	321.	384.	374.	1.00	1.00	6.79	:	1104.
		(:	
	BEND	(530M	106.	122.	71.	386.	511.	1.00	1.00	6.79	:	1139.
		>- 530F	52.	169.	407.	358.	352.	1.00	1.00	6.79	:	1142.
	STR	(:	
	STR	>- 530F.1	54.	184.	407.	112.	635.	1.00	1.00	6.79	:	1347.
		>- 535N	56.	186.	407.	1016.	246.	1.00	1.00	6.79	:	1981.
		(:	
	BEND	(535M	93.	170.	392.	1072.	303.	1.00	1.00	6.79	:	2086.
		>- 535F	154.	119.	295.	1105.	412.	1.00	1.00	6.79	:	2148.
	STR	(:	
		>- 540	155.	120.	295.	1123.	423.	1.00	1.00	6.79	:	2183.

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 48

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULES (IN (3))	LONGITUDINAL:	
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		STRESS PSI	
		>- 540	155.	120.	295.	1123.	423.	1.00	1.00	6.79	2183.	:
	STR - (	>- 545N	155.	120.	295.	440.	1141.	1.00	1.00	6.79	2222.	:
	HEND - (	545M	136.	142.	814.	467.	868.	1.00	1.00	6.79	2258.	:
		>- 545F	105.	166.	1160.	277.	503.	1.00	1.00	6.79	2286.	:
	STR - (	>- 550N	105.	166.	1160.	260.	551.	1.00	1.00	6.79	2314.	:
	BEND - (	550M	109.	164.	502.	264.	1221.	1.00	1.00	6.79	2378.	:
		>- 550F	57.	189.	605.	292.	1234.	1.00	1.00	6.79	2482.	:
	STR - (	-- 555	57.	189.	605.	440.	1460.	1.00	1.00	6.79	2698.	:
	ANCHR	-- 210	72.	313.	37.	924.	1321.	1.00	1.00	6.79	2853.	:
	BR PT											
	STR - (	>- 400	69.	310.	37.	662.	1165.	2.00	2.00	1.95	12380. **	:
	STR - (	>- 405	65.	145.	37.	139.	734.	1.00	1.00	1.95	4604.	:
	STR - (	>- 405.1	61.	117.	37.	55.	376.	1.00	1.00	1.95	2349.	:
	STR - (	>- 410	57.	80.	37.	30.	577.	1.00	1.00	1.95	3564.	:
	STR - (	>- 410.1	55.	56.	37.	26.	840.	1.00	1.00	1.95	5176.	:
	STR - (	>- 415	53.	56.	37.	28.	973.	1.00	1.00	1.95	5999.	:
	STR - (	>- 415.1	53.	59.	37.	52.	988.	1.00	1.00	1.95	6098.	:
	STR - (	>- 420	54.	78.	37.	131.	899.	1.00	1.00	1.95	5595.	:
	STR - (	>- 420.1	54.	78.	37.	19.	702.	1.00	1.00	1.95	4328.	:
	STR - (	>- 425	56.	103.	37.	167.	477.	1.00	1.00	1.95	3120.	:
	STR - (	>- 425.1	58.	124.	37.	273.	499.	1.00	1.00	1.95	3511.	:
	STR - (	>- 430N	61.	135.	37.	378.	764.	1.00	1.00	1.95	5251.	:
	HEND - (	430M	66.	136.	550.	381.	565.	1.00	1.00	1.95	5390.	:

267

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 50

* DISPLACEMENTS AND ROTATIONS *

EXPLANATORY NOTES:

VALUES IN PARENTHESES ARE ACCELERATIONS (IN PER SECOND SQUARED)

DISPLACEMENTS (INCHES)

ROTATIONS (DEGREES) ABOUT

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
ANCHOR		170	.000 (.0)	.000 (.0)	.000 (.0)	.000	.000	.000
	STRAIGHT -(>	170.1	.087 (5.4)	.015 (1.3)	.000 (.0)	.018	.199	.111
	STRAIGHT -(>	175	.320 (17.3)	.000 (.0)	.000 (.0)	.074	.350	.221
	STRAIGHT -(>	175.1	.687 (32.4)	.113 (10.0)	.000 (.0)	.153	.459	.339
	STRAIGHT -(>	175.2	1.127 (48.2)	.231 (24.5)	.000 (.0)	.093	.520	.458
		190N	1.599 (66.0)	.233 (37.9)	.000 (.0)	.184	.537	.576
	BEND -(>	190M	1.653 (66.6)	.226 (38.9)	.007 (.6)	.225	.537	.587
		140F	1.707 (64.8)	.222 (39.3)	.025 (1.9)	.266	.538	.598
	STRAIGHT -(>	190F.1	2.266 (44.3)	.222 (39.3)	.429 (23.0)	.521	.547	.661
	STRAIGHT -(>	190F.2	2.884 (60.1)	.222 (39.3)	1.065 (47.7)	.612	.580	.663
	STRAIGHT -(>	190F.3	3.492 (83.6)	.222 (39.3)	1.589 (70.5)	.541	.633	.608
		195N	4.030 (100.2)	.222 (39.3)	2.025 (86.8)	.318	.702	.502
	BEND -(>	195M	4.073 (99.4)	.215 (38.8)	2.046 (87.7)	.282	.708	.486
		195F	4.106 (96.1)	.194 (37.6)	2.055 (88.0)	.247	.715	.471
	STRAIGHT -(>	195F.1	4.359 (53.6)	.089 (20.9)	2.055 (88.0)	.094	.767	.312
	STRAIGHT -(>	205N	4.652	.009	2.055	.088	.823	.153

269

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X-AXIS	Y-AXIS	Z-AXIS
		> 205N	4.652	.009	2.055	.088	.823	.153
	(		(41.1)	(2.2)	(88.0)			
	BEND - (	205M	4.681	.003	2.055	.088	.832	.137
	(		(41.5)	(.6)	(87.9)			
		> 205F	4.699	.000	2.055	.088	.840	.121
	STRAIGHT - (		(41.8)	(.0)	(87.7)			
BRANCH PT.		-- 210	4.732	.000	2.063	.087	.882	.061
			(43.0)	(.0)	(87.0)			
BRANCH PT.		-- 210	4.732	.000	2.063	.087	.882	.061
	STRAIGHT - (		(43.0)	(.0)	(87.0)			
		> 210.1	4.732	.027	2.113	.079	.916	.026
	STRAIGHT - (		(43.0)	(2.1)	(78.5)			
		> 220	4.732	.035	2.342	.072	.941	.001
	STRAIGHT - (		(43.0)	(2.9)	(73.2)			
		> 220.1	4.732	.022	2.989	.059	.951	.021
	STRAIGHT - (		(43.0)	(1.9)	(69.3)			
		> 225	4.732	.000	3.783	.046	.918	.016
	STRAIGHT - (		(43.0)	(.0)	(72.7)			
270		> 225.1	4.732	.008	4.464	.036	.865	.004
	STRAIGHT - (		(43.0)	(1.0)	(70.8)			
		> 225.2	4.732	.008	5.102	.025	.801	.004
	STRAIGHT - (		(43.0)	(1.2)	(62.4)			
		> 230N	4.732	.008	5.665	.016	.748	.005
	(		(43.0)	(1.6)	(60.8)			
	BEND - (	230M	4.718	.008	5.708	.015	.743	.008
	(		(42.7)	(1.6)	(61.4)			
		> 230F	4.684	.007	5.725	.014	.738	.005
	STRAIGHT - (		(41.9)	(1.5)	(61.7)			
		> 235	4.369	.000	5.725	.008	.728	.014
	STRAIGHT - (		(43.2)	(.0)	(61.7)			
		> 235.1	3.802	.003	5.725	.001	.739	.024
	STRAIGHT - (		(68.3)	(.9)	(61.7)			
		> 240	3.160	.000	5.725	.006	.758	.035
	STRAIGHT - (		(87.7)	(.0)	(61.7)			
		> 240.1	2.459	.008	5.725	.008	.770	.045
	STRAIGHT - (		(91.0)	(2.5)	(61.7)			
		> 240.2	1.726	.012	5.725	.002	.771	.056
	STRAIGHT - (		(79.5)	(3.6)	(61.7)			
		> 245	.995	.000	5.725	.023	.765	.067
	STRAIGHT - (		(56.1)	(.0)	(61.7)			
		> 250N	.444	.034	5.725	.089	.765	.076
	(		(51.4)	(8.8)	(61.7)			
	BEND - (	250M	.471	.039	5.725	.080	.766	.076
	(		(52.3)	(10.1)	(61.4)			
		> 250F	.459	.041	5.725	.092	.768	.076

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE: 52

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		> 250F	.459 (52.8)	.041 (10.7)	5.725 (60.6)	.097	.768	.076
	STRAIGHT -(
		> 255M	.440 (54.7)	.041 (10.7)	5.731 (54.8)	.141	.810	.069
	(
	BEND -(	255M	.439 (55.0)	.039 (10.2)	5.712 (53.9)	.149	.819	.067
	(
		> 255F	.438 (55.1)	.035 (9.0)	5.662 (52.7)	.155	.830	.063
	STRAIGHT -(
		> 260	.438 (55.1)	.000 (.0)	5.154 (64.4)	.268	.892	.031
	STRAIGHT -(
		> 260.1	.438 (55.1)	.008 (1.9)	4.658 (46.6)	.257	.939	.005
	STRAIGHT -(
		> 265	.438 (55.1)	.000 (.0)	4.138 (130.5)	.308	.971	.024
	STRAIGHT -(
		> 265.1	.438 (55.1)	.035 (5.4)	3.373 (169.1)	.382	.984	.048
	STRAIGHT -(
271		> 265.2	.438 (55.1)	.076 (11.4)	2.639 (191.7)	.456	.956	.036
	STRAIGHT -(
		> 270	.438 (55.1)	.089 (13.6)	1.998 (204.7)	.531	.883	.020
	STRAIGHT -(
BRANCH PT.		-- 275	.438 (55.1)	.044 (9.1)	1.514 (220.1)	.613	.746	.118
BRANCH PT.		-- 275	.438 (55.1)	.044 (9.1)	1.514 (220.1)	.613	.746	.118
TERMINAL	STRAIGHT -(	-- 280	.438 (55.1)	.040 (8.5)	1.453 (223.8)	.613	.746	.118
BRANCH PT.		-- 275	.438 (55.1)	.044 (9.1)	1.514 (220.1)	.613	.746	.118
	STRAIGHT -(
		> 275.1	.353 (44.5)	.044 (9.1)	1.155 (167.5)	.630	.618	.172
	STRAIGHT -(
		> 285	.246 (31.1)	.044 (9.1)	.798 (117.4)	.604	.491	.193
	STRAIGHT -(
		> 285.1	.108 (14.0)	.044 (9.1)	.321 (59.4)	.566	.327	.167
	STRAIGHT -(
BRANCH PT.		-- 290	.023 (2.1)	.044 (9.1)	.077 (10.1)	.316	.168	.082
BRANCH PT.		-- 290	.023 (2.1)	.044 (9.1)	.077 (10.1)	.316	.168	.082
	STRAIGHT -(
		> 295M	.022 (1.7)	.044 (9.1)	.057 (5.8)	.295	.155	.076
	(
	BEND -(	295M	.020 (1.5)	.039 (8.2)	.046 (2.1)	.259	.139	.065
	(
		> 295F	.016 (1.4)	.031 (6.5)	.025 (1.5)	.223	.121	.054
	STRAIGHT -(
		> 300N	.004	.004	.010	.096	.067	.024

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 53

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		>- 300N	.004	.004	.010	.096	.067	.026
	(		(.7)	(.9)	(2.2)			
	BEND - (	300H	.003	.001	.011	.061	.046	.015
	(		(.5)	(.2)	(2.0)			
	RIGID - (	>- 305	.002	.000	.008	.025	.026	.006
	(		(.4)	(.0)	(1.5)			
	STRAIGHT - (	>- 310	.000	.000	.001	.025	.026	.005
	(		(.1)	(.0)	(.2)			
ANCHOR		-- 315	.000	.000	.000	.000	.000	.000
	(		(.0)	(.0)	(.0)			
BRANCH PT.	STRAIGHT - (	-- 290	.023	.044	.077	.316	.168	.082
	(		(2.1)	(4.1)	(10.1)			
		>- 500N	.040	.075	.077	.314	.166	.077
	(		(2.7)	(15.7)	(10.2)			
	BEND - (	500H	.052	.097	.085	.313	.164	.064
	(		(3.4)	(21.0)	(12.4)			
	STRAIGHT - (	>- 500F	.056	.107	.107	.312	.163	.056
	(		(4.2)	(23.4)	(18.2)			
272	RIGID - (	>- 505	.056	.107	.138	.311	.161	.050
	(		(5.2)	(23.4)	(27.3)			
	STRAIGHT - (	>- 510	.058	.107	.223	.311	.161	.050
	(		(8.1)	(23.4)	(52.4)			
	STRAIGHT - (	>- 510.1	.062	.107	.388	.303	.155	.035
	(		(13.7)	(23.4)	(106.5)			
		>- 515N	.062	.107	.546	.291	.153	.033
	(		(18.2)	(23.4)	(167.2)			
	BEND - (	515H	.062	.106	.564	.288	.153	.033
	(		(18.6)	(23.5)	(175.7)			
	STRAIGHT - (	>- 515F	.062	.104	.562	.285	.153	.033
	(		(18.8)	(23.6)	(179.1)			
	STRAIGHT - (	>- 520	.062	.095	.520	.275	.153	.033
	(		(18.8)	(24.4)	(178.3)			
	STRAIGHT - (	>- 520.1	.062	.077	.421	.253	.151	.031
	(		(18.8)	(26.5)	(173.3)			
	STRAIGHT - (	>- 525	.062	.059	.327	.231	.139	.036
	(		(18.8)	(27.9)	(161.9)			
		>- 530N	.062	.052	.290	.222	.130	.034
	(		(18.8)	(28.1)	(155.8)			
	BEND - (	530H	.061	.050	.276	.220	.126	.036
	(		(18.6)	(28.1)	(150.7)			
	STRAIGHT - (	>- 530F	.059	.050	.256	.217	.122	.038
	(		(18.0)	(28.2)	(141.5)			
	STRAIGHT - (	>- 530F.1	.039	.050	.137	.193	.094	.045
	(		(12.1)	(28.2)	(76.1)			
		>- 535N	.024	.050	.037	.150	.068	.039

DYNAFLEX

LOADING - SHOCK LOADING NO. 2

PAGE 54

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		> 535N	.024 (7.1)	.050 (28.2)	.037 (19.2)	.150	.064	.039
	BEND - (	535M	.022 (6.3)	.045 (25.6)	.027 (13.1)	.138	.064	.036
		> 535F	.017 (5.0)	.036 (20.0)	.023 (10.7)	.126	.059	.033
	STRAIGHT - (	540	.011 (3.4)	.023 (12.8)	.023 (10.7)	.115	.056	.029
		> 545N	.006 (1.9)	.013 (6.3)	.023 (10.7)	.104	.052	.026
	BEND - (	545M	.004 (1.1)	.006 (2.3)	.021 (10.3)	.091	.047	.023
		> 545F	.003 (1.0)	.003 (1.0)	.018 (9.3)	.079	.041	.019
	STRAIGHT - (	550N	.003 (1.0)	.002 (.5)	.015 (7.9)	.065	.036	.017
		> 550M	.003 (.8)	.000 (.1)	.011 (6.1)	.053	.029	.014
	BEND - (	550M	.002 (.6)	.000 (.0)	.006 (3.8)	.039	.023	.011
	STRAIGHT - (	555	.000 (.0)	.000 (.0)	.000 (.0)	.000	.000	.000
ANCHOR								
		> 210	4.732 (43.0)	.000 (.0)	2.063 (87.0)	.067	.882	.061
BRANCH PT.	STRAIGHT - (	400	4.732 (43.0)	.011 (.8)	2.068 (90.0)	.066	.886	.046
		> 405	4.732 (43.0)	.000 (.0)	2.345 (103.1)	.081	.968	.037
	STRAIGHT - (	405.1	4.732 (43.1)	.011 (.8)	3.030 (173.1)	.077	1.001	.066
		> 410	4.732 (43.1)	.000 (.0)	3.797 (251.0)	.080	.862	.012
	STRAIGHT - (	410.1	4.732 (43.1)	.005 (.6)	4.411 (267.6)	.088	.582	.061
		> 415	4.732 (43.1)	.000 (.0)	4.734 (227.9)	.101	.272	.012
	STRAIGHT - (	415.1	4.732 (43.1)	.010 (2.1)	4.697 (207.3)	.116	.331	.006
		> 420	4.732 (43.1)	.000 (.0)	4.293 (239.9)	.132	.685	.035
	STRAIGHT - (	420.1	4.732 (43.1)	.047 (9.0)	3.572 (246.9)	.150	.998	.060
		> 425	4.732 (43.1)	.087 (14.6)	2.636 (184.4)	.169	1.196	.018
	STRAIGHT - (	425.1	4.732 (43.1)	.078 (14.6)	1.931 (14.6)	.183	1.246	.053

273

GENERAL NOTES FOR THIS LOADING:

- (1) THE SPECIFICATIONS FOR THE SHOCK LOAD INCLUDING SPECTRUM INTERPOLATION RULES APPEAR IN THE EDITED PIPING SYSTEM DESCRIPTION.
- (2) THE GLOBAL COMPONENTS OF THE SHOCK HAVE BEEN ASSUMED TO ACT INDEPENDENTLY.
- (3) THE ABSOLUTE VALUE OF THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE HAVE BEEN COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD. MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

LUC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
ANCHORS:								
170	31.	639.	103.	648.	1692.	405.	215.	1753.
275	315	107.	141.	67.	189.	341.	224.	464.
	555	120.	51.	54.	141.	415.	177.	428.
	460	127.	65.	41.	149.	239.	248.	827.
RESTRAINTS:								
175	0.	1025.	0.	1025.	0.	6.	0.	0.
205F	0.	280.	0.	280.	0.	0.	0.	0.

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 57

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LIC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED)								
225	0.	20.	0.	20.	0.	0.	0.	0.
235	0.	70.	0.	70.	0.	0.	0.	0.
240	0.	83.	0.	83.	0.	0.	0.	0.
245	0.	47.	0.	47.	0.	0.	0.	0.
240	0.	76.	0.	76.	0.	0.	0.	0.
265	0.	67.	0.	67.	0.	0.	0.	0.
405	0.	31.	0.	31.	0.	0.	0.	0.
410	0.	6.	0.	6.	0.	0.	0.	0.
415	0.	15.	0.	15.	0.	0.	0.	0.
420	0.	34.	0.	34.	0.	0.	0.	0.

276

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 50

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LIC. ID.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED)								
430F	0.	35.	0.	35.	0.	0.	0.	0.

DYNAPLEX

LOADING - SHOCK LOADING NO. 3

PAGE 59

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*
* INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *
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THE MAXIMUM STRESS OF 6045. OCCURS AT POINT 175

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE ANSI B31.1 - 1977 PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (**) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE HEADING BELOW) ARE AUTOMATICALLY CALCULATED AND APPLIED AT BENDS, ELBOWS, MITERS AND ADMISSIBLE TYPES OF TEES (AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE MODULUS IS USED FOR THE BRANCH LEG AT REDUCED OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK. THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

278

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 60

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
ANCHR		-- 170	103.	640.	215.	1692.	405.	1.00	1.00	6.79	3097.
	STR	>- 170.1	103.	640.	215.	864.	296.	1.00	1.00	6.79	1657.
	STR	>- 175	103.	389.	215.	3409.	205.	1.00	1.00	6.79	6045. **
	STR	>- 175.1	103.	367.	215.	1749.	139.	1.00	1.00	6.79	3123.
	STR	>- 175.2	103.	312.	215.	243.	96.	1.00	1.00	6.79	597.
	STR	>- 190N	103.	312.	215.	1163.	107.	1.00	1.00	6.79	2098.
	BEND	(190M	115.	253.	224.	1268.	86.	1.00	1.00	6.79	2279.
		>- 190F	196.	105.	116.	206.	1339.	1.00	1.00	6.79	2402.
	STR	>- 190F.1	92.	76.	116.	95.	1789.	1.00	1.00	6.79	3172.
	STR	>- 190F.2	92.	76.	116.	130.	2086.	1.00	1.00	6.79	3698.
279	STR	>- 190F.3	31.	43.	116.	246.	2159.	1.00	1.00	6.79	3844.
	STR	>- 195N	184.	44.	116.	2035.	290.	1.00	1.00	6.79	3637.
	BEND	(195M	107.	156.	140.	1996.	275.	1.00	1.00	6.79	3568.
		>- 195F	40.	185.	287.	1926.	110.	1.00	1.00	6.79	3445.
	STR	>- 195F.1	46.	240.	287.	895.	67.	1.00	1.00	6.79	1664.
	STR	>- 205N	65.	297.	287.	368.	233.	1.00	1.00	6.79	922.
	BEND	(205M	168.	253.	345.	479.	148.	1.00	1.00	6.79	1075.
		>- 205F	293.	79.	255.	541.	267.	1.00	1.00	6.79	1158.
	STR	-- 210	18.	83.	255.	197.	657.	1.00	1.00	6.79	1243.
	BR pT	-- 210	37.	40.	585.	101.	530.	1.00	1.00	6.79	1466.
	STR	>- 210.1	35.	32.	585.	67.	513.	1.00	1.00	6.79	1380.
	STR	>- 220	33.	26.	585.	34.	491.	1.00	1.00	6.79	1351.

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 61

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	FLEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS	
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN-PLANE	OUT-OF-PLANE		PSI	
	STR	>- 220	33.	26.	585.	34.	491.	1.00	1.00	6.79	1351.	
	STR	>- 220.1	31.	31.	585.	51.	433.	1.00	1.00	6.79	1289.	
	STR	>- 225	31.	31.	585.	87.	326.	1.00	1.00	6.79	1193.	
	STR	>- 225.1	30.	37.	585.	50.	206.	1.00	1.00	6.79	1100.	
	STR	>- 225.2	28.	45.	585.	19.	148.	1.00	1.00	6.79	1067.	
	STR	>- 230N	28.	43.	585.	264.	19.	1.00	1.00	6.79	1134.	
	BEND	(230M	34.	41.	421.	272.	407.	1.00	1.00	6.79	1140.	
	STR	>- 230F	43.	28.	22.	273.	583.	1.00	1.00	6.79	1138.	
	STR	>- 235	39.	77.	22.	576.	253.	1.00	1.00	6.79	1112.	
280	STR	>- 235.1	37.	76.	22.	232.	258.	1.00	1.00	6.79	614.	
	STR	>- 240	35.	21.	22.	119.	258.	1.00	1.00	6.79	504.	
	STR	>- 240.1	34.	27.	22.	77.	219.	1.00	1.00	6.79	411.	
	STR	>- 240.2	34.	32.	22.	45.	155.	1.00	1.00	6.79	289.	
	STR	>- 245	35.	52.	22.	60.	146.	1.00	1.00	6.79	281.	
	STR	>- 250N	35.	52.	22.	170.	214.	1.00	1.00	6.79	485.	
	BEND	(250M	55.	32.	160.	180.	154.	1.00	1.00	6.79	504.	
	STR	>- 250F	43.	48.	224.	19.	174.	1.00	1.00	6.79	502.	
	STR	>- 255N	43.	48.	224.	96.	82.	1.00	1.00	6.79	455.	
	BEND	(255M	44.	46.	132.	104.	190.	1.00	1.00	6.79	448.	
	STR	>- 255F	30.	57.	72.	104.	207.	1.00	1.00	6.79	429.	
	STR	>- 260	30.	57.	72.	137.	116.	1.00	1.00	6.79	341.	
	STR	>- 260.1	32.	48.	72.	83.	98.	1.00	1.00	6.79	260.	

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 62

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULES (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN- PLANE	OUT-OF- PLANE		
		> 260.1	32.	48.	72.	83.	98.	1.00	1.00	6.79	260.
	STR - (
		> 265	36.	34.	72.	150.	144.	1.00	1.00	6.79	388.
	STR - (
		> 265.1	41.	31.	72.	25.	192.	1.00	1.00	6.79	365.
	STR - (
		> 265.2	48.	34.	72.	106.	181.	1.00	1.00	6.79	392.
	STR - (
		> 270	57.	38.	72.	223.	125.	1.00	1.00	6.79	469.
	STR - (
BR	PT	-- 275	57.	38.	72.	345.	82.	1.00	1.00	6.79	639.
BR	PT	-- 275	1.	2.	0.	1.	2.	1.00	1.00	6.79	4.
	STR - (
TERM		-- 280	1.	2.	0.	0.	0.	1.00	1.00	6.79	0.
BR	PT	-- 275	29.	75.	83.	345.	72.	1.00	1.00	6.79	640.
	STR - (
		> 275.1	31.	80.	83.	183.	58.	1.00	1.00	6.79	370.
	STR - (
		> 285	34.	82.	83.	117.	153.	1.00	1.00	6.79	369.
	STR - (
		> 285.1	38.	81.	83.	300.	300.	1.00	1.00	6.79	764.
	STR - (
BR	PT	-- 290	38.	81.	83.	455.	521.	1.00	1.00	6.79	1231.
BR	PT	-- 290	138.	126.	69.	369.	217.	1.00	1.00	6.79	766.
	STR - (
		> 295N	139.	127.	69.	276.	362.	1.00	1.00	6.79	813.
	HEND - (
		295M	55.	180.	289.	298.	262.	1.00	1.00	6.79	867.
	STR - (
		> 295F	92.	166.	394.	322.	74.	1.00	1.00	6.79	909.
	HEND - (
		> 300N	92.	166.	394.	454.	182.	1.00	1.00	6.79	1110.
	HEND - (
		300M	158.	105.	382.	479.	215.	1.00	1.00	6.79	1148.
	STR - (
		> 305	141.	127.	223.	464.	362.	1.00	1.00	6.79	1112.
	PIGID - (
		> 310	141.	126.	223.	274.	359.	1.00	1.00	6.79	890.
	STR - (
ANCHP		-- 315	141.	126.	223.	222.	341.	1.00	1.00	6.79	820.

181

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
ANCHR		-- 315	141.	126.	223.	222.	341.	1.00	1.00	6.79	820.
BR PT	STR	-- 290	63.	160.	367.	425.	87.	1.00	1.00	6.79	1004.
		> 500N	63.	158.	367.	412.	47.	1.00	1.00	6.79	979.
	BEND	(500M	87.	146.	266.	399.	235.	1.00	1.00	6.79	943.
		> 500F	104.	135.	62.	376.	314.	1.00	1.00	6.79	872.
	STR	(> 505	103.	134.	62.	265.	345.	1.00	1.00	6.79	776.
	RIGID	(> 510	86.	100.	62.	169.	267.	1.00	1.00	6.79	569.
	STR	(> 510.1	81.	79.	62.	205.	138.	1.00	1.00	6.79	450.
		> 515N	78.	61.	62.	340.	42.	1.00	1.00	6.79	615.
282	BEND	(515M	87.	48.	45.	343.	56.	1.00	1.00	6.79	619.
		> 515F	40.	81.	35.	322.	57.	1.00	1.00	6.79	581.
	STR	(> 520	40.	81.	35.	208.	62.	1.00	1.00	6.79	388.
	STR	(> 520.1	24.	75.	35.	55.	81.	1.00	1.00	6.79	184.
	STR	(> 525	65.	68.	35.	241.	62.	1.00	1.00	6.79	512.
		> 530N	76.	69.	35.	372.	69.	1.00	1.00	6.79	671.
	BEND	(530M	95.	39.	55.	381.	61.	1.00	1.00	6.79	689.
		> 530F	59.	85.	78.	363.	37.	1.00	1.00	6.79	659.
	STR	(> 530F.1	54.	124.	74.	106.	140.	1.00	1.00	6.79	339.
	STR	(> 535N	53.	128.	78.	241.	205.	1.00	1.00	6.79	630.
	BEND	(535M	57.	126.	211.	299.	142.	1.00	1.00	6.79	694.
		> 535F	53.	128.	263.	305.	45.	1.00	1.00	6.79	716.
	STR	(> 540	53.	129.	265.	305.	67.	1.00	1.00	6.79	722.

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 64

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			RIF		SECTION MODULUS (IN (3))	LONGITUDINAL: STRESS PSI	
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		:	:
	STR	>- 540	53.	129.	263.	305.	67.	1.00	1.00	6.79	:	722.
	STR	>- 545N	53.	129.	263.	119.	308.	1.00	1.00	6.79	:	746.
	BEND	- (545M	102.	95.	284.	157.	286.	1.00	1.00	6.79	:	764.
	STR	>- 545F	119.	74.	312.	238.	172.	1.00	1.00	6.79	:	756.
	STR	>- 550N	119.	74.	312.	214.	172.	1.00	1.00	6.79	:	735.
	BEND	- (550M	120.	73.	195.	214.	308.	1.00	1.00	6.79	:	747.
	STR	>- 550F	51.	131.	177.	249.	338.	1.00	1.00	6.79	:	804.
	ANCHR	-- 555	51.	131.	177.	428.	415.	1.00	1.00	6.79	:	1099.
	BR PT	-- 210	77.	71.	74.	97.	409.	1.00	1.00	6.79	:	753.
283	STR	>- 400	77.	70.	74.	69.	345.	2.00	2.00	1.95	:	3324.
	STR	>- 405	77.	70.	74.	15.	163.	1.00	1.00	1.95	:	1107.
	STR	>- 405.1	79.	40.	74.	5.	124.	1.00	1.00	1.95	:	891.
	STR	>- 410	81.	19.	74.	8.	271.	1.00	1.00	1.95	:	1731.
	STR	>- 410.1	82.	23.	74.	8.	321.	1.00	1.00	1.95	:	2030.
	STR	>- 415	83.	39.	74.	21.	274.	1.00	1.00	1.95	:	1755.
	STR	>- 415.1	83.	39.	74.	30.	176.	1.00	1.00	1.95	:	1192.
	STR	>- 420	86.	51.	74.	72.	156.	1.00	1.00	1.95	:	1152.
	STR	>- 420.1	87.	42.	74.	31.	262.	1.00	1.00	1.95	:	1687.
	STR	>- 425	88.	34.	74.	91.	386.	1.00	1.00	1.95	:	2407.
	STR	>- 425.1	89.	37.	74.	96.	454.	1.00	1.00	1.95	:	2490.
	STR	>- 430N	90.	39.	74.	84.	506.	1.00	1.00	1.95	:	3193.
	BEND	- (430M	58.	79.	405.	89.	317.	1.00	1.00	1.95	:	3212.

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 66

 * DISPLACEMENTS AND ROTATIONS *
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EXPLANATORY NOTES:

VALUES IN PARENTHESES ARE ACCELERATIONS (IN PER SECOND SQUARED)

DISPLACEMENTS (INCHES)

ROTATIONS (DEGREES) ABOUT

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
ANCHOR		170	.000	.000	.000	.000	.000	.000
	STRAIGHT -(		(.0)	(.0)	(.0)			
	>-	170.1	.012	.028	.000	.032	.027	.022
	STRAIGHT -(		(8.8)	(6.8)	(.0)			
	>-	175	.043	.000	.000	.133	.046	.043
	STRAIGHT -(		(24.7)	(.0)	(.0)			
	>-	175.1	.090	.226	.000	.347	.059	.066
	STRAIGHT -(		(36.5)	(55.0)	(.0)			
	>-	175.2	.147	.582	.000	.427	.067	.089
	STRAIGHT -(		(41.1)	(141.7)	(.0)			
	>-	190N	.209	.955	.000	.387	.074	.112
	(		(51.0)	(232.3)	(.0)			
	BEND -(	190M	.211	.983	.012	.373	.075	.115
	(		(51.5)	(239.1)	(2.8)			
	>-	190F	.205	.995	.039	.359	.076	.117
	STRAIGHT -(		(50.0)	(241.9)	(9.4)			
	>-	190F.1	.089	.995	.329	.218	.087	.130
	STRAIGHT -(		(28.0)	(241.9)	(79.8)			
	>-	190F.2	.068	.995	.460	.061	.099	.128
	STRAIGHT -(		(31.0)	(241.9)	(111.5)			
	>-	190F.3	.177	.995	.407	.159	.112	.113
	STRAIGHT -(		(49.6)	(241.9)	(98.0)			
	>-	195N	.275	.995	.215	.349	.124	.089
	(		(74.2)	(241.9)	(49.6)			
	BEND -(	195M	.278	.984	.199	.372	.126	.086
	(		(74.9)	(239.2)	(45.6)			
	>-	195F	.271	.955	.193	.394	.127	.083
	STRAIGHT -(		(73.0)	(232.3)	(43.9)			
	>-	195F.1	.154	.538	.193	.511	.131	.052
	STRAIGHT -(		(39.7)	(139.7)	(43.9)			
	>-	205N	.043	.056	.193	.533	.120	.021

285

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 67

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	>- 205M	(	.043	.096	.193	.533	.124	.021
	(	(11.7)	(13.5)	(43.9)				
	BEND - (	205M	.036	.016	.183	.529	.122	.018
	(	(10.5)	(3.9)	(41.3)				
	>- 205F	(	.035	.000	.160	.523	.120	.015
	(	(10.3)	(.0)	(35.4)				
BRANCH PT.	STRAIGHT - (	210	.038	.000	.193	.500	.111	.006
	(	(11.4)	(.0)	(44.0)				
BRANCH PT.	STRAIGHT - (	210	.038	.000	.193	.500	.111	.006
	(	(11.4)	(.0)	(44.0)				
	>- 210.1	(	.038	.002	.192	.456	.083	.003
	(	(11.4)	(1.7)	(45.4)				
	STRAIGHT - (	220	.038	.003	.189	.412	.058	.002
	(	(11.4)	(2.4)	(45.1)				
	>- 220.1	(	.038	.004	.169	.338	.036	.002
	(	(11.4)	(1.9)	(45.4)				
	STRAIGHT - (	225	.038	.000	.128	.264	.051	.007
	(	(11.4)	(.0)	(41.7)				
	>- 225.1	(	.038	.009	.082	.202	.041	.013
	(	(11.4)	(2.4)	(31.9)				
	STRAIGHT - (	225.2	.038	.022	.037	.140	.042	.016
	(	(11.4)	(5.5)	(20.0)				
	>- 230M	(	.038	.036	.046	.078	.055	.016
	(	(11.4)	(6.9)	(14.0)				
	BEND - (	230M	.039	.035	.049	.072	.053	.016
	(	(11.6)	(6.7)	(14.4)				
	>- 230F	(	.041	.031	.050	.066	.051	.016
	(	(11.9)	(7.6)	(14.6)				
	STRAIGHT - (	235	.060	.000	.050	.032	.042	.016
	(	(19.3)	(.0)	(14.6)				
	>- 235.1	(	.085	.011	.050	.005	.042	.015
	(	(30.9)	(2.8)	(14.6)				
	STRAIGHT - (	240	.043	.000	.050	.010	.028	.014
	(	(36.3)	(.0)	(14.6)				
	>- 240.1	(	.091	.006	.050	.002	.036	.014
	(	(34.4)	(3.7)	(14.6)				
	STRAIGHT - (	240.2	.088	.005	.050	.004	.044	.014
	(	(27.3)	(4.8)	(14.6)				
	>- 245	(	.096	.000	.050	.006	.046	.015
	(	(26.3)	(.0)	(14.6)				
	STRAIGHT - (	250M	.111	.006	.050	.011	.044	.015
	(	(26.1)	(9.1)	(14.6)				
	BEND - (	250M	.112	.007	.050	.012	.043	.015
	(	(27.8)	(10.1)	(14.4)				
	>- 250F	(	.113	.007	.050	.014	.043	.015

286

DYNAFLEX

LOADING - SHOCK LOADING NO. 3

PAGE 68

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		> 250F	.113 (26.8)	.007 (10.5)	.050 (14.0)	.010	.043	.015
	STRAIGHT -(
		> 255H	.111 (24.2)	.007 (10.5)	.047 (15.4)	.021	.043	.013
	(
	BEND -(	255H	.111 (24.2)	.007 (9.9)	.046 (16.0)	.021	.044	.012
	(
		> 255F	.111 (24.2)	.006 (8.6)	.044 (16.1)	.022	.044	.011
	STRAIGHT -(
		> 260	.111 (24.2)	.000 (.0)	.040 (17.5)	.027	.048	.005
	STRAIGHT -(
		> 260.1	.111 (24.2)	.002 (1.5)	.057 (27.2)	.032	.047	.001
	STRAIGHT -(
		> 265	.111 (24.2)	.000 (.0)	.042 (37.2)	.037	.043	.005
	STRAIGHT -(
		> 265.1	.111 (24.2)	.009 (3.8)	.114 (43.0)	.044	.035	.012
	STRAIGHT -(
		> 265.2	.111 (24.2)	.019 (6.6)	.138 (38.3)	.052	.028	.009
	STRAIGHT -(
		> 270	.111 (24.2)	.022 (5.8)	.153 (32.7)	.059	.025	.006
	STRAIGHT -(
BRANCH PT.		-- 275	.111 (24.1)	.011 (18.2)	.163 (40.1)	.068	.021	.032
BRANCH PT.		-- 275	.111 (24.1)	.011 (18.2)	.163 (40.1)	.068	.021	.032
	STRAIGHT -(
TERMINAL		-- 280	.111 (24.1)	.011 (23.6)	.165 (42.7)	.068	.021	.032
BRANCH PT.		-- 275	.111 (24.1)	.011 (18.2)	.163 (40.1)	.068	.021	.032
	STRAIGHT -(
		> 275.1	.090 (17.6)	.011 (18.2)	.124 (30.2)	.069	.016	.045
	STRAIGHT -(
		> 285	.063 (22.6)	.011 (18.2)	.086 (22.2)	.066	.012	.050
	STRAIGHT -(
		> 285.1	.030 (27.8)	.011 (18.2)	.041 (14.4)	.055	.009	.043
	STRAIGHT -(
BRANCH PT.		-- 290	.005 (9.5)	.011 (18.2)	.008 (9.6)	.039	.012	.029
BRANCH PT.		-- 290	.005 (9.5)	.011 (18.2)	.008 (9.6)	.039	.012	.029
	STRAIGHT -(
		> 295H	.003 (6.2)	.011 (18.2)	.006 (9.9)	.037	.012	.028
	(
	BEND -(	295H	.001 (2.6)	.010 (16.8)	.004 (9.8)	.032	.011	.025
	(
		> 295F	.001 (.7)	.008 (13.6)	.004 (8.6)	.028	.011	.023
	STRAIGHT -(
		> 300N	.001	.004	.002	.013	.007	.012

287

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		>- 300N	.001	.001	.002	.013	.007	.012
	(		(2.1)	(2.0)	(3.0)			
	END - (	300N	.001	.000	.002	.004	.005	.007
	(		(2.0)	(.4)	(1.9)			
		>- 305	.001	.009	.001	.003	.003	.002
	RIGID - (		(1.5)	(.0)	(1.3)			
		>- 310	.000	.000	.000	.003	.003	.002
	STRAIGHT - (		(.2)	(.0)	(.2)			
ANCHOR		-- 315	.000	.000	.000	.000	.000	.000
	(		(.0)	(.0)	(.0)			
BRANCH PT.		-- 290	.005	.011	.008	.039	.012	.029
	STRAIGHT - (		(9.5)	(18.2)	(9.6)			
	(	>- 500N	.006	.013	.008	.041	.012	.030
			(12.2)	(19.6)	(9.6)			
	END - (	500N	.004	.016	.009	.044	.013	.031
	(		(15.9)	(20.7)	(9.6)			
		>- 500F	.011	.017	.012	.046	.012	.033
	STRAIGHT - (		(21.5)	(21.2)	(9.9)			
		>- 505	.014	.017	.016	.048	.012	.034
	RIGID - (		(24.8)	(21.2)	(11.4)			
		>- 510	.023	.017	.029	.048	.012	.034
	STRAIGHT - (		(49.0)	(21.2)	(18.3)			
		>- 510.1	.041	.017	.057	.055	.012	.029
	STRAIGHT - (		(27.2)	(21.3)	(37.4)			
		>- 515N	.053	.017	.087	.057	.013	.016
	(		(115.2)	(21.3)	(60.4)			
	END - (	515N	.054	.017	.091	.057	.013	.012
	(		(117.5)	(20.5)	(63.8)			
		>- 515F	.054	.016	.092	.057	.013	.009
	STRAIGHT - (		(118.3)	(19.0)	(65.4)			
		>- 520	.054	.016	.091	.057	.014	.004
	STRAIGHT - (		(118.3)	(16.9)	(66.2)			
		>- 520.1	.054	.017	.085	.056	.015	.007
	STRAIGHT - (		(110.3)	(23.7)	(66.8)			
		>- 525	.054	.017	.078	.056	.016	.007
	STRAIGHT - (		(118.3)	(26.1)	(64.6)			
		>- 530N	.050	.015	.074	.056	.016	.016
	(		(118.2)	(20.1)	(63.3)			
	END - (	530N	.053	.015	.072	.056	.015	.020
	(		(117.0)	(17.9)	(61.6)			
		>- 530F	.052	.014	.067	.056	.015	.025
	STRAIGHT - (		(113.5)	(16.8)	(57.8)			
		>- 530F.1	.034	.014	.036	.052	.015	.037
	STRAIGHT - (		(73.6)	(16.8)	(50.3)			
		>- 535N	.013	.014	.009	.041	.016	.034

288

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	>-- 535H		.013	.014	.009	.041	.016	.034
	(		(27.0)	(16.0)	(9.2)			
	BEND - (	535H	.010	.013	.007	.030	.017	.032
	(		(20.7)	(16.0)	(7.8)			
	>-- 535F		.008	.011	.006	.034	.017	.029
	STRAIGHT - (		(16.2)	(10.3)	(7.4)			
	>-- 540		.006	.008	.006	.031	.016	.026
	STRAIGHT - (		(12.8)	(12.6)	(7.4)			
	>-- 545H		.004	.006	.006	.028	.015	.022
	(		(9.5)	(11.5)	(7.4)			
	BEND - (	545H	.003	.004	.005	.025	.014	.020
	(		(7.3)	(9.7)	(6.6)			
	>-- 545F		.003	.003	.005	.022	.012	.017
	STRAIGHT - (		(6.5)	(6.6)	(5.0)			
	>-- 550H		.003	.001	.004	.018	.011	.015
	(		(6.5)	(3.0)	(3.4)			
	BEND - (	550H	.003	.000	.003	.015	.009	.012
	(		(5.6)	(.8)	(2.4)			
	>-- 550F		.002	.000	.002	.011	.007	.010
	STRAIGHT - (		(3.8)	(.0)	(1.6)			
ANCHOR	-- 555		.000	.000	.000	.000	.000	.000
	(		(.0)	(.0)	(.0)			
BRANCH PT.	-- 210		.038	.000	.193	.560	.111	.006
	STRAIGHT - (		(11.4)	(.0)	(40.0)			
	>-- 400		.038	.001	.192	.498	.117	.005
	STRAIGHT - (		(11.4)	(.6)	(43.5)			
	>-- 405		.038	.000	.189	.469	.187	.004
	STRAIGHT - (		(11.4)	(.0)	(45.0)			
	>-- 405.1		.038	.001	.336	.427	.199	.001
	STRAIGHT - (		(11.4)	(1.1)	(114.2)			
	>-- 410		.038	.000	.470	.386	.131	.002
	STRAIGHT - (		(11.4)	(.0)	(158.4)			
	>-- 410.1		.038	.002	.518	.345	.100	.001
	STRAIGHT - (		(11.4)	(3.7)	(150.9)			
	>-- 415		.038	.000	.458	.365	.165	.006
	STRAIGHT - (		(11.4)	(.0)	(121.1)			
	>-- 415.1		.038	.005	.319	.266	.240	.003
	STRAIGHT - (		(11.4)	(15.0)	(161.4)			
	>-- 420		.038	.000	.211	.228	.256	.019
	STRAIGHT - (		(11.3)	(.0)	(90.1)			
	>-- 420.1		.038	.025	.238	.193	.205	.029
	STRAIGHT - (		(11.3)	(55.8)	(98.2)			
	>-- 425		.038	.040	.368	.162	.125	.003
	STRAIGHT - (		(11.5)	(82.6)	(120.1)			
	>-- 425.1		.038	.032	.305	.143	.149	.029

289

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X-AXIS	Y-AXIS	Z-AXIS
	STRAIGHT - (	425.1	.038 (11.3)	.032 (67.6)	.305 (118.9)	.143	.149	.029
	(	430N	.038 (11.3)	.904 (7.7)	.255 (107.9)	.129	.266	.057
	BEND - (	430N	.038 (10.9)	.001 (2.3)	.252 (103.9)	.129	.280	.059
	(	430F	.040 (11.9)	.000 (.0)	.252 (95.3)	.128	.294	.061
	STRAIGHT - (	435N	.661 (59.6)	.000 (.0)	.268 (52.2)	.116	.421	.089
	(	435N	.059 (65.6)	.002 (3.8)	.270 (54.0)	.113	.437	.096
	BEND - (	435F	.046 (68.6)	.007 (12.9)	.271 (55.2)	.110	.452	.104
	(	440	.446 (148.6)	.987 (151.1)	.271 (55.2)	.052	.582	.280
	STRAIGHT - (	440.1	1.074 (267.1)	.097 (159.6)	.271 (55.2)	.039	.538	.471
	STRAIGHT - (	445N	1.554 (384.6)	.041 (36.2)	.271 (55.2)	.084	.408	.663
	(	445N	1.559 (386.5)	.037 (54.6)	.270 (54.6)	.087	.400	.673
	BEND - (	445F	1.536 (380.7)	.035 (53.3)	.266 (53.2)	.091	.392	.681
	STRAIGHT - (	445F.1	1.608 (249.4)	.035 (53.2)	.184 (37.2)	.129	.266	.739
	STRAIGHT - (	445F.2	.477 (117.8)	.035 (53.2)	.086 (17.5)	.129	.140	.681
	STRAIGHT - (	450N	.044 (12.6)	.035 (53.1)	.005 (2.0)	.085	.015	.471
	(	450N	.023 (8.9)	.034 (52.0)	.002 (.8)	.079	.009	.446
	BEND - (	450F	.014 (7.3)	.030 (30.5)	.060 (.0)	.074	.009	.418
	STRAIGHT - (	460	.000	.000	.000	.000	.000	.000
ANCHOR								

290

GENERAL NOTES FOR THIS LOADING:

- (1) THE SPECIFICATIONS FOR THE SHOCK LOAD INCLUDING SPECTRUM INTERPOLATION RULES APPEAR IN THE EARTHQUAKE PIPING SYSTEM DESCRIPTION.
- (2) THE GLOBAL COMPONENTS OF THE SHOCK HAVE BEEN ASSUMED TO ACT INDEPENDENTLY.
- (3) THE ABSOLUTE VALUE OF THE RESPONSE QUANTITIES ASSOCIATED WITH EACH FUNDAMENTAL MODE HAVE BEEN COMBINED USING THE CLOSELY SPACED FREQUENCY (CSF) METHOD. MODES WITHIN 10 PERCENT OF EACH OTHER ARE DIRECTLY SUMMED AND THEN COMBINED WITH THE REMAINING MODAL QUANTITIES BY SRSS.

 * FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS *

LDC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
ANCHORS:								
170	308.	779.	469.	960.	2062.	5189.	1657.	5824.
315	563.	324.	437.	783.	2865.	2994.	1629.	4452.
555	395.	177.	171.	465.	1574.	871.	1550.	2374.
460	207.	130.	302.	388.	1348.	1236.	1519.	2377.
RESTRAINTS:								
175	0.	1404.	0.	1404.	0.	0.	0.	0.
205F	0.	669.	0.	669.	0.	0.	0.	0.

ANCHORS:

281

RESTRAINTS:

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED)								
225	0.	122.	0.	122.	0.	0.	0.	0.
235	0.	84.	0.	84.	0.	0.	0.	0.
240	0.	95.	0.	95.	0.	0.	0.	0.
245	0.	230.	0.	230.	0.	0.	0.	0.
260	0.	538.	0.	538.	0.	0.	0.	0.
265	0.	794.	0.	794.	0.	0.	0.	0.
405	0.	454.	0.	454.	0.	0.	0.	0.
410	0.	35.	0.	35.	0.	0.	0.	0.
415	0.	34.	0.	34.	0.	0.	0.	0.
420	0.	87.	0.	87.	0.	0.	0.	0.

292

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 74

FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS (CONTINUED)

EXPLANATORY NOTES

THE FORCES AND MOMENTS SHOWN BELOW ARE THE ACTIONS OF THE PIPING SYSTEM ON THE ANCHORS AND RESTRAINTS.

LOC. NO.	FORCES (POUNDS)				MOMENTS (FOOT-POUNDS)			
	X	Y	Z	RESULTANT	X	Y	Z	RESULTANT
RESTRAINTS (CONTINUED)								
430F	0.	139.	0.	139.	0.	0.	0.	0.

 *
 * INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS *
 * ----- *
 *

THE MAXIMUM STRESS OF 16,450. OCCURS AT POINT 400

EXPLANATORY NOTES:

- (1) THE FORCES AND MOMENTS SHOWN BELOW ARE WITH REFERENCE TO THE ELEMENT LOCAL AXES.
- (2) THE STRESSES SHOWN BELOW ARE CALCULATED IN ACCORDANCE WITH THE
ANSI B31.1 - 1977
PIPING CODE (INCLUDING ALL MANDATORY UPDATES)
- (3) A (**) FOLLOWING A STRESS VALUE INDICATES THE MAXIMUM STRESS FOR THIS LOADING CONDITION.
- (4) A (*) FOLLOWING A STRESS VALUE INDICATES A STRESS WITHIN 10 PER CENT OF THE MAXIMUM.
- (5) THE COLD MODULUS HAS BEEN USED IN THIS ANALYSIS.
- (6) THE STRESS INTENSIFICATION FACTORS (ABBREVIATED AS SIF IN THE TABLE HEADING BELOW) ARE AUTOMATICALLY CALCULATED AND APPLIED AT BENDS, ELBOWS, MITERS AND ADMISSIBLE TYPES OF TEES (AS SPECIFICALLY IDENTIFIED IN THE INPUT DESCRIPTION OF THE PIPING SYSTEM). USER ENTERED STRESS INTENSIFICATION FACTORS TAKE PRECEDENCE OVER INTERNALLY CALCULATED VALUES.
- (16) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE MODULUS IS USED FOR THE BRANCH LEG AT REDUCED OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK. THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.

294

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 76

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN- PLANE	OUT-OF- PLANE		
ANCHR		-- 170	469.	837.	1657.	2062.	5199.	1.00	1.00	6.79	10289.
	STR	>- 170.1	469.	834.	1657.	1052.	4017.	1.00	1.00	6.79	7898.
	STR	>- 175	469.	713.	1657.	4157.	2904.	1.00	1.00	6.79	9424.
	STR	>- 175.1	469.	689.	1657.	1841.	1877.	1.00	1.00	6.79	5489.
	STR	>- 175.2	469.	644.	1657.	2241.	1310.	1.00	1.00	6.79	5440.
	STR	>- 190N	469.	644.	1657.	4544.	1485.	1.00	1.00	6.79	8937.
	BEND	(190M	688.	347.	1753.	4680.	1327.	1.00	1.00	6.79	9135.
	STR	>- 190F	541.	514.	1539.	1566.	4618.	1.00	1.00	6.79	9034.
	STR	>- 190F.1	541.	514.	1539.	748.	2925.	1.00	1.00	6.79	5986.
	STR	>- 190F.2	508.	499.	1539.	575.	2200.	1.00	1.00	6.79	4850.
	STR	>- 190F.3	497.	479.	1539.	1334.	2979.	1.00	1.00	6.79	6375.
	STR	>- 195N	511.	453.	1539.	2187.	4393.	1.00	1.00	6.79	9085.
	BEND	(195M	631.	266.	1669.	4429.	2092.	1.00	1.00	6.79	9141.
	STR	>- 195F	387.	565.	2273.	4290.	1539.	1.00	1.00	6.79	8997.
	STR	>- 195F.1	372.	585.	2273.	1904.	1711.	1.00	1.00	6.79	6047.
	STR	>- 205N	337.	609.	2273.	656.	2188.	1.00	1.00	6.79	5693.
	BEND	(205M	603.	348.	1096.	819.	3010.	1.00	1.00	6.79	5840.
	STR	>- 205F	581.	383.	2254.	827.	2335.	1.00	1.00	6.79	5916.
BR PT		-- 210	340.	377.	2254.	2586.	694.	1.00	1.00	6.79	6183.
BR PT		-- 210	160.	266.	617.	1100.	2856.	1.00	1.00	6.79	5532.
	STR	>- 210.1	161.	260.	617.	838.	2496.	1.00	1.00	6.79	4780.
	STR	>- 220	163.	254.	617.	574.	2299.	1.00	1.00	6.79	4326.

205

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 77

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION KIDGES (IN (3))	LONGITUDINAL STRESS PSI	
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		:	:
	STR	> 220	163.	254.	617.	574.	2299.	1.00	1.00	6.79	:	4326.
	STR	> 220.1	171.	243.	617.	144.	2366.	1.00	1.00	6.79	:	4328.
	STR	> 225	182.	216.	617.	324.	2786.	1.00	1.00	6.79	:	5073.
	STR	> 225.1	182.	216.	617.	186.	3298.	1.00	1.00	6.79	:	5936.
	STR	> 225.2	194.	202.	617.	94.	3935.	1.00	1.00	6.79	:	7038.
	STR	> 230N	218.	174.	617.	4587.	127.	1.00	1.00	6.79	:	8179.
	BEND	(230M	244.	155.	453.	4617.	442.	1.00	1.00	6.79	:	8233.
	STR	> 230F	170.	220.	141.	4586.	616.	1.00	1.00	6.79	:	8178.
	STR	> 235	149.	244.	141.	620.	4151.	1.00	1.00	6.79	:	7419.
206	STR	> 235.1	141.	239.	141.	263.	3564.	1.00	1.00	6.79	:	6319.
	STR	> 240	142.	216.	141.	159.	3195.	1.00	1.00	6.79	:	5657.
	STR	> 240.1	153.	213.	141.	103.	2976.	1.00	1.00	6.79	:	5266.
	STR	> 240.2	171.	230.	141.	219.	2961.	1.00	1.00	6.79	:	5252.
	STR	> 245	192.	343.	141.	364.	3170.	1.00	1.00	6.79	:	5642.
	STR	> 250N	205.	356.	141.	1072.	3538.	1.00	1.00	6.79	:	6536.
	BEND	(250M	294.	287.	2558.	1130.	2508.	1.00	1.00	6.79	:	6636.
	STR	> 250F	238.	356.	3599.	65.	1112.	1.00	1.00	6.79	:	6656.
	STR	> 255N	239.	376.	3599.	862.	829.	1.00	1.00	6.79	:	6701.
	BEND	(255M	318.	323.	2835.	952.	2525.	1.00	1.00	6.79	:	6491.
	STR	> 255F	302.	328.	826.	973.	3509.	1.00	1.00	6.79	:	6547.
	STR	> 260	324.	335.	826.	1100.	2918.	1.00	1.00	6.79	:	5700.
	STR	> 260.1	401.	506.	826.	747.	2435.	1.00	1.00	6.79	:	4730.

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	FLEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)			SIF		SECTION MODULES (IN (3))	LONGITUDINAL STRESS PSI
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN PLANE	OUT-OF PLANE		
ANCHR		-- 315	324.	713.	2994.	1629.	2865.	1.00	1.00	6.79	7866.
BR PT		-- 290	173.	444.	2751.	1212.	619.	1.00	1.00	6.79	5422.
	STR - (	>- 500N	172.	442.	2751.	1188.	540.	1.00	1.00	6.79	5379.
	HEND - (	500M	223.	419.	1931.	1157.	1962.	1.00	1.00	6.79	5276.
	STR - (	>- 500F	261.	396.	512.	1101.	2596.	1.00	1.00	6.79	5063.
	STR - (	>- 505	259.	395.	512.	2443.	1026.	1.00	1.00	6.79	4768.
	RIGID - (	>- 510	228.	354.	512.	2053.	841.	1.00	1.00	6.79	4023.
	STR - (	>- 510.1	220.	333.	512.	1375.	562.	1.00	1.00	6.79	2775.
	STR - (	>- 515N	215.	317.	512.	898.	415.	1.00	1.00	6.79	1967.
298	HEND - (	515M	197.	329.	505.	829.	410.	1.00	1.00	6.79	1861.
	STR - (	>- 515F	302.	236.	405.	744.	498.	1.00	1.00	6.79	1735.
	STR - (	>- 520	298.	228.	405.	451.	470.	1.00	1.00	6.79	1354.
	STR - (	>- 520.1	311.	212.	405.	399.	429.	1.00	1.00	6.79	1258.
	STR - (	>- 525	331.	218.	405.	1041.	436.	1.00	1.00	6.79	2118.
	STR - (	>- 530N	343.	224.	405.	1319.	500.	1.00	1.00	6.79	2592.
	HEND - (	530M	371.	174.	182.	1334.	639.	1.00	1.00	6.79	2633.
	STR - (	>- 530F	186.	365.	533.	1242.	429.	1.00	1.00	6.79	2504.
	STR - (	>- 530F.1	181.	419.	533.	279.	702.	1.00	1.00	6.79	1633.
	STR - (	>- 535N	179.	425.	533.	1105.	830.	1.00	1.00	6.79	2616.
	HEND - (	535M	172.	429.	887.	1161.	668.	1.00	1.00	6.79	2839.
	STR - (	>- 535F	168.	431.	1023.	1190.	492.	1.00	1.00	6.79	2904.
	STR - (	>- 540	169.	431.	1023.	1207.	540.	1.00	1.00	6.79	2952.

INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS (CONTINUED)

POINT TYPE	ELEM TYPE	LOC. NO.	FORCES (POUNDS)		MOMENTS (FOOT-POUNDS)		SIF		SECTION MODULUS (IN (3))	LONGITUDINAL STRESS PSI	
			AXIAL	RESULTANT SHEAR	TORSION	IN-PLANE BENDING	OUT-OF-PLANE BENDING	IN- PLANE			OUT-OF- PLANE
		>- 540	169.	431.	1023.	1207.	540.	1.00	1.00	6.79	2952.
	STR - (
		>- 545N	169.	432.	1023.	650.	1234.	1.00	1.00	6.79	3054.
	BEND - (	545M	321.	338.	1208.	754.	1104.	1.00	1.00	6.79	3183.
		>- 545F	394.	245.	1266.	937.	811.	1.00	1.00	6.79	3131.
	STR - (
		>- 550N	395.	245.	1266.	853.	837.	1.00	1.00	6.79	3076.
	BEND - (	550M	402.	233.	597.	852.	1435.	1.00	1.00	6.79	3131.
		>- 550F	177.	430.	871.	963.	1342.	1.00	1.00	6.79	3299.
	STR - (
	ANCHR	-- 555	177.	430.	871.	1550.	1574.	1.00	1.00	6.79	4195.
	BR PT	-- 210	149.	469.	100.	1486.	1606.	1.00	1.00	6.79	3870.
	STR - (
		>- 400	145.	468.	100.	1059.	1429.	2.00	2.00	1.95	16450. **
	STR - (
		>- 405	139.	179.	100.	222.	947.	1.00	1.00	1.95	6018.
	STR - (
		>- 405.1	134.	145.	100.	87.	639.	1.00	1.00	1.95	4018.
	STR - (
		>- 410	130.	98.	100.	50.	839.	1.00	1.00	1.95	5208.
	STR - (
		>- 410.1	127.	70.	100.	40.	1121.	1.00	1.00	1.95	6931.
	STR - (
		>- 415	125.	79.	100.	48.	1250.	1.00	1.00	1.95	7728.
	STR - (
		>- 415.1	125.	89.	100.	83.	1234.	1.00	1.00	1.95	7636.
	STR - (
		>- 420	126.	116.	100.	205.	1113.	1.00	1.00	1.95	6997.
	STR - (
		>- 420.1	126.	116.	100.	46.	942.	1.00	1.00	1.95	5836.
	STR - (
		>- 425	129.	130.	100.	262.	851.	1.00	1.00	1.95	5517.
	STR - (
		>- 425.1	132.	142.	100.	406.	913.	1.00	1.00	1.95	6185.
	STR - (
		>- 430N	135.	151.	100.	550.	1130.	1.00	1.00	1.95	7758.
	BEND - (	430M	116.	171.	836.	554.	794.	1.00	1.00	1.95	7875.

289

DYNAPLEX

LOADING - SHOCK LOADING NO. 4

PAGE 02

 *
 * DISPLACEMENTS AND ROTATIONS *
 * ----- *
 *

EXPLANATORY NOTES:

VALUES IN PARENTHESES ARE ACCELERATIONS (IN PER SECOND SQUARED)

DISPLACEMENTS (INCHES)

ROTATIONS (DEGREES) ABOUT

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
ANCHOR		170	.000	.000	.000	.000	.000	.000
	STRAIGHT -(		(.0)	(.0)	(.0)			
	>- 170.1		.156	.034	.000	.039	.356	.167
	STRAIGHT -(		(22.1)	(7.2)	(.0)			
	>- 175		.572	.000	.000	.163	.622	.333
	STRAIGHT -(		(66.8)	(.0)	(.0)			
	>- 175.1		1.221	.264	.000	.401	.813	.512
	STRAIGHT -(		(114.0)	(58.1)	(.0)			
	>- 175.2		2.000	.660	.000	.454	.916	.690
	STRAIGHT -(		(156.0)	(149.4)	(.0)			
	>- 190N		2.832	1.025	.001	.454	.947	.868
	(		(204.0)	(244.3)	(.0)			
	BEND -(	190N	2.917	1.051	.015	.466	.947	.885
	(		(206.8)	(251.4)	(3.0)			
	>- 190F		2.984	1.061	.050	.484	.947	.902
	STRAIGHT -(		(204.7)	(254.3)	(10.0)			
	>- 190F.1		3.630	1.061	.605	.648	.959	1.003
	STRAIGHT -(		(158.9)	(254.3)	(87.1)			
	>- 190F.2		4.424	1.061	1.265	.717	1.000	1.017
	STRAIGHT -(		(128.9)	(254.3)	(129.0)			
	>- 190F.3		5.259	1.061	1.902	.653	1.068	.944
	STRAIGHT -(		(122.7)	(254.3)	(133.0)			
	>- 195N		6.020	1.061	2.375	.519	1.169	.785
	(		(146.2)	(254.3)	(118.7)			
	BEND -(	195N	6.689	1.048	2.344	.507	1.178	.760
	(		(106.5)	(251.4)	(118.0)			
	>- 195F		6.154	1.015	2.408	.499	1.149	.737
	STRAIGHT -(		(102.1)	(244.1)	(117.6)			
	>- 195F.1		6.746	.566	2.408	.540	1.261	.489
	STRAIGHT -(		(84.9)	(137.3)	(117.6)			
	>- 205N		7.416	.058	2.408	.561	1.326	.242

301

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 83

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X-AXIS	Y-AXIS	Z-AXIS
			-----	-----	-----	-----	-----	-----
	> 205H		7.416	.058	2.408	.561	1.326	.242
	(		(67.6)	(14.2)	(117.6)			
	BEND -(	205H	7.479	.017	2.407	.557	1.335	.218
	(		(68.8)	(4.1)	(116.6)			
	> 205F		7.514	.000	2.406	.551	1.343	.192
	(		(69.8)	(.0)	(114.3)			
BRANCH PT.	STRAIGHT -(	210	7.562	.000	2.418	.527	1.388	.098
	(		(72.2)	(.0)	(116.6)			
BRANCH PT.	STRAIGHT -(	210	7.562	.000	2.418	.527	1.348	.098
	(		(72.2)	(.0)	(116.6)			
	> 210.1		7.562	.043	2.806	.481	1.435	.042
	(		(72.2)	(4.9)	(110.1)			
	> 220		7.562	.055	3.438	.434	1.462	.003
	(		(72.2)	(6.7)	(114.0)			
	> 220.1		7.562	.035	4.715	.357	1.449	.034
	(		(72.2)	(4.7)	(120.7)			
	> 225		7.562	.000	6.042	.279	1.365	.026
	(		(72.2)	(.0)	(118.4)			
302	STRAIGHT -(	225.1	7.562	.016	7.091	.214	1.259	.015
	(		(72.2)	(3.2)	(104.0)			
	> 225.2		7.562	.026	8.015	.148	1.145	.017
	(		(72.2)	(6.2)	(86.4)			
	> 230H		7.562	.039	8.777	.083	1.062	.020
	(		(72.2)	(9.8)	(84.1)			
	BEND -(	230H	7.546	.038	8.832	.077	1.056	.021
	(		(71.5)	(9.6)	(84.8)			
	> 230F		7.503	.033	8.854	.070	1.052	.021
	(		(69.9)	(8.4)	(85.1)			
	> 235		7.047	.000	8.854	.035	1.055	.026
	(		(68.1)	(.0)	(85.1)			
	> 235.1		6.302	.012	8.854	.006	1.124	.038
	(		(105.4)	(3.7)	(85.1)			
	> 240		5.342	.000	8.854	.014	1.208	.053
	(		(140.1)	(.0)	(85.1)			
	> 240.1		4.264	.012	8.854	.010	1.274	.064
	(		(163.3)	(7.3)	(85.1)			
	> 240.2		3.136	.016	8.854	.005	1.309	.086
	(		(174.5)	(9.8)	(85.1)			
	> 245		2.078	.000	8.854	.030	1.313	.102
	(		(180.0)	(.0)	(85.1)			
	> 250H		1.497	.039	8.854	.075	1.503	.116
	(		(186.5)	(19.5)	(85.1)			
	BEND -(	250H	1.470	.045	8.854	.086	1.302	.117
	(		(186.8)	(21.8)	(84.9)			
	> 250F		1.455	.048	8.855	.098	1.301	.117

DYNAFLEX

LOADING = SHOCK LOADING NO. 4

PAGE 84

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		> 250F	1.455	.048	8.855	.098	1.301	.117
	STRAIGHT - (		(186.0)	(22.9)	(84.1)			
		> 255N	1.410	.048	8.862	.148	1.328	.097
	(		(180.4)	(22.9)	(81.4)			
	BEND - (	255M	1.406	.045	8.828	.156	1.335	.089
	(		(180.0)	(21.6)	(81.1)			
		> 255F	1.404	.039	8.742	.163	1.345	.081
	STRAIGHT - (		(179.9)	(18.8)	(80.1)			
		> 260	1.404	.000	7.884	.223	1.403	.035
	STRAIGHT - (		(179.9)	(.0)	(86.8)			
		> 260.1	1.404	.014	7.063	.280	1.451	.012
	STRAIGHT - (		(179.9)	(3.7)	(115.9)			
		> 265	1.404	.000	6.211	.340	1.484	.061
	STRAIGHT - (		(179.9)	(.0)	(148.9)			
		> 265.1	1.404	.104	4.958	.427	1.443	.148
	STRAIGHT - (		(179.9)	(15.0)	(185.8)			
		> 265.2	1.404	.230	3.739	.515	1.445	.108
	STRAIGHT - (		(179.9)	(31.5)	(200.1)			
		> 270	1.404	.264	2.640	.604	1.332	.059
	STRAIGHT - (		(179.8)	(35.1)	(210.1)			
BRANCH PT.		-- 275	1.404	.078	1.743	.702	1.124	.378
			(179.8)	(37.9)	(229.8)			
BRANCH PT.		-- 275	1.404	.078	1.743	.702	1.124	.378
			(179.8)	(37.9)	(229.8)			
TERMINAL		-- 280	1.404	.054	1.619	.762	1.124	.378
			(179.8)	(47.2)	(235.1)			
BRANCH PT.		-- 275	1.404	.078	1.743	.702	1.124	.378
			(179.8)	(37.9)	(229.8)			
	STRAIGHT - (
		> 275.1	1.131	.078	1.331	.722	.932	.551
	STRAIGHT - (		(144.3)	(37.9)	(175.0)			
		> 285	.789	.078	.922	.691	.740	.618
	STRAIGHT - (		(108.1)	(37.8)	(122.7)			
		> 285.1	.346	.078	.446	.571	.443	.534
	STRAIGHT - (		(70.2)	(37.8)	(63.0)			
BRANCH PT.		-- 290	.046	.078	.102	.358	.249	.265
			(19.4)	(37.8)	(21.0)			
BRANCH PT.		-- 290	.046	.078	.102	.358	.249	.265
			(19.4)	(37.8)	(21.0)			
	STRAIGHT - (
		> 295N	.035	.078	.080	.334	.229	.246
	(		(12.6)	(37.8)	(20.3)			
	BEND - (	295M	.029	.071	.057	.293	.205	.213
	(		(5.4)	(34.8)	(19.6)			
		> 295F	.025	.055	.039	.253	.177	.178
	STRAIGHT - (		(2.2)	(24.0)	(17.1)			
		> 300N	.010	.007	.011	.188	.098	.081

303

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
		>- 300N	.010	.007	.011	.108	.098	.081
	(		(4.4)	(4.0)	(6.3)			
	BEND -(	300N	.008	.001	.012	.069	.067	.048
	(		(4.1)	(.8)	(4.2)			
		>- 305	.006	.000	.009	.029	.038	.017
	RIGID -(		(3.0)	(.0)	(2.9)			
		>- 310	.001	.000	.001	.029	.038	.017
	STRAIGHT -(		(.4)	(.0)	(.5)			
ANCHOR		-- 315	.000	.000	.000	.000	.000	.000
			(.0)	(.0)	(.0)			
BRANCH PT.		-- 290	.046	.078	.102	.358	.249	.265
	STRAIGHT -(		(19.4)	(37.8)	(21.0)			
		>- 500N	.065	.105	.102	.356	.246	.234
	(		(24.6)	(42.1)	(21.0)			
	BEND -(	500N	.084	.128	.112	.354	.242	.209
	(		(32.1)	(45.9)	(21.8)			
		>- 500F	.096	.137	.136	.353	.239	.184
	STRAIGHT -(		(43.2)	(47.7)	(25.1)			
		>- 505	.106	.137	.171	.351	.235	.164
	RIGID -(		(57.9)	(47.7)	(32.2)			
304		>- 510	.137	.137	.266	.351	.235	.164
	STRAIGHT -(		(98.1)	(47.7)	(56.6)			
		>- 510.1	.190	.137	.451	.340	.217	.095
	STRAIGHT -(		(173.7)	(47.7)	(113.8)			
		>- 515N	.214	.137	.628	.326	.203	.057
	(		(228.9)	(47.8)	(179.3)			
	BEND -(	515N	.216	.136	.647	.322	.202	.051
	(		(233.5)	(46.3)	(188.5)			
		>- 515F	.216	.133	.643	.319	.200	.047
	STRAIGHT -(		(235.0)	(43.8)	(192.3)			
		>- 520	.216	.122	.549	.306	.195	.042
	STRAIGHT -(		(235.0)	(40.2)	(192.0)			
		>- 520.1	.216	.102	.468	.278	.183	.040
	STRAIGHT -(		(235.0)	(51.7)	(187.9)			
		>- 525	.216	.076	.357	.251	.165	.058
	STRAIGHT -(		(235.0)	(55.6)	(177.1)			
		>- 530N	.216	.060	.315	.241	.154	.086
	(		(234.9)	(44.7)	(171.5)			
	BEND -(	530N	.213	.057	.298	.238	.149	.099
	(		(232.5)	(40.9)	(166.2)			
		>- 540F	.206	.055	.277	.234	.145	.112
	STRAIGHT -(		(225.4)	(39.1)	(156.0)			
		>- 540F.1	.131	.055	.149	.208	.116	.148
	STRAIGHT -(		(146.1)	(39.1)	(83.0)			
		>- 535N	.052	.055	.043	.162	.093	.131

DYNAFLEX

LOADING - SHOCK LOADING NO. 4

PAGE 86

DISPLACEMENTS AND ROTATIONS (CONTINUED)

POINT DESIGNATION	ELEMENT DESIGNATION	LOC. NO.	DISPLACEMENTS (INCHES)			ROTATIONS (DEGREES) ABOUT		
			X	Y	Z	X AXIS	Y AXIS	Z AXIS
	> 535N	(	.052	.055	.043	.162	.093	.131
	(		(53.8)	(39.1)	(23.6)			
	BEND - (	535M	.042	.051	.032	.149	.090	.122
	(		(41.2)	(36.7)	(18.6)			
	> 535F	(	.033	.041	.028	.136	.086	.111
	STRAIGHT - (		(32.3)	(31.8)	(16.9)			
	> 540	(	.024	.030	.028	.124	.082	.099
	STRAIGHT - (		(25.4)	(26.4)	(16.9)			
	> 545N	(	.017	.022	.028	.113	.076	.086
	(		(18.8)	(23.0)	(16.9)			
	BEND - (	545M	.012	.017	.026	.099	.069	.076
	(		(14.5)	(19.2)	(15.4)			
	> 545F	(	.011	.011	.022	.086	.060	.065
	STRAIGHT - (		(13.0)	(13.2)	(12.3)			
	> 550N	(	.011	.005	.016	.070	.052	.056
	(		(13.0)	(5.9)	(9.1)			
	BEND - (	550M	.009	.001	.011	.057	.042	.047
	(		(11.2)	(1.5)	(6.7)			
	> 550F	(	.006	.000	.007	.042	.033	.036
	STRAIGHT - (		(7.6)	(.0)	(4.2)			
ANCHOR	-- 555	(	.000	.000	.000	.000	.000	.000
	(		(.0)	(.0)	(.0)			
BRANCH PT.	> 210	(	7.562	.000	2.418	.527	1.388	.098
	STRAIGHT - (		(72.2)	(.0)	(116.6)			
	> 400	(	7.562	.018	2.358	.526	1.388	.073
	STRAIGHT - (		(72.2)	(1.9)	(119.2)			
	> 405	(	7.562	.000	2.468	.495	1.396	.059
	STRAIGHT - (		(72.2)	(.0)	(132.8)			
	> 405.1	(	7.562	.017	3.190	.454	1.342	.010
	STRAIGHT - (		(72.2)	(2.2)	(230.3)			
	> 410	(	7.562	.000	4.122	.418	1.118	.019
	STRAIGHT - (		(72.2)	(.0)	(328.1)			
	> 410.1	(	7.562	.008	4.874	.388	.764	.002
	STRAIGHT - (		(72.2)	(4.6)	(345.5)			
	> 415	(	7.562	.000	5.268	.365	.475	.018
	STRAIGHT - (		(72.2)	(.0)	(308.1)			
	> 415.1	(	7.562	.016	5.235	.350	.556	.009
	STRAIGHT - (		(72.2)	(16.0)	(277.3)			
	> 420	(	7.562	.000	4.785	.344	.414	.055
	STRAIGHT - (		(72.2)	(.0)	(276.0)			
	> 420.1	(	7.562	.078	4.009	.344	1.241	.042
	STRAIGHT - (		(72.2)	(68.1)	(278.4)			
	> 425	(	7.562	.138	3.024	.362	1.524	.027
	STRAIGHT - (		(72.2)	(106.1)	(252.3)			
	> 425.1	(	7.562	.118	2.378	.378	1.642	.084

DYNAFLEX

STEARNS - ROGER CORP

PAGE 88

PROJECT 10MW SOLAR PILOT PLANT - DOE - C-21700
JOB RECVR FW-HTRS TO TOWER(X-FW-02-A-2)
DATE 2/29/80

*
* STRESS SUMMARY *
*

EXPLANATORY NOTES:

- (1) EQUATION NUMBERS REFER TO ARTICLE 104.8 OF THE ANSI B31.1-1977 PIPING CODE.
- (7) THE EXACT SECTION MODULUS IS USED IN THE STRESS CALCULATIONS UNLESS THE SPECIFIC PIPING CODE OR THE USER EXPLICITLY REQUESTS OTHERWISE. IN THIS ANALYSIS THE SO-CALLED EFFECTIVE MODULUS IS USED FOR THE BRANCH LEG AT REDUCED OUTLET CONNECTIONS. THESE ARE IDENTIFIED WITH AN ASTERISK. THE EXACT SECTION MODULUS IS USED FOR ALL OTHER POINTS.
- (9) THE COLD MODULUS WAS USED IN ANALYZING THE OCCASIONAL LOADS.

307

DYNAFLEX

STRESS SUMMARY (CONTINUED)

STRESSES ARE IN PSI

ED (12) EO (12) EQ (12) EW (12)

SHOCK 1 SHOCK 2 SHOCK 3 SHOCK 4

LOC.
NO.

LOC. NO.	ED (12)	EO (12)	EQ (12)	EW (12)
170	7983	5705	3097	10289
170.1	6263	4518	1657	7898
175	5372	4839	6045	9424
175.1	3554	2783	3123	5489
175.2	3499	4123	597	5440
190N	5001	7104	2098	8937
190W	5050	7263	2279	9135
190F	5011	7122	2402	9034
190F.1	3265	3887	3172	5986
190F.2	2453	1957	3698	4850
190F.3	3360	3819	3844	6375
195N	5111	6572	3637	9085
195H	5122	6678	3568	9141
195F	5131	6539	3445	8997
195F.1	3975	4242	1664	6047
205N	4044	3899	922	5693
205M	4131	3986	1075	5840
205F	4190	4013	1158	5916
210	4471	4070	1293	6183
210	3851	3714	1406	5532
210.1	3377	3090	1380	4780

DYNAFLEX

STRESS SUMMARY (CONTINUED)

PAGE 90

STRESSES ARE IN PSI

	EQ (12)	EQ (12)	EQ (12)	EQ (12)
	SHUCK 1	SHUCK 2	SHUCK 3	SHUCK 4

LOC.
NO.

220	3161	2625	1351	4326
220.1	3382	2372	1289	4328
225	4017	2774	1193	5073
225.1	4793	3324	1100	5936
225.2	5713	3970	1067	7038
230N	6645	4632	1134	8179
230H	6686	4664	1140	8233
230F	6636	4642	1138	8178
235	5970	4261	1112	7419
235.1	5021	3787	614	6319
240	4390	3531	504	5657
240.1	3945	3463	411	5266
240.2	3777	3638	289	5252
245	3893	4074	281	5642
250N	4258	4935	485	6536
250H	4309	5022	504	6636
250F	4330	5030	502	6656
255N	4547	4900	455	6701
255H	4571	4866	448	6691
255F	4531	4776	429	6597
260	3901	4142	341	5700

DYNAFLEX

STRESS SUMMARY (CONTINUED)

STRESSES ARE IN PSI

EX (12) FY (12) EZ (12) EW (12)

SHUCK 1 SHUCK 2 SHUCK 3 SHUCK 4

LOC. NO.

260.1	3301	3377	260	4730
265	4021	3035	388	5053
265.1	2053	2578	365	3316
265.2	2824	2643	392	3889
270	5209	3146	469	6103
275	8043	4210	639	9101
275	5	18	4	19
280	0	0	0	0
275	8042	4212	640	9101
275.1	5293	3515	370	6365
285	3824	3682	369	5321
285.1	6065	5216	764	8036
290	10319	7469	1231	12797
290	6254	6244	766	8870
295M	6717	6469	813	9361
295M	7002	6716	867	9741
295F	7106	6850	909	9912
300M	7097	7095	1110	10096
300M	7090	7076	1148	10019
305	6726	6889	1112	9692
310	5555	6096	890	8295

DYNAFLEX

STRESS SUMMARY (CONTINUED)

PAGE 92

STRESSES ARE IN PSI

EQ (12) EQ (12) EQ (12) EQ (12)

SHOCK 1 SHOCK 2 SHOCK 3 SHOCK 4

LOC.
NO.

515	5235	5813	820	7866
290	4657	2589	1004	5422
500N	4631	2557	979	5379
500M	4552	2494	943	5276
500F	4380	2386	872	5063
505	4134	2247	776	4768
510	3501	1897	569	4023
510.1	2391	1335	450	2775
515N	1590	981	615	1967
515M	1478	946	619	1861
515F	1353	919	581	1735
520	966	867	388	1354
520.1	916	842	184	1258
525	1816	964	512	2118
530N	2247	1104	671	2592
530M	2272	1139	689	2633
530F	2129	1142	659	2504
530F.1	859	1347	339	1633
535N	1588	1981	630	2616
535M	1796	2086	694	2839
535F	1819	2148	716	2904

DYNAFLEX

STRESS SUMMARY (CONTINUED)

STRESSES ARE IN PSI

EQ (12) EQ (12) EQ (12) EQ (12)

SHUCK 1 SHUCK 2 SHUCK 3 SHUCK 4

LOC. NO.

LOC. NO.	SHUCK 1	SHUCK 2	SHUCK 3	SHUCK 4
540	1852	2183	722	2952
545N	1958	2222	746	3054
545R	2110	2258	764	3143
545F	2001	2286	758	3131
550N	1890	2314	735	3076
550R	1895	2378	747	3131
550F	2018	2482	804	3299
555	2826	2898	1099	4195
312 210	2503	2853	753	3870
400	10310	12380	3324	16450
405	3714	4604	1107	6018
405.1	3135	2349	891	4018
410	3391	3564	1731	5208
410.1	4139	5176	2030	6931
415	4544	5999	1755	7728
415.1	4439	6098	1192	7636
420	4040	5595	1152	6997
420.1	3533	4328	1687	5836
425	3810	3120	2487	5517
425.1	4193	3511	2690	6185
430N	4735	5251	3193	7758

DYNAFLEX

STRESS SUMMARY (CONTINUED)

STRESSES ARE IN PSI

EQ (12) EQ (12) EQ (12) EQ (12)

SHUCK 1 SHUCK 2 SHUCK 3 SHUCK 4

LOC. NO.

LOC. NO.	SHUCK 1	SHUCK 2	SHUCK 3	SHUCK 4
430M	4759	5390	3212	7875
430F	4742	5428	3246	7905
435N	4587	5526	3611	8038
435M	4577	5532	3632	8043
435F	4442	5443	3561	7876
440	3563	3889	2213	5720
440.1	5346	4528	2528	7448
445N	7839	6857	2750	10772
445M	7865	6889	2718	10803
445F	7688	6712	2661	10547
445F.1	4452	3596	1696	5968
445F.2	5371	4523	2699	7522
450N	9978	8532	5265	14145
450M	10299	8788	5412	14581
450F	10395	8852	5429	14693
460	10509	8564	5515	14635

DYNAFLEX

TABLE OF CONTENTS

INPUT DATA - (CARD IMAGES)	1
EDITED PIPING SYSTEM DESCRIPTION	4
LUMPED DYNAMIC MODEL	17
FREQUENCIES, PERIODS OF VIBRATION AND MASS PARTICIPATION FACTORS	22
LOADING - SHOCK LOADING NO. 1	
FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS	24
INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS	27
DISPLACEMENTS AND ROTATIONS	34
LOADING - SHOCK LOADING NO. 2	
FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS	40
INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS	43
DISPLACEMENTS AND ROTATIONS	50
LOADING - SHOCK LOADING NO. 3	
FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS	56
INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS	59
DISPLACEMENTS AND ROTATIONS	66
LOADING - SHOCK LOADING NO. 4	
FORCES AND MOMENTS ON ANCHORS AND RESTRAINTS	72
INTERNAL FORCES, MOMENTS AND STRESS CALCULATIONS	75
DISPLACEMENTS AND ROTATIONS	82
STRESS SUMMARY	84

314



STMPD 188



Department of Energy
San Francisco Operations Office
1333 Broadway
Oakland, California 94612

Reply To: DOE Solar One Project Office
P.O. Box 366
Daggett, CA 92327

OCT 11 1984

Mr. Robert L. Gervais
Solar One Project Office
McDonnell Douglas Astronautics Corp.
P.O. Box 366
Daggett, CA 92327

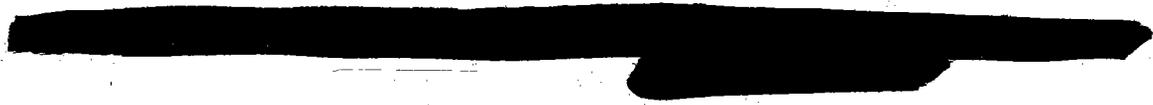
Subject: Contractor Clearance of Contract DE-AC03-79SF10499
Solar One Reports for DOE/TIC Inclusion.

Dear Bob:

Enclosed are copies of covers and title pages of eight reports prepared by McDonnell Douglas Astronautics Corporation for the Solar One Project under the above referenced contract. In preparation for delivery of these documents to DOE/TIC, I have prepared a SAN form 70 "Request for Patent Clearance" and a DOE form RA-426 "Recommendations for Announcement and Distribution of Documents" for each document.

Please have the appropriate MDAC personnel complete and sign these forms. As agreed, SAN form 70 should be forwarded to SAN/OPC by your office with copies of the completed SAN form 70 and the transmittal letter being sent to me. The completed DOE form RA-426 should be sent directly back to me.

The documents covered by this letter are:

<u>Primary Document No.</u>	<u>Secondary No.</u>	<u>Brief Title</u>
DOE/SF/10499-T100	STMPD 185	PSS Final Design Calculations (Book 10 of 26)
DOE/SF/10499-T101	STMPD 186	PSS Final Design Calculations (Book 11 of 26)
DOE/SF/10499-T102	STMPD 187	PSS Final Design Calculations (Book 12 of 26)
		
DOE/SF/10499-T104	STMPD 189	PSS Final Design Calculations (Book 14 of 26)

DOE/SF/10499-T105	STMPO 190	PSS Final Design Calculations (Book 15 of 26)
DOE/SF/10499-T106	STMPO 191	PSS Final Design Calculations (Book 16 of 26)
DOE/SF/10499-T107	STMPO 192	PSS Final Design Calculations (Book 17 of 26)

If you should have any questions or concerns please do not hesitate to contact me by telephone at, (619) 254-2672.

Sincerely,



S.D. Elliott, Jr., Director
DOE Solar One Project Office

SDE/aks
Project File: CCC009.RNO(SA3:)

Encl: Eight Document Covers W/forms 70 and RA-426

cc: Roger Gaither, SAN/OPC
W.D. Matheny, DOE/TIC
Mike Lopez, DOE/SAN (FGS)
Mary Soderstrum, B&McD



**DEPARTMENT OF ENERGY
SAN FRANCISCO OPERATIONS OFFICE**

**CONTRACTOR REQUEST FOR PATENT CLEARANCE
FOR RELEASE OF UNCLASSIFIED DOCUMENT**

Prime Contract No. DE-AC03-79SF10499
Subcontract No. (N/A)
Report No. (STMP0 188) DOE/SF/10499-T103
Date of Report September 1980
Name & Phone No. of DOE Technical Representative S.D. Elliott, Jr. (619) 254-2672

TO: Roger S. Gaither, Asst. Chief for Prosecution
Office of Patent Counsel/Livermore Office
P.O. Box 808, L-376
Livermore, California 94550

FROM: McDonnell Douglas Corporation
3855 Lakewood Blvd.
Long Beach, CA 90846

- Document Title: Plant Support Subsystems Final Design Calculations
(Book 13 of 26)
- Type of Document: Technical Report, Conference Paper, Journal Article, Abstract or Summary,
 Copy of Oral Presentation, Other (please specify): _____
- In order to meet a publication schedule or submission deadline, patent clearance by _____ (Routine) would be desired.

SENDER IS TO CHECK BOX #4 OR #5 BELOW.

4. I have reviewed (or have had reviewed by technically knowledgeable personnel) this document for possible inventive subject matter (Subject Inventions) and that no inventions or discoveries (Subject Inventions) are deemed to be disclosed in this document except as stated below:
- Attention should be directed to pages _____ of this document.
 - This document describes matter relating to an invention:
 - Contractor Invention Docket No. _____
 - A disclosure of the invention was submitted to DOE on _____ (date)
 - A disclosure of the invention will be submitted shortly _____ (approximate date)
 - A waiver of DOE's patent rights to the contractor:

has been granted, has been applied for; or will be applied for _____ (date)
5. This document is being submitted, but no review has been made of this document for possible inventive subject matter.
Provide copy of clearance to: Solar One Project Office
P.O. Box 366, Daggett, CA 92327
6. Remarks:

Reviewing/Submitting Official: Name (Print/Type) _____
Title _____
Signature _____ Date _____

TO: INITIATOR OF REQUEST
FROM: ASSISTANT CHIEF FOR PROSECUTION
Office of Patent Counsel/Livermore Office

- No patent objection to above-identified release.
 Please defer release until advised by this office.

Signed _____ Date Mailed _____

U.S. DEPARTMENT OF ENERGY

DOE AND MAJOR CONTRACTOR RECOMMENDATIONS FOR
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1. DOE Report No. <u>DOE/SF/10499-T103 (STMPO 188)</u>	2. Contract No. <u>DE-AC03-79SF10499</u>	3. Subject Category No. <u>UC-62, 62c, 62d</u>
4. Title <u>Plant Support Subsystems Final Design Calculations (Book 13 of 26)</u>		
5. Type of Document ("x" one) <input checked="" type="checkbox"/> a. Scientific and technical report <input type="checkbox"/> b. Conference paper: Title of conference _____ <div style="text-align: right;">Date of conference _____</div> Exact location of conference _____ Sponsoring organization _____ <input type="checkbox"/> c. Other (specify planning, educational, impact, market, social, economic, thesis, translations, journal article manuscript, etc.) _____		
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14. Submitted by (Name and Position) (Please print or type) <u>S.D. Elliott, Jr., Director, DOE Solar One Project Office</u> Organization _____ <u>P.O. Box 366 Daggett, CA 92327 (619) 254-2672</u> Signature _____ Date _____		

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10 MWe Solar Thermal
Central Receiver Pilot Plant

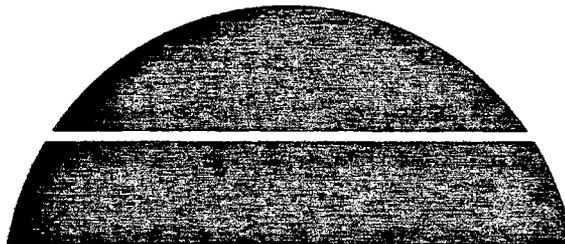
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CONSTRUCTION PACKAGE 9 (RADL ITEM 7-8)

September 1980

WORK PERFORMED UNDER CONTRACT
DE-AC03-79SF10499

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Solar Energy

**10 MWe Solar Thermal
Central Receiver Pilot Plant
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**PSS FINAL DESIGN CALCULATIONS
BOOK 13 OF 26--RECEIVER FEEDWATER PIPING
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September 1980

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CONTRACTOR REQUEST FOR PATENT CLEARANCE
FOR RELEASE OF UNCLASSIFIED DOCUMENT.

Prime Contract No. DE-AC03-79SF10499
Subcontract No. (N/A)
Report No. (STMP0 188) DOE/SF/10499-T103
Date of Report September 1980
Name & Phone No. of DOE Technical Representative S.D. Elliott, Jr. (619) 254-2672

TO: Roger S. Gaither, Asst. Chief for Prosecution
Office of Patent Counsel/Livermore Office
P.O. Box 808, L-376
Livermore, California 94550

FROM: McDonnell Douglas Corporation
3855 Lakewood Blvd.
Long Beach, CA 90846

- Document Title: Plant Support Subsystems Final Design Calculations
(Book 13 of 26)
- Type of Document: Technical Report, Conference Paper, Journal Article, Abstract or Summary,
 Copy of Oral Presentation, Other (please specify): _____
- In order to meet a publication schedule or submission deadline, patent clearance by (Routine)
would be desired.

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Reviewing/Submitting Official: Name (Print/Type) John P. Scholl
Title Asst. Chief Patent Counsel, MDC (MS 122-23)
Signature [Signature] Date 8 NOV 84

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FROM: ASSISTANT CHIEF FOR PROSECUTION
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4. Title
Plant Support Subsystems Final Design Calculations (Book 13 of 26)

5. Type of Document ("x" one)
 a. Scientific and technical report
 b. Conference paper: Title of conference _____
Date of conference _____

Exact location of conference _____ Sponsoring organization _____
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S.D. Elliott, Jr., Director, DOE Solar One Project Office

Organization
P.O. Box 366 Daggett, CA 92327 (619) 254-2672

Signature _____ Date _____