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**RESPONSE MARGINS INVESTIGATION
OF PIPING DYNAMIC ANALYSES USING
THE INDEPENDENT SUPPORT MOTION METHOD
AND PVRC DAMPING**

P. Bezler, Y.K. Wang and M. Reich

Date Published - March 1988

DEPARTMENT OF NUCLEAR ENERGY, BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK 11973

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ABSTRACT

An evaluation of Independent Support Motion (ISM) response spectrum methods of analysis coupled with the Pressure Vessel Research Committee (PVRC) recommendation for damping, to compute the dynamic component of the seismic response of piping systems, was completed. Response estimates for five piping/structural systems were developed using fourteen variants of the ISM response spectrum method, the Uniform Support Motion response spectrum method and the ISM time history analysis method, all based on the PVRC recommendations for damping. The ISM/PVRC calculational procedures were found to exhibit orderly characteristics with levels of conservatism comparable to those obtained with the ISM/uniform damping procedures. Using the ISM/PVRC response spectrum method with absolute combination between group contributions provided consistently conservative results while using the ISM/PVRC response spectrum method with square root sum of squares combination between group contributions provided estimates of response which were deemed to be acceptable.

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
2.0 STUDY DESCRIPTION	4
3.0 PROBLEM SET DESCRIPTION	7
4.0 STUDY RESULTS	28
5.0 DISCUSSION OF RESULTS	49
6.0 SUPPORTING STUDIES	58
Summary of Observation	71
Comparison to other Studies	73
Conclusions	75
References	76
APPENDIX I	
APPENDIX II	
APPENDIX III	
APPENDIX IV	

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	RHR Model, Support Groups Based on Attachment Point	12
2	AFW Model, Support Groups Based on Attachment Point	18
3	Model Parameters	27
4	Representative Moment Results, BM3 Problem	30
5	Representative Moment Results, RHR Problem	31
6	Mean Value and Standard Deviation of Zion Problem Set Mean Data	52
7	Mean Value and Standard Deviation of BNL Problem Set Data	53
7	Mean Value and Standard Deviation of BNL Problem Set Data Continued	54
8	Representative Pipe Stress Results, BM3 Problem	63

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Graphical Representation of Technical Position on Damping Values	6
2	RHR Piping Model	8
2A	Representative Response Spectra Set, Support Specific and Min/Max/Mean RHR Problem, X Coordinate Direction	9
2B	Representative Response Spectra Set, Support Specific and Min/Max/Mean RHR Problem, Y Coordinate Direction	10
2C	Representative Response Spectra Set, Support Specific and Min/Max/Mean RHR Problem, Z Coordinate Direction	11
3	AFW Piping Model	14
3A	Representative Response Spectra Set, Support Specific and AFW Problem, X Coordinate Direction	15
3B	Representative Response Spectra Set, Support Specific and AFW Problem, Y Coordinate Direction	16
3C	Representative Response Spectra Set, Support Specific and AFW Problem, Z Coordinate Direction	17
4	Z Bend Finite Element Model	19
4A	Z Bend Problem, Support Group Broadened Response Spectra, Three Groups, PVRC Damping	20
5	BM1 and BM2 Piping Model	21
5A	BM1 Problem, Support Group Broadened Response Spectra, Five Groups, PVRC Damping	22
5B	BM2 Problem, Support Group Broadened Response Spectra, Four Groups, PVRC Damping	23
6	BM3 Piping Model	25
6A	BM3 Problem, Support Group Broadened Response Spectra, Two Groups, PVRC Damping	26
7	PVRC Damping RHR Dynamic Displacement	34

LIST OF FIGURES (Continued)

<u>Figure</u>		<u>Page</u>
8	RHR Dynamic Acceleration	3.
9	PVRC Damping RHR Dynamic Support Force Responses	36
10	PVRC Damping RHR Dynamic Moment	37
11	Response Cases Uniform Damping RHR Dynamic Moment Distribution of Mean Values	38
12	Response Cases Uniform Damping RHR Dynamic Support Force Distribution of Mean Values	39
13	Response Cases Uniform Damping Z Bend Dynamic Moment Distribution of Results	40
14	Response Cases Uniform Damping Z Bend Dynamic Support Force Distribution of Results	41
15	Response Cases Uniform Damping BM1 Dynamic Moment Distribution of Results	42
16	Response Cases Uniform Damping BM1 Dynamic Support Force Distribution of Results	43
17	Response Cases Uniform Damping BM2 Dynamic Moment Distribution of Results	44
18	Response Cases Uniform Damping BM2 Dynamic Support Force Distribution of Results	45
19	Response Cases Uniform Damping BM3 Dynamic Moment Distribution of Results	46
20	Response Cases Uniform Damping BM3 Dynamic Support Force Distribution of Results	47
21	Response Cases Uniform Damping AFW Dynamic Moment Distribution of Mean Values	48
22	Force at Support No. 13 Coarse Time Step	64
23	Force at Support No. 13	65
24	Hovgaard Bend	70

EXECUTIVE SUMMARY

A major concern of the USNRC Piping Review Committee was the over-design of piping systems for dynamic inertial loads. The committee anticipated that endorsement of Code Case N-411 (PVRC damping) and of the Independent Support Motion (ISM) response spectrum method of analysis would provide the greatest immediate improvement on the dynamic load design of piping. However, the use of these new criteria in combination was left as an item requiring evaluation.

In an earlier BNL study, documented in NUREG/CR-3811, the total seismic response of six piping systems were evaluated using the ISM methods with uniform damping. Based in part on the results of that study the NRC accepted the use of the ISM response spectrum method applied with absolute combination between support group components and using uniform damping.

In the current study the dynamic component of response was determined for the same problem set and for the same fourteen variants of the ISM response spectrum method considered in the earlier study, but, using the PVRC recommendations for damping. Solutions were also developed using the uniform support motion response spectrum method with PVRC damping and the time history analysis method with PVRC damping. The acceptability of each response spectrum method was assessed by comparing the estimates of system displacements, accelerations, forces and moments, derived using the response spectrum methods, to estimates of those response quantities derived using the time history method. A complete compilation of the data comparisons are presented in the report.

The ISM/PVRC calculational procedures were found to exhibit orderly characteristics with levels of conservatism comparable to those obtained with the ISM/uniform damping procedures. The ISM/PVRC procedures are therefore deemed to be as acceptable as the ISM/uniform damping procedures. Further, the ISM/PVRC method with absolute combination between support group contributions was found to provide the most conservative estimate of response, with those estimates however, exhibiting a large dispersion. The ISM/PVRC method with root mean square (SRSS) combination between group contributions was found to provide acceptable estimates of response which exhibited small dispersion.

The results of ancillary studies indicated:

- i Based on time history analyses the effect of PVRC variable damping did not significantly vary between piping systems or response type (acceleration, force etc.).
- ii The degree of correlation between the inputs used in the BNL studies was neither consistently strong or consistently weak. It is considered to be indicative of the results to be expected in real systems.

EXECUTIVE SUMMARY (Continued)

- iii Excellent agreement was found to exist between the time history results developed with the computer codes PSAFE2 and SMACS, confirming the accuracy of both methods.

- iv The salient results from the present and earlier studies were consistent with the results obtained in similar studies performed by Westinghouse Electric Corporation and sponsored by the Electric Power Research Institute.

1.0 INTRODUCTION

A major concern of the USNRC Piping Review Committee was the over-design of piping systems for dynamic inertial loads. After reviewing earthquake experience data, dynamic test data, and analytical studies, the committee concluded that the existing nuclear piping design criteria and practices were very conservative. In fact, they were considered too conservative in light of the negative impact these had on normal plant operation and overall reliability.

The Piping Review Committee made several recommendations in NUREG-1061 [1] to improve the dynamic load design of piping. Of these, the two anticipated to have the greatest immediate impact were the endorsements of Code Case N-411 [2] (PVRC damping) and of the Independent Support Motion (ISM) method [3]. However, the use of these new criteria in combination was left as an open item when NUREG-1061 was published in 1985.

Figure 1 shows the pipe damping criteria recommended by the Pressure Vessel Research Committee (PVRC) in WRC Bulletin 300 [4], and also the damping criteria currently in Regulatory Guide 1.61 [5]. Note that the PVRC damping varies with frequency and is generally higher than the uniform Regulatory Guide 1.61 damping. Thus dynamic analyses using PVRC damping will usually predict lower inertial responses and the resulting piping system designs will require less supports.

In September 1984, the American Society of Mechanical Engineers (ASME) approved Code Case N-411. This adopts the PVRC damping criteria as an alternative to the criteria now given in Appendix N of the ASME Code, which itself is based on the pipe damping criteria in Regulatory Guide 1.61. Code Case N-411 has been used in several individual licensing cases to reduce the number of snubbers and was endorsed generically by the NRC through Rev. 24 of Regulatory Guide 1.84 [6] in June 1986. This endorsement carries many application limitations, including the statement:

"The damping values specified may be used only in those analyses in which current seismic spectra and procedures have been employed. Such use should be limited to response spectral analyses (similar to that used in the study supporting its acceptance - Reference NUREG/CR-3526) [7]. The acceptance of the use with other types of dynamic analyses (e.g., time history analysis) is pending further justification."

Because the LLNL study reported in NUREG/CR-3526 only investigated envelope spectra methods, the use of multiple spectra methods with PVRC damping has not been generically approved. It is hoped that the information from this new ISM study will support a new NRC position on this topic.

The Independent Support Motion (ISM) method is the multiple response spectra method [8,9] now endorsed by the NRC. The acceptance of this was based on the results of a BNL study that was documented in NUREG/CR-3811 [10]. This study compared the calculated responses of various multiple spectra procedures with responses from enveloped spectra and time history analyses. Regulatory Guide 1.61 damping was used exclusively. The NUREG/CR-3811 study addressed the computation of pseudostatic response (i.e., seismic anchor motion response) as well as inertial load response, and the combination of these. With one exception, the Piping Review Committee endorsed the recommendations of NUREG/CR-3811 and in Volume 4 of NUREG-1061 established the current NRC positions on the Independent Support Motion Method:

"The independent support motion response spectrum method should be allowed as an option in calculating the response of multiply supported piping with independent inputs. This method should be implemented under the following rules for response combination.

a. For Inertial or Dynamic Components

- (1) Group responses for each direction should be combined by the absolute sum method.
- (2) Modal and directional responses should be combined by the SRSS method without considering closely spaced frequencies.

b. For the Pseudostatic Components

- (1) For each group, the maximum absolute response should be calculated for each input direction.
- (2) These should then be combined by the absolute sum rule.
- (3) Combination of the directional responses should be by the SRSS rule.

c. For the Total Response

Dynamic and pseudostatic responses should be combined by the SRSS rule."

The positions above provide an alternative to the Standard Review Plan (SRP) guidance for response spectra methods. The SRP currently specifies that "envelope" (also called "uniform") spectra methods can be used. Position a.(2) above changes the requirements for closely spaced modes when the ISM method is used.

The positions above on pseudostatic and total response allow a significant relaxation to the conservatism of SRP requirements. (These changes are permitted only when the ISM method is used). Specifically, positions b.(3) and c. above permit SRSS combination whereas the SRP specifies absolute summation. Although this goes against the trend to emphasize seismic anchor motion (pseudostatic) effects in piping design, no controversy has been raised about positions b. and c. Therefore, pseudostatic effects are not addressed in the new ISM study. Note that pseudostatic response is based on building response, not piping inertial response, and thus the pipe damping criteria has no direct influence on the calculation.

Position a.(1) above is the one exception taken by the Piping Review Committee to NUREG/CR-3811's recommendations. Whereas BNL suggested SRSS summation of group responses, the Piping Review Committee recommended the more conservative absolute summation of group responses. Industry generally favors the SRSS approach and there have been some recent licensing cases where the use of this has been an issue. Because of this controversy, this new ISM study has addressed some of the concerns present when the Piping Review Committee opted for absolute summation of group responses: 1) phase correlation between groups of the problem set has been investigated, 2) the SMACS time history computer code has been benchmarked against PSAF 2, and 3) the data from NUREG/CR-3811 has been revisited and presented in a more complete way.

Like many NRC-sponsored piping research studies (e.g., NUREG/CR-3811, NUREG/CR-3526, NUREG/CR-3996 [11], NUREG/CR-5073 [12]), this new ISM study provides data from which a "response margins" approach can be used by the NRC. This approach looks at relative differences between results from a "baseline" procedure now accepted by the NRC (in some cases, a best-estimate calculation may be used as a baseline). The new procedure is endorsed or rejected based on some acceptance criteria. The acceptance criteria could recognize conservatism elsewhere in the piping design process (such as in building response calculations and in code allowables), but past efforts have generally considered only the conservatism (or "margins") in the piping analysis procedures themselves.

The analytical procedure that has evolved as the current most popular baseline is a time-history analysis (with multiple support input) using Regulatory Guide 1.61 damping. At one time (during the SSMRP) this was thought to be a best-estimate procedure but, with the advent of PVRC damping, it has become the least conservative procedure that the NRC staff accepts. The new ISM study uses both this procedure and time-history analyses using PVRC damping as baselines. The latter procedure can be envisioned as an approximate "best-estimate" method since piping time-history analysis by itself is thought to have no conservatism and PVRC damping is roughly mean-valued data. The use of PVRC damping with time-history analyses has not been accepted by the staff at this time, but is being investigated in a separate ongoing study. Appendix III of this report quantifies the impact of various damping criteria on time-history response and should provide insights into the relative importance of the baseline cases considered.

2.0 STUDY DESCRIPTION

In the NUREG/CR-3811 study, the total seismic response of six different piping systems were evaluated using ISM methods with uniform damping. Response calculations were made using fourteen different combination procedures to compute the dynamic component of response, five different methods to compute the pseudo-static component of response, and two combination procedures to compute the total response. In the current study the dynamic component of response was determined for five piping problems from the NUREG/CR-3811 problem set, again using all fourteen combination procedures. In this study, however, the ISM response spectrum and time history evaluations were coupled with the PVRC damping criteria. For each of the combination methods, the degree of conservatism associated with a response spectrum estimate was assessed by comparison to a time history estimate of the same response quantity calculated using independent inputs and PVRC damping or uniform damping.

Using different combination procedures fourteen response spectrum estimates of response were developed for each problem using the ISM methods. The fourteen combination procedures investigated vary in the method used to combine between support group response contributions, algebraic, absolute and SRSS being considered, and in the sequence of performing the combination between groups, modes and directions. A summary of the combination procedures and their associated case number identifiers are:

Case No.	Combination Sequence	Case No.	Combination Sequence
1	Group(ALG)-Direction-Modes	8	Direction-Modes-Group(SRSS)
2	Group(ALG)-Modes-Direction	9	Group(ABS)-Direction-Modes
3	Group(SRSS)-Direction-Modes	10	Group(ABS)-Modes-Direction
4	Group(SRSS)-Modes-Direction	11	Modes-Group(ABS)-Direction
5	Modes-Group(SRSS)-Direction	12	Direction-Group(ABS)-Modes
6	Direction-Group(SRSS)-Modes	13	Modes-Direction-Group(ABS)
7	Modes-Direction-Group(SRSS)	14	Direction-Modes-Group(ABS)

In all cases the combination between modes is SRSS with clustering of closely spaced modes (contrary to the NRC position) and the combination over directional contributions is SRSS. Case numbers 9 or 10 correspond to the current NRC recommendation.

To complete the data set, two additional solutions were developed for each problem. In one, the uniform response spectrum method with envelope spectra was used to develop a solution which corresponds to current practice as modified by PVRC damping. In the second, independent support motion, time history methods, incorporating the PVRC damping recommendations, were used to formulate one best estimate of true response. For each problem then estimates of the dynamic component of response was determined using fifteen variations of the response spectrum method and one time history evaluation.

The six problems from the earlier study were used in this study. They include of the RHR and AFW piping models from the Zion Nuclear Power Plant and four "BNL" problems designated the Z bend, BM1, BM2 and BM3. For the RHR and AFW problems thirty-three different sets of seismic excitation were considered providing a statistical basis to the study results. For the BNL problems only one seismic excitation was considered for each problem. With these problems the piping models/inputs were varied to reflect different reactor systems and levels of modeling sophistication. Unfortunately, at the end of the study, the input spectra used in the response spectrum evaluations of the AFW problem were determined to be in error and the ISM/PVRC response spectrum results, for this problem, were deleted from the study results.

All the response spectrum solutions developed in this study were prepared at BNL using the independent support motion response spectrum solution option of the finite element computer code PSAFE2. In these evaluations the PVRC recommendations for damping were embodied in the spectra used as input for each support group. For the Z-bend, BM1, BM2 and BM3 problems, the time history results were also developed at BNL using the independent support motion time history algorithms in the PSAFE2 computer code modified to incorporate frequency dependent damping. For the Zion problems, all time history results and input spectra were developed by Brian J. Benda and James J. Johnson (now of EQE) using the SMACS computer code and the Zion structure and piping models originally developed in the Seismic Safety Margins Research Program (SSMRP) [13]. Since all the time history solutions were based on the model superposition methodology, the implementation of the PVRC damping recommendation was achieved by varying, in the required manner, the level of damping assigned to each mode of vibration.

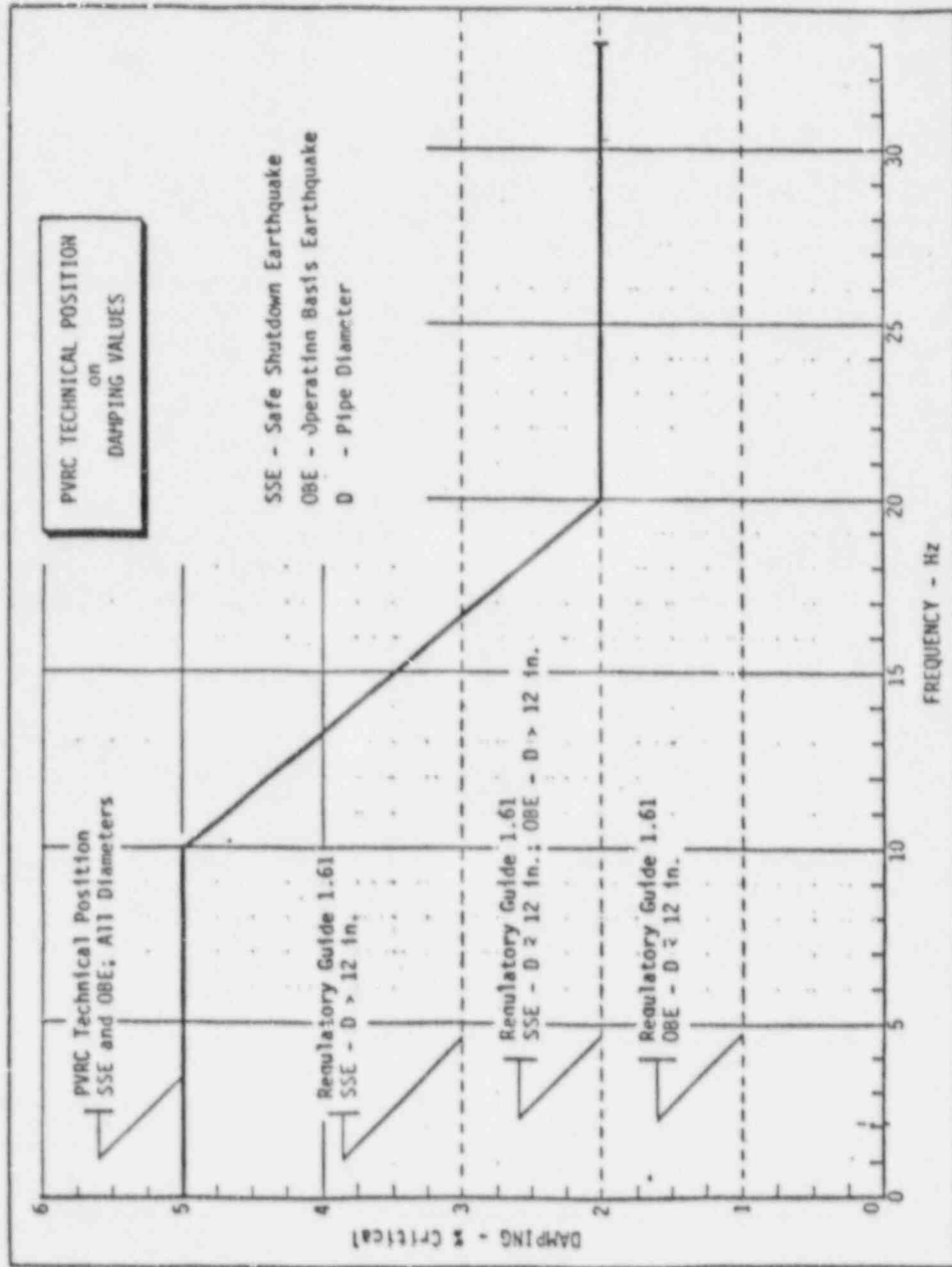


Figure 1 - Graphical Representation Of The Technical Position On Damping Values

3.0 PROBLEM SET DESCRIPTION

As mentioned, the problem set consists of six piping systems. The systems are identified in NUREG/CR-3811 as; the RHR piping model, the AFW piping model, the Z-bend piping system model, and the BM1, BM2 and BM3 piping system models. Each of these system models are fully described in NUREG/CR-3811, however, for continuity a brief description of each model is provided here.

The RHR and AFW piping systems are housed in the containment structure of the Zion Nuclear Power Plant in Illinois. The containment structure consists of the containment shell and a separate concrete internal structure supporting a four-loop PWR nuclear steam supply system. Details pertaining to this system were made available to BNL by LLNL who analyzed it as part of the Zion SSMRP studies performed by Lawrence Livermore Laboratory for NRC [13]. The Zion RHR and AFW were also used as problems in the LLNL studies of PVRC damping and peak broadening [7] and response margins [11,12].

The RHR model, shown in Figure 2, consists of a 12 inch, Sch. 40 and Sch. 160, pipe line header running from a wall anchor at the internal structure of the containment building to an anchor in the AFT complex and an 8-inch, Sch. 40, branch line from the Refueling Water Storage Tank (RWST) nozzle to the 12-inch pipe. The pipe material for the entire system is stainless steel. The line is rated at a design temperature of 400°F and a design pressure of 75 psi. One isolation valve exists, at the upper end of the model, near the containment wall. The system supports are raised from nine different locations in the Zion structure as depicted in Figure 2 and summarized in Table 1.

A representative set of unbroadened response spectra, defining the inputs for one of the thirty-three seismic excitations for which the RHR problem was evaluated, are shown on figures 2A, 2B and 2C. On each figure both the spectra corresponding to the individual group inputs, five in one plot and four on the second plot, as well as spectra defining the minimum, maximum and mean spectra for all nine groups are shown. Figure 2A shows the spectra defining the inputs in the X coordinate direction, 2B the spectra defining the inputs in the Y coordinate direction and 2C the spectra defining the inputs in the Z coordinate direction. As will be noted, only three support spectra are in fact shown on figure 2C. For this seismic excitation these three spectra were sufficient to fully define the inputs in the Z coordinate direction for all nine support groups. The legends above each plot define both the Zion structure support points and the piping problem specific support points (as delineated in table 1) for which the data applies. The data presented are typical and should not be construed to represent either a maximum or a minimum of the excitations considered in the study. They are presented only to provide some illustration of the differences between support group and coordinate direction excitations.

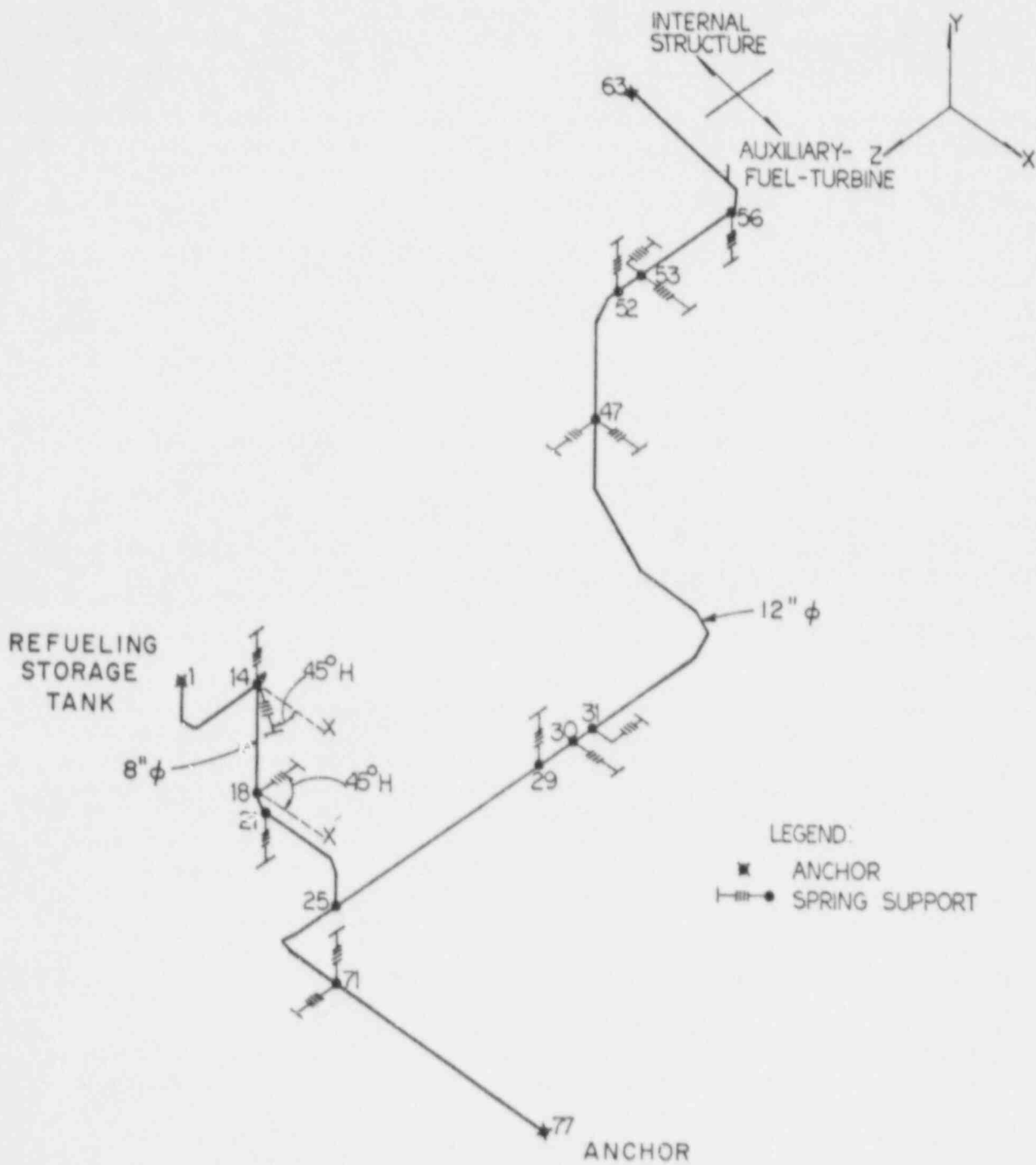
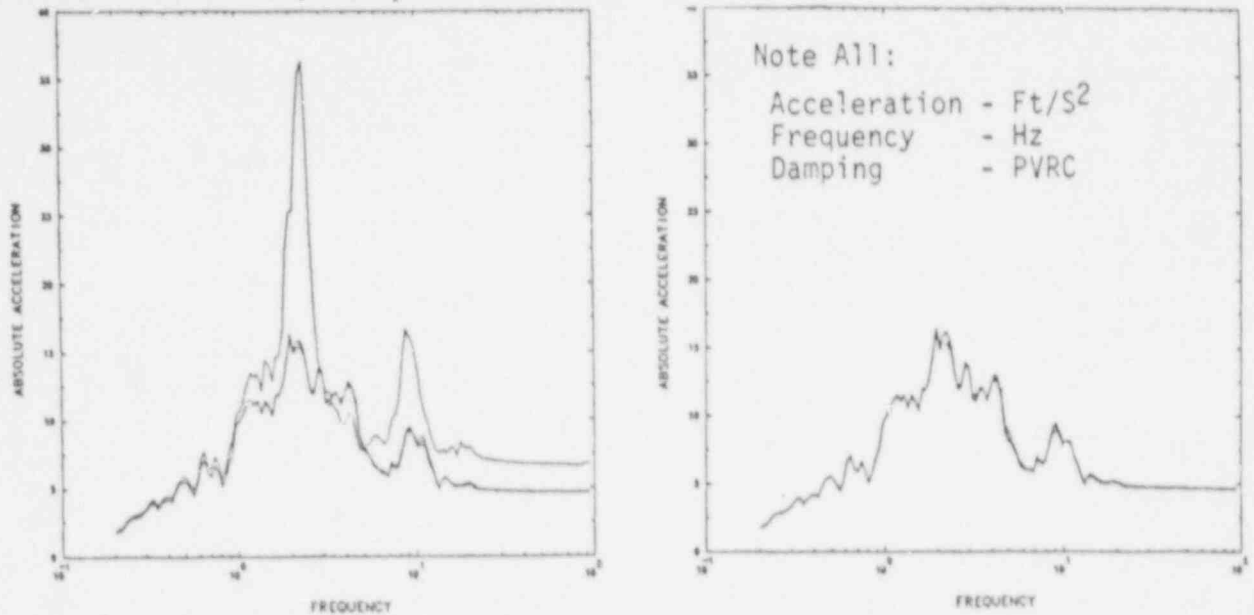


Figure 2 - RHR Piping Model

Structure Node 708, Group 1	—————	Structure Node 540, Group 6	—————
Structure Node 518, Group 2	-----	Structure Node 1026, Group 7	-----
Structure Node 529, Group 3	- - - - -	Structure Node 1027, Group 8	- - - - -
Structure Node 530, Group 4	- - - - -	Structure Node 1032, Group 9	- - - - -
Structure Node 531, Group 5	- - - - -		



COUPLED FACTOR & FFT BLOCK - MULTIPLE ANALYSIS * SPECTRA (NORMAL) MEAN —————

MINIMUM & MAXIMUM RESPONSE — - - - -

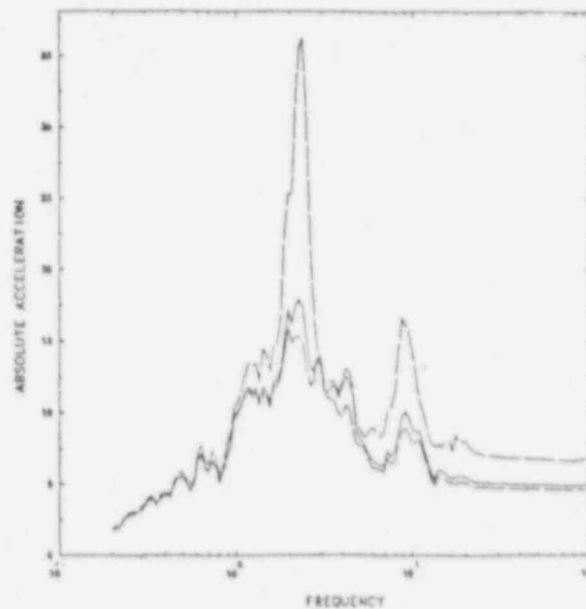
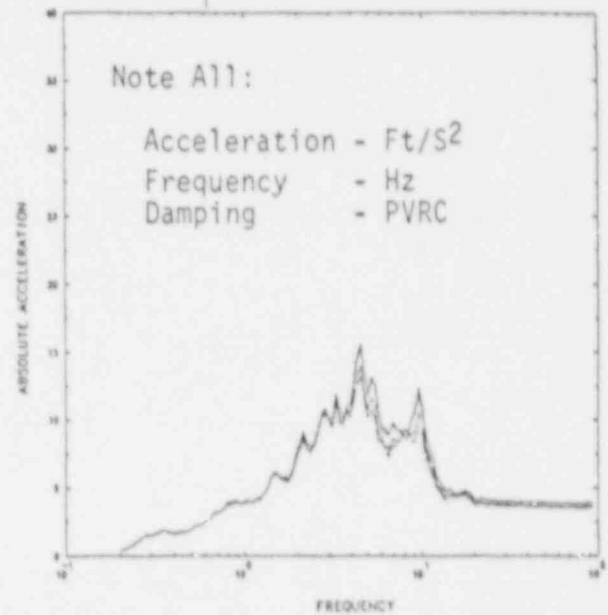
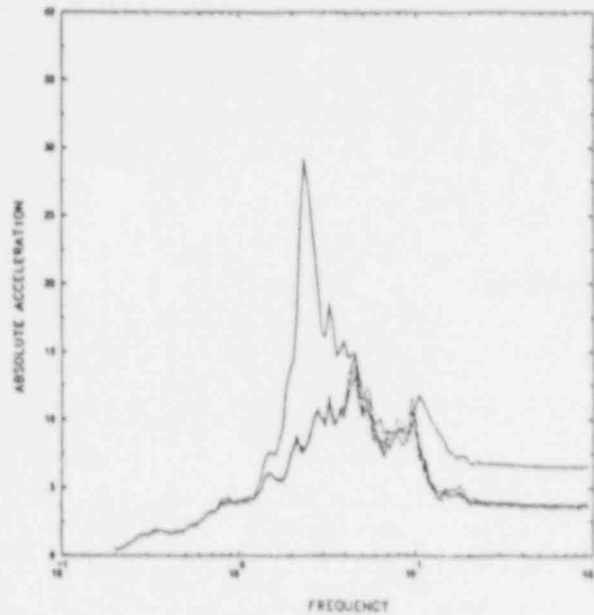


Figure 2A - Representative Response Spectra Set, Support Specific and Min/Max/Mean RHR Problem, X coordinate Direction

Structure Node 708, Group 1	_____	Structure Node 540, Group 6	_____
Structure Node 518, Group 2	_____	Structure Node 1026, Group 7	_____
Structure Node 529, Group 3	_____	Structure Node 1027, Group 8	_____
Structure Node 530, Group 4	_____	Structure Node 1032, Group 9	_____
Structure Node 531, Group 5	_____		



AMPLED REACTOR & AFT BLADE - MULTIPLE ANALYSIS
 Y SPECTRA (NORMAL) MEAN _____
 MINIMUM & MAXIMUM RESPONSE _____

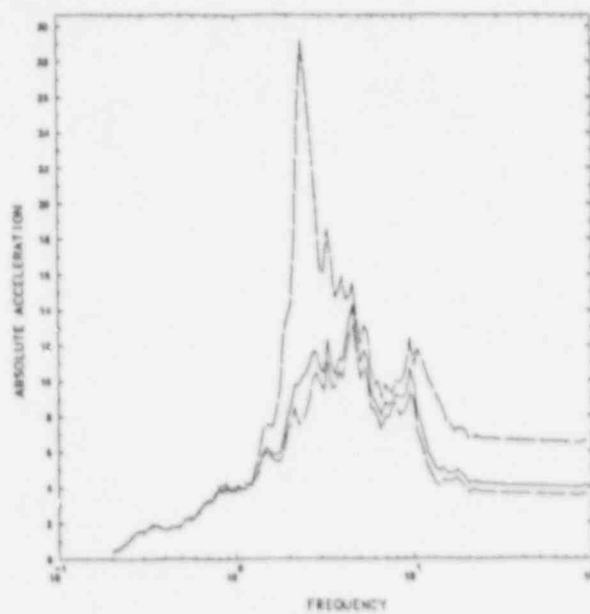


Figure 2B - Representative Response Spectra Set, Support Specific and Min/Max/Mean RHR Problems, Y Coordinate Direction

Structure Node 708, Group 1 —————
 Structure Node 530, Group 4 - - - - -
 Structure Node 1026, Group 7 - - - - -
 Null Input, Groups 2, 3, 5, 6, 8, 9

Coupled Reactor & Aft Blows - BNL/PVRC ANALYSIS
 3 SPECTRA (NORMAL) MEAN —————
 MINIMUM & MAXIMUM RESPONSE - - - - -

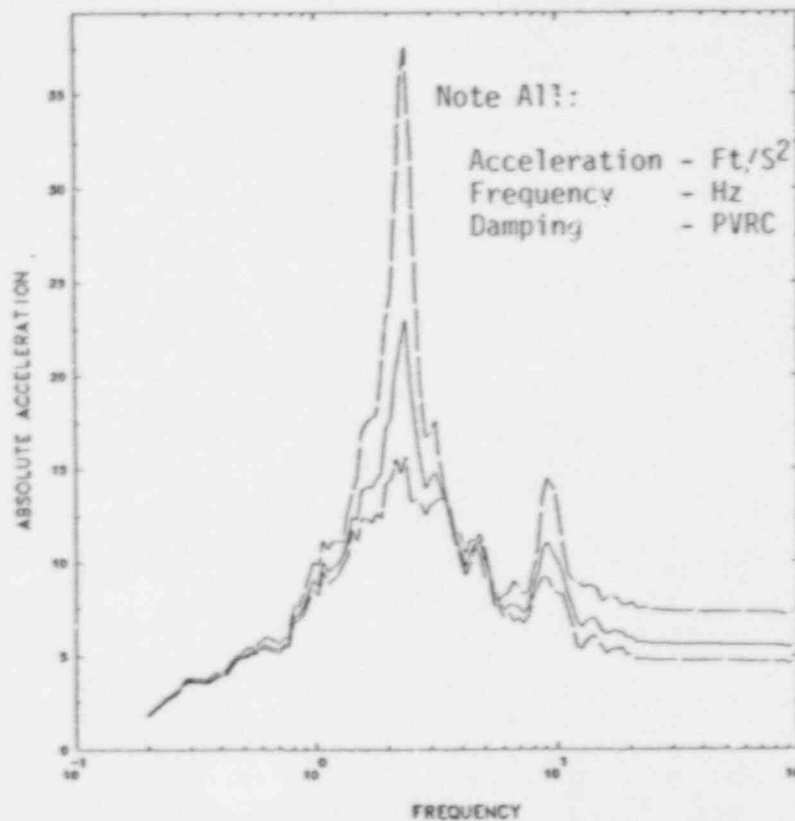
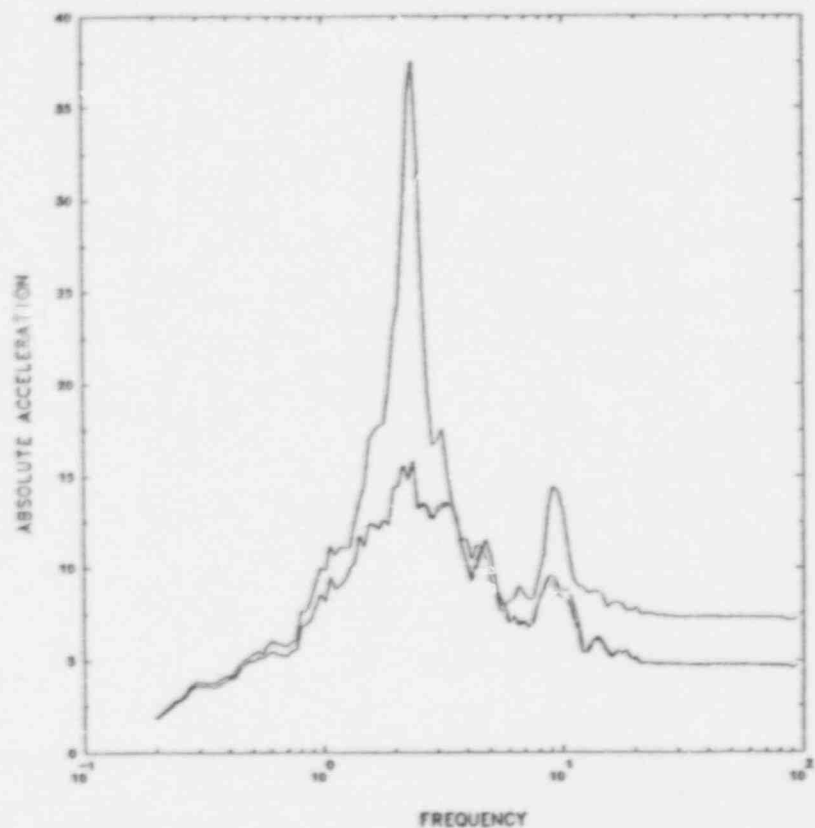


Figure 2C - Representative Response Spectra Set, Support Specific and Min/Max/Me_{an}
 RHR Problem, Z Coordinate Direction

Table 1 - RHR Model, Support Groups Based
On Attachment Point

Group No.	Zion Structure Node Number	Pipe Support Location and Direction
1	708	63X, 63Y, 63Z
2	518	77X, 77Y
3	529	29Y, 30X
4	530	18XZ*, 21Y, 31Z, 47Z, 71Z, 77Z
5	531	71Y
6	540	47X
7	1026	1Z, 14XZ, 14Y, 53Z
8	1027	1X, 1Y
9	1032	52Y, 53X, 56Y

*18XZ refers to a skew support at node 18 in the XZ plane.

The AFW model, shown in Figure 3, consists of a 16", Sch. 120, main feedwater (MFW) line running from a steam generator nozzle to a containment penetration, and a 3-inch, Sch. 160, Auxiliary Feedwater (AFW) branch line running from the 16-inch MFW line to a containment penetration. The entire line, rated for a design temperature of 400°F and a design pressure of 200 psi, is carbon steel. The spring supports and snubbers are shown in the figure. Supports in this system are mounted at 15 different structural points, and constitute the 15 support groups summarized in Table 2.

An illustration of a set of unbroadened response spectra defining the inputs for one seismic excitation for the AFW problem are shown in figures 3A, 3B and 3C. The format for these figures is identical to those described above for the RHR problem with the exception that the AFW problem set includes fifteen instead of nine support groups. Consequentially four plots are shown on each figure, three showing five support spectra each and one showing the minimum, maximum and mean spectra. Again this data set should be considered to be typical only.

The Z-bend is a simple planar configuration of 4-inch dia. pipe and is depicted in Figure 4. The excitation used in the evaluation consisted of three groups of inputs introduced at the three support points 1, 7 and 34. The input response spectra, broadened and labeled by group number are shown in figure 4A. Essentially, the inputs correspond to a test in which uniform excitation of the supports was intended. Consequentially the dominant (Z) inputs are highly correlated. The inputs in the X and Y direction are weakly correlated and exhibit amplitudes 1/2 the Z input.

The BM1 and BM2 evaluations both involve the piping model shown in Figure 5. In BM1, the piping system was considered to be part of a PWR system and the inputs to the model were derived from a 3D analysis of a PWR containment and internal structure. For that analysis, the inputs were segregated into 5 groups, group 1 - nodes 29 and 37, group 2 - nodes 16 and 25, group 3 - nodes 6, 15 and 55, group 4 - nodes 1, 32 and 60 and group 5 - nodes 43 and 48. The input response spectra, broadened and labeled by group number, are shown in figure 5A. The degree of correlation between the inputs was not determined but would be consistent with the filtering introduced by a 3D structural model including different types of structures.

In BM2 the piping was assumed to be part of a BWR system. The inputs were derived from a time history analysis of a 1D stick model of a BWR structure. For this analysis the inputs were segregated into 4 groups, group 1 - nodes 6 and 16, group 2 - nodes 15, 25, 29 and 37, group 3 - nodes 32, 43 and 48 and group 4 - nodes 55 and 50. Since, in the

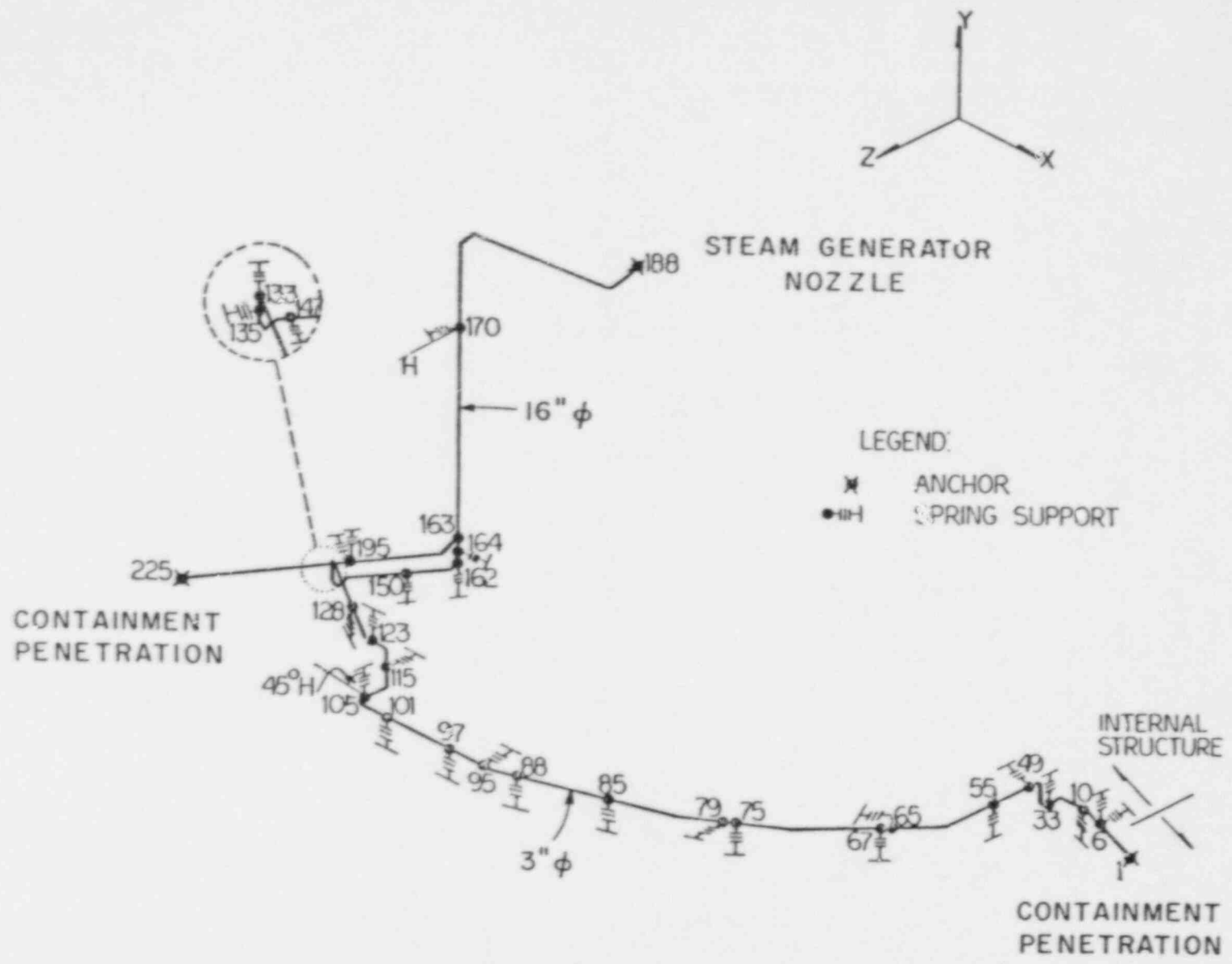
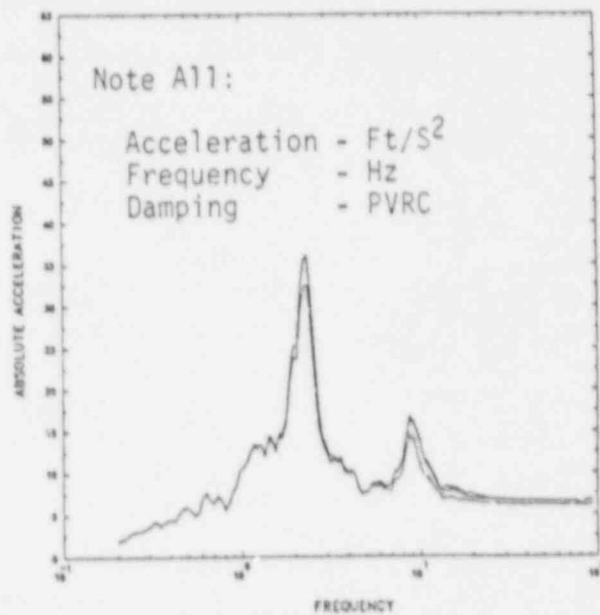
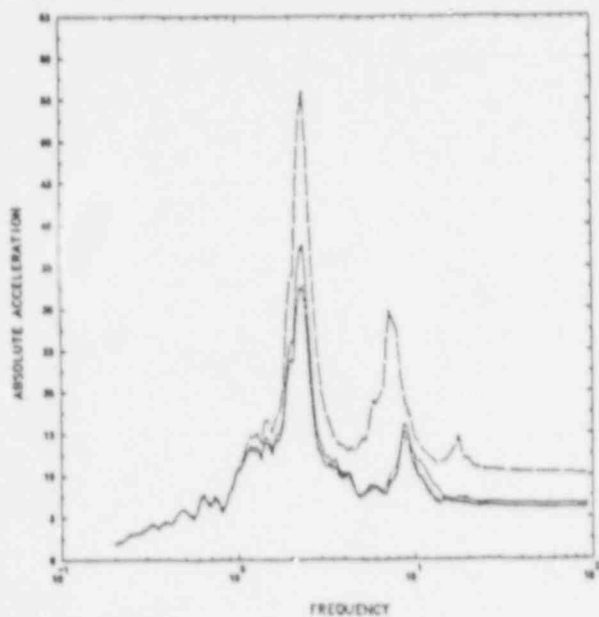


Figure 3 - AFW Piping Model

Structure Node 23, Group 1 —————
 Structure Node 24, Group 2 - - - - -
 Structure Node 491, Group 5 - - - - -
 Structure Node 530, Group 7 - - - - -
 Structure Node 1221, Group 15 - - - - -

Structure Node 488, Group 4 - - - - -
 Structure Node 526, Group 6 - - - - -
 Structure Node 703, Group 11 - - - - -
 Structure Node 704, Group 12 - - - - -
 Structure Node 705, Group 13 - - - - -



Structure Node 470, Group 3 - - - - -
 Structure Node 544, Group 8 - - - - -
 Structure Node 673, Group 9 - - - - -
 Structure Node 698, Group 10 - - - - -
 Structure Node 995, Group 14 - - - - -

AMPLITUDE SPECTRUM & FFT BASED - BAL/PNE ANALYSIS
 15 SPECTRA (NORMAL) MEAN - - - - -
 MINIMUM & MAXIMUM RESPONSE - - - - -

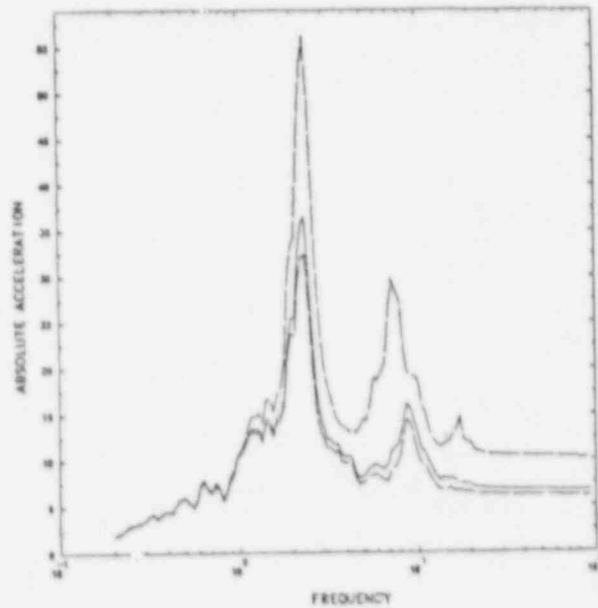
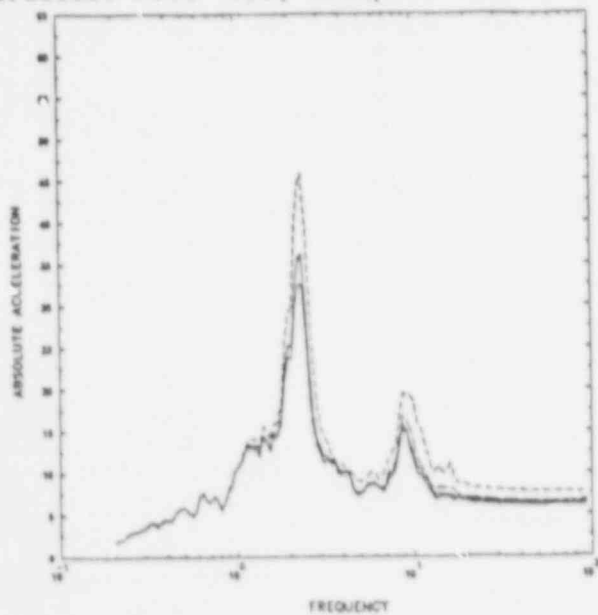
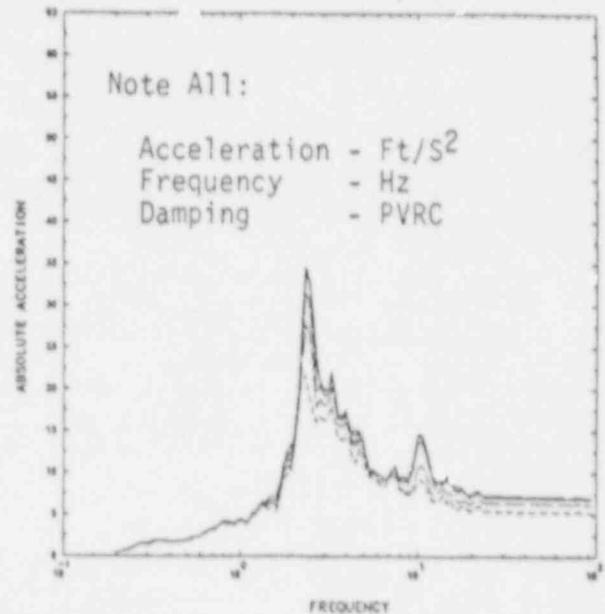
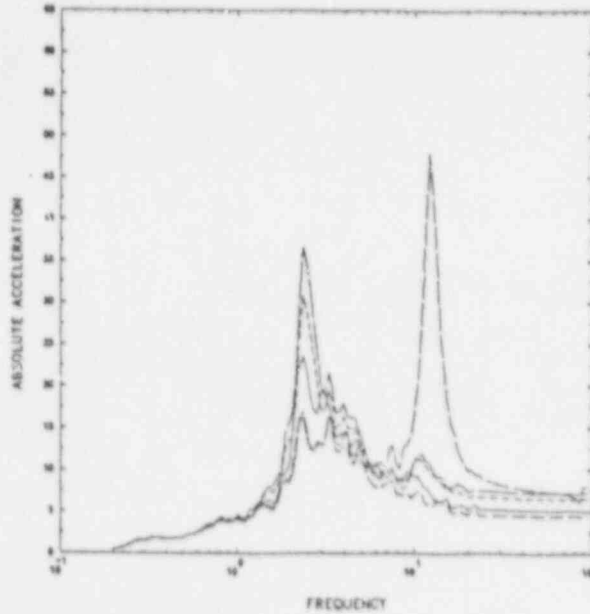


Figure 3A - Representative Response Spectra Set, Support Specific and Min/Max/Mean AFW Problem, X Coordinate Direction

Structure Node 23, Group 1 —————
 Structure Node 24, Group 2 —————
 Structure Node 491, Group 5 - - - - -
 Structure Node 530, Group 7 - - - - -
 Structure Node 1221, Group 15 - - - - -

Structure Node 488, Group 4 - - - - -
 Structure Node 526, Group 6 - - - - -
 Structure Node 703, Group 11 - - - - -
 Structure Node 704, Group 12 - - - - -
 Structure Node 705, Group 13 - - - - -



Structure Node 470, Group 3 - - - - -
 Structure Node 544, Group 8 - - - - -
 Structure Node 673, Group 9 - - - - -
 Structure Node 698, Group 10 - - - - -
 Structure Node 995, Group 14 - - - - -

COMPLEX VECTOR & FFT MODE - MULTIPLE ANALYSIS
 15 SPECTRA (NORMAL) MEAN —————
 MINIMUM & MAXIMUM RESPONSE - - - - -

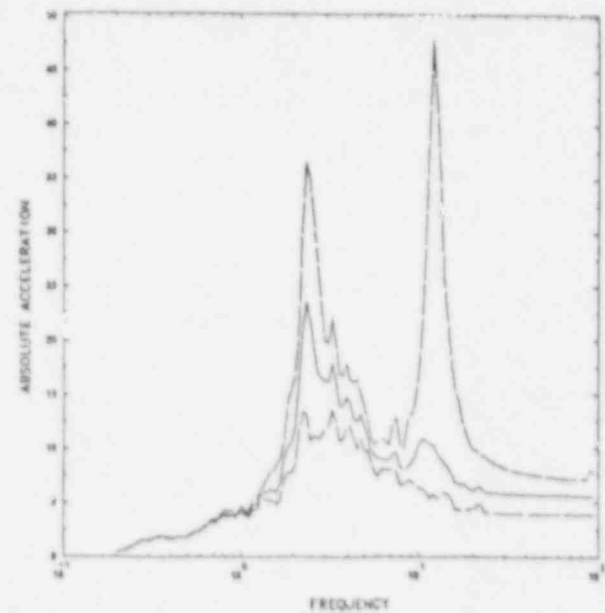
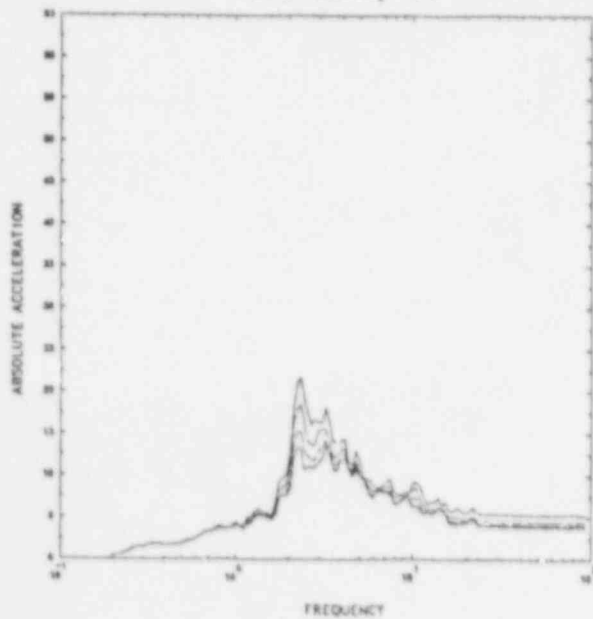
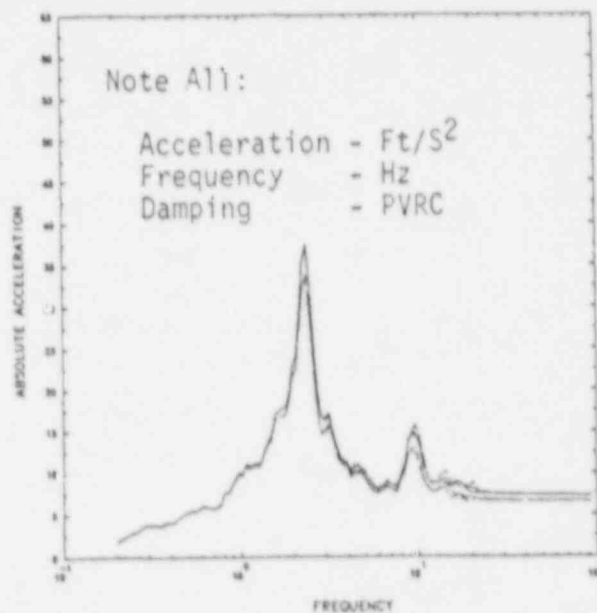
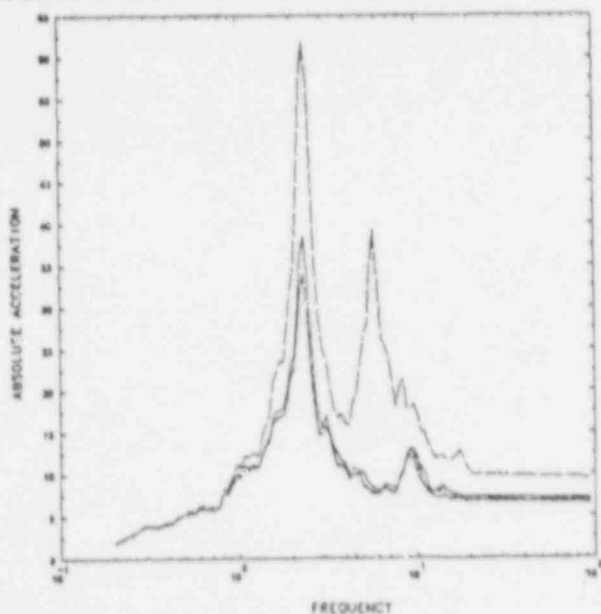


Figure 3B - Representative Response Spectra Set, Support Specific and Min/Max/Mean AFW Problem, Y Coordinate Direction

Structure Node 23, Group 1 —————
 Structure Node 24, Group 2 —————
 Structure Node 491, Group 5 - - - - -
 Structure Node 530, Group 7 - - - - -
 Structure Node 1221, Group 15 - - - - -

Structure Node 488, Group 4 - - - - -
 Structure Node 526, Group 6 - - - - -
 Structure Node 703, Group 11 - - - - -
 Structure Node 704, Group 12 - - - - -
 Structure Node 705, Group 13 - - - - -



Structure Node 470, Group 3 - - - - -
 Structure Node 544, Group 8 - - - - -
 Structure Node 673, Group 9 - - - - -
 Structure Node 698, Group 10 - - - - -
 Structure Node 995, Group 14 - - - - -

COUPLED BEAM & FT SLAB - MULTIPLE ANALYSIS
 12 SPECTRA (MIN/M/MEAN) MEAN —————
 MINIMUM & MAXIMUM RESPONSE - - - - -

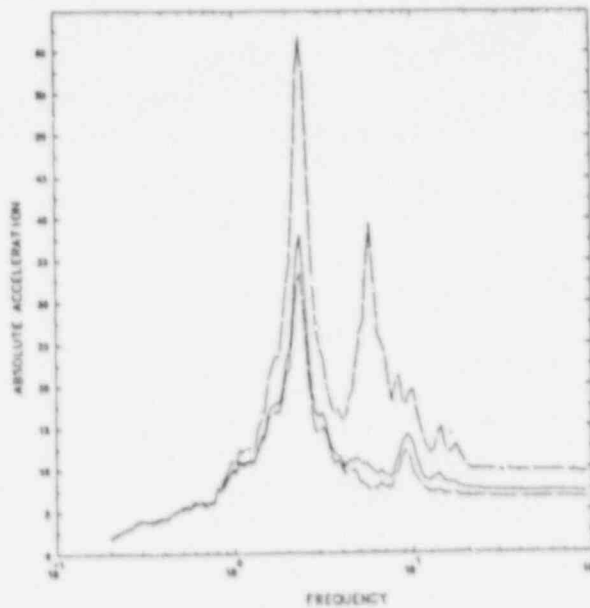
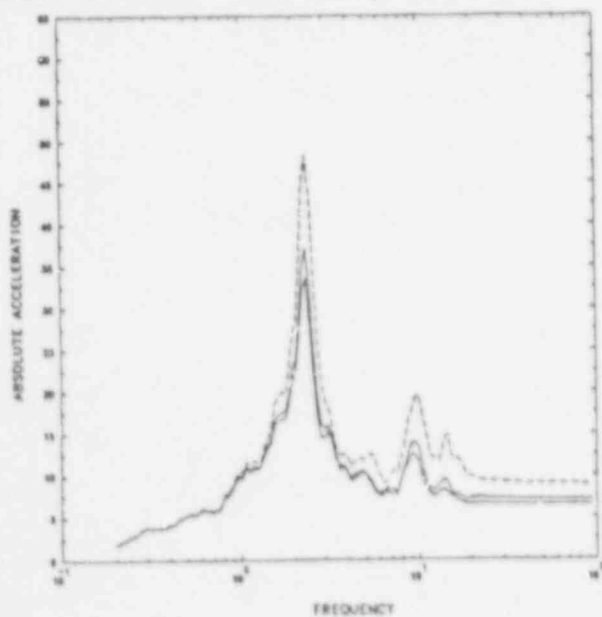


Figure 3C - Representative Response Spectra Set, Support Specific and Min/Max/Mean AFW Problem, Z Coordinate Direction

Table 2 - AFW Model, Support Groups Based
On Attachment Point

Group No.	Zion Structure Node Number	Pipe Support Location and Direction
1	23	225X, 225Y, 225Z
2	24	1X, 1Y, 1Z
3	470	150Y
4	488	85Y
5	491	6XZ*, 6Y, 10Y, 33Y, 49X, 55Y
6	529	101Y, 105XZ, 115XZ
7	530	162Y
8	544	135Z, 195XZ, 195Y, 147X
9	673	164XZ
10	698	123Y, 128Y, 133Y
11	703	88Y, 95XZ, 97Y
12	704	75XZ, 79Y
13	705	65XZ, 67Y
14	995	170XZ
15	1221	188X, 182Y, 188Z

*6XZ refers to a skew support at node 6 in the XZ plane.

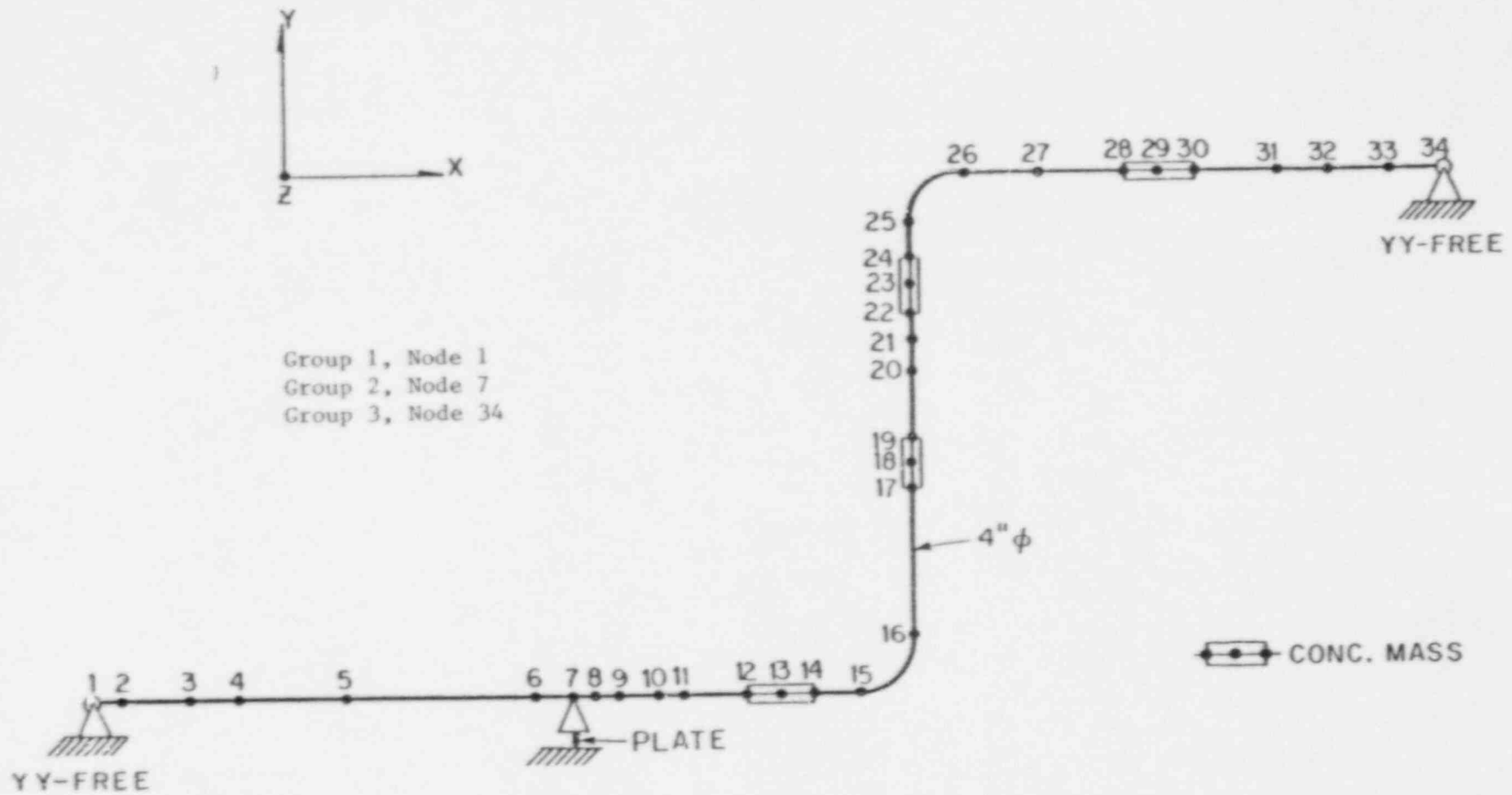


Figure 4 - Z Bend Finite Element Model

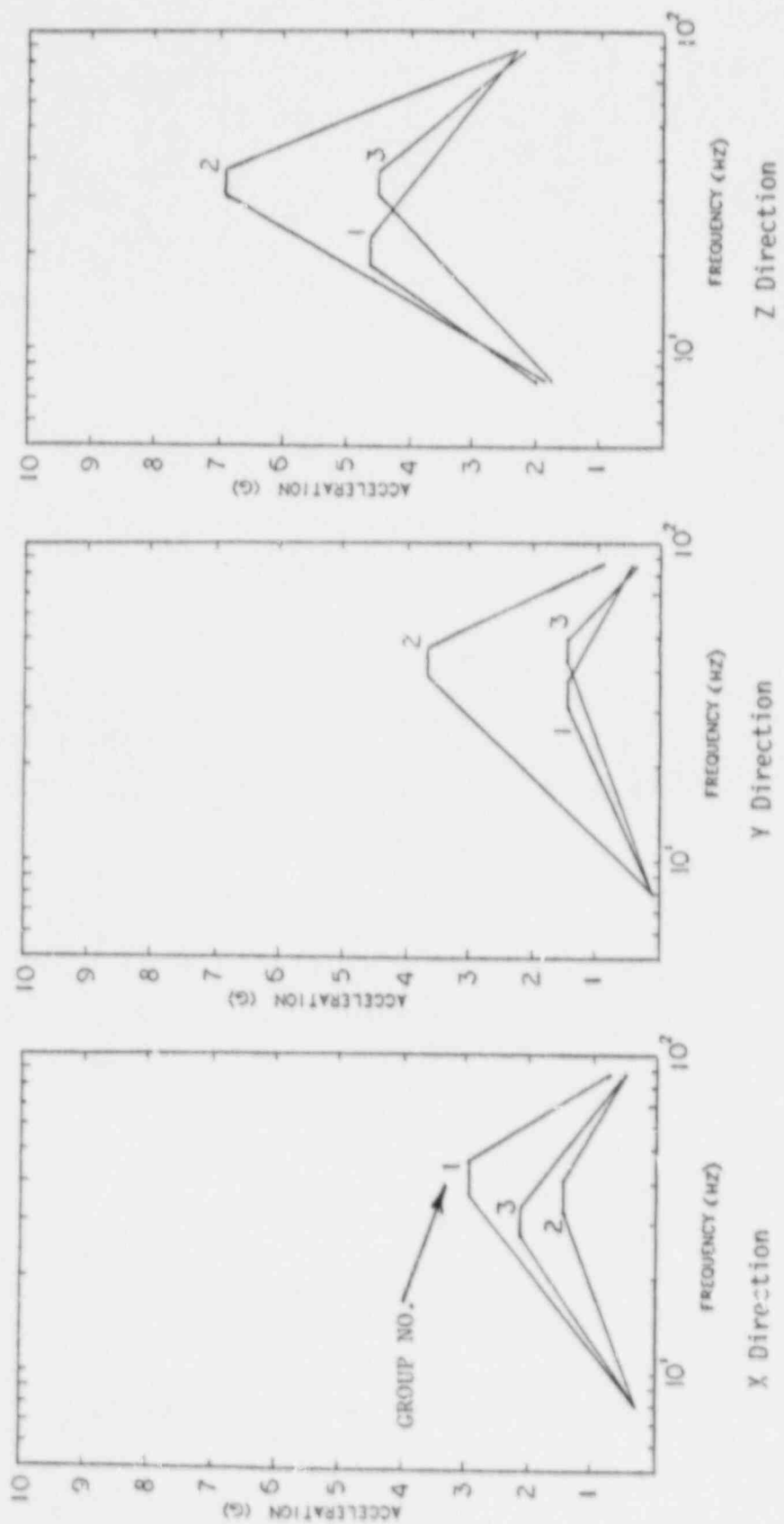


Figure 4A - Z Bend Problem, Support Group Broadened Response Spectra, Three Groups, PYRC Damping

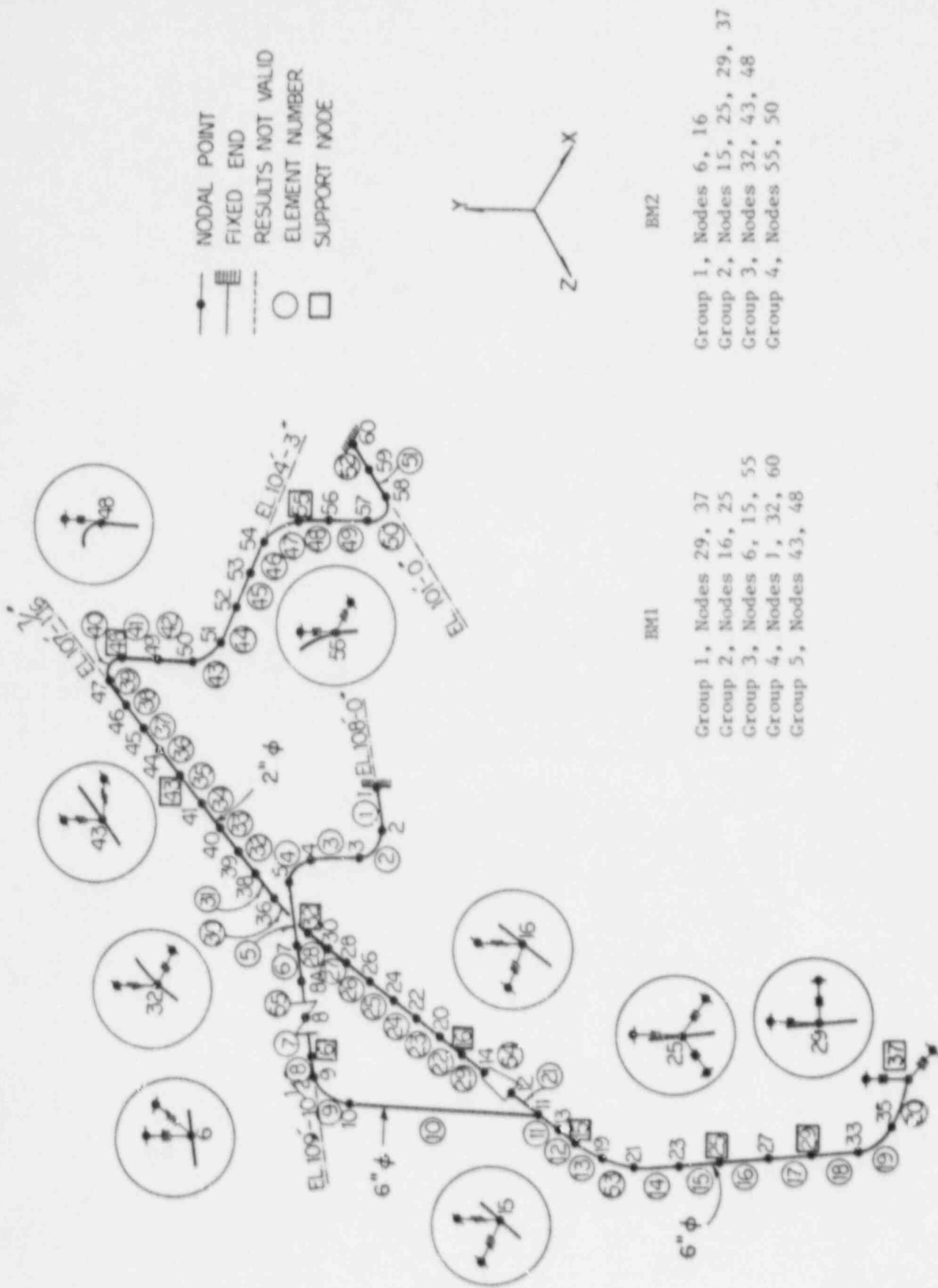


Figure 5 - BM1 and BM2 Piping Model

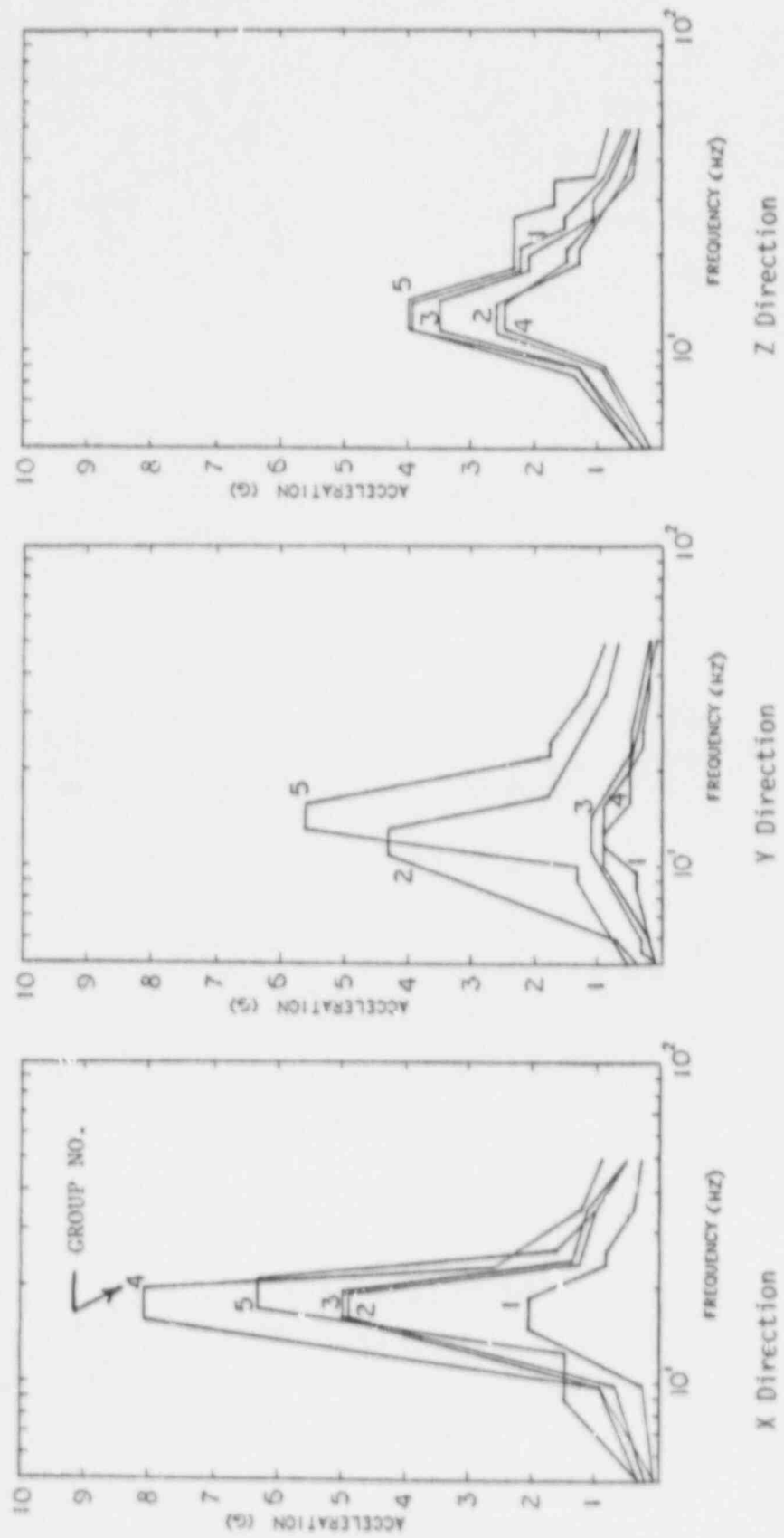


Figure 5A - BMI Problem, Support Group Broadened Response Spectra, Five Groups, PVRC Damping

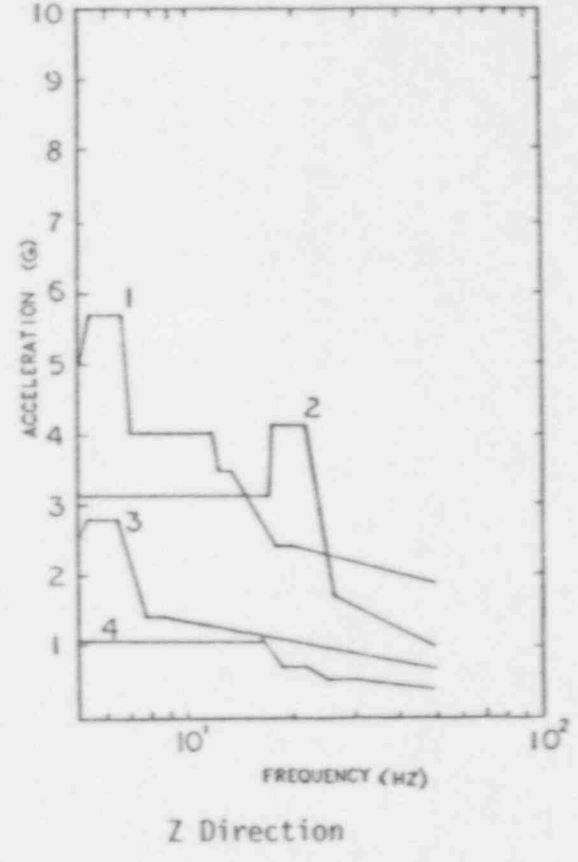
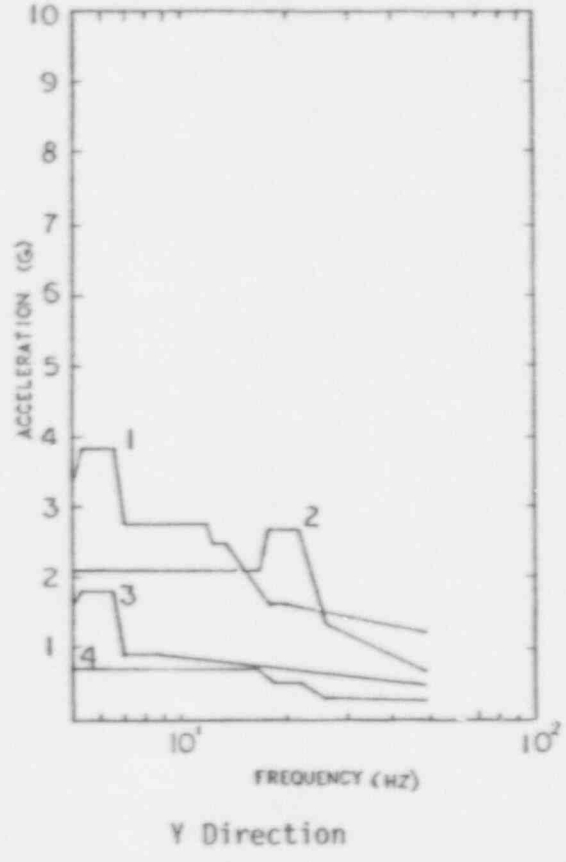
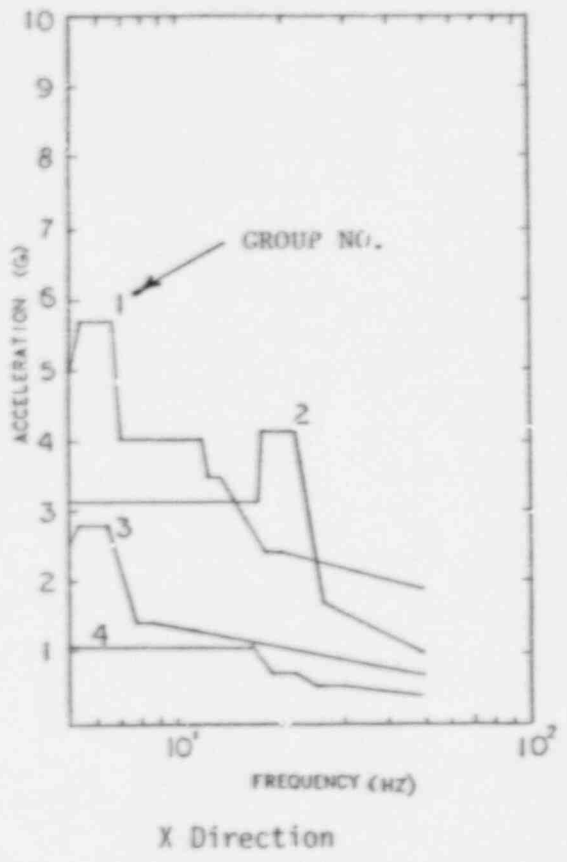
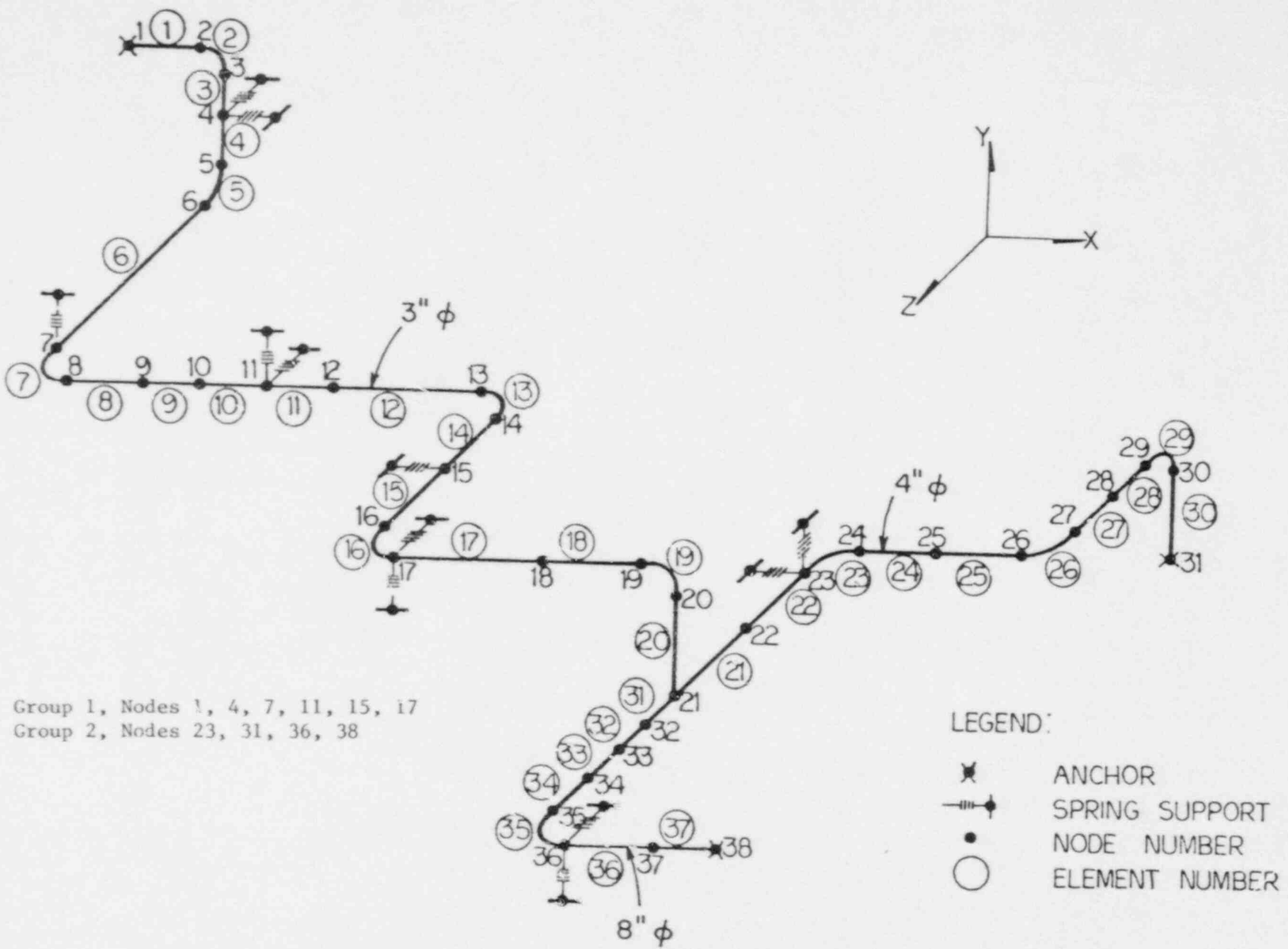


Figure 5B - BM2 Problem, Support Group Broadened Response Spectra, Four Groups, PVRC Damping

structural evaluation, only one horizontal response was determined for each floor level, the two horizontal inputs for each group were taken identical and the group vertical inputs were taken as $2/3$ the respective horizontal input. In this case the three directional components of input for each group are totally correlated and the correlation between groups is very strong. The input response spectra are shown in figure 5B. Examination of the figure will indicate that the spectra for the Y direction have the same shape but lower amplitudes than the X direction spectra and the spectra for the X and Z directions are identical.

The BM3 model, Figure 6, is a portion of a piping system from the HFBR Test Reactor at BNL. The inputs to the model were segregated into two groups, with nodes 1, 4, 7, 11, 15 and 17 forming one group and nodes 23, 31, 36 and 38 forming the second group. The group inputs were derived from a 1D analysis of the reactor structure. Again, within a group, the two horizontal inputs were identical and the vertical input was taken as $2/3$ the respective horizontal input. Obviously the degree of correlation between inputs ranged from totally correlated to strongly correlated. The broadened and labeled input response spectra are shown in figure 6A.

Summaries of some of the pertinent parameters for the problem set are given in Table 3.



Group 1, Nodes 1, 4, 7, 11, 15, 17
Group 2, Nodes 23, 31, 36, 38

LEGEND:
* ANCHOR
Spring symbol SPRING SUPPORT
• NODE NUMBER
○ ELEMENT NUMBER

Figure 5 - BM3 Piping Model

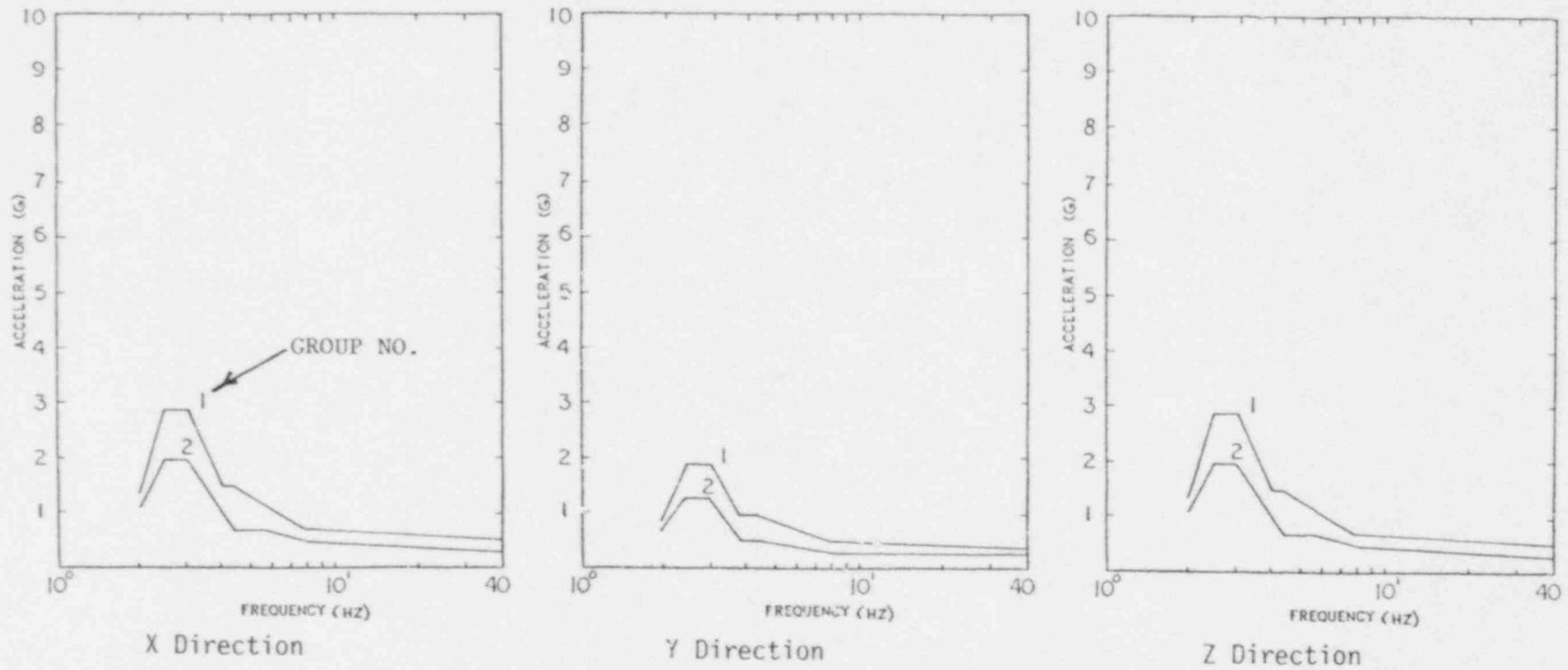


Figure 6A - BM3 Problem, Support Group Broadened Response Spectra, Two Groups, PVRC Damping

Table 3 - Model Parameters

Model	Structure	No. of Equations	Pipe Size	Pipe Frequencies 1st, 2nd	No. of Support Groups	No. of Seismic Events	No. of Modes Used	No. of Moments	No. of Support Forces	No. of Disp./Accel. Parameters
RHR	Zion (3D)	423	8", 12"	3.86, 8.11	9	33	18	22	15	17 x 3
AFW	Zion (3D)	945	3", 16"	2.86, 3.76	15	33	37	23	28	21 x 3
Z-Bend	ANCO Test (3D)	204	4"	8.57, 17.42	3	1	10	39	16	34 x 3
BM 1	PWR (3D)	336	2", 6"	5.05, 14.63	5	1	15	55	32	56 x 3
BM 2	BWR (Stick)	336	2", 6"	5.05, 14.63	4	1	15	55	32	55 x 3
BM 3	Test Reactor	228	3", 4", 8"	2.91, 4.39	2	1	23	37	30	38 x 3

4.0 STUDY RESULTS

a. Consistent Comparison Results

The basic results of the study are presented as tables in Appendix I. Tables for the dynamic component of displacement, acceleration, support force and moment are included for each problem. For the problems involving a single seismic event the parameters presented in the tables are the percentage by which the respective response spectrum (RS) estimate of a response quantity exceeded the time history (TH) estimate of that quantity developed considering PVRC damping. This percentage is defined as:

$$\text{Percentage Over Time History} = 100 (\text{RS}-\text{TH})/\text{TH}$$

If this value is equal to zero, then the predicted value is identical to the time history estimate. If the value is negative, the results corresponding to the candidate method or procedure underpredict the time history estimate of response.

For the problems involving multiple seismic events the tables present statistical parameters, developed by processing the Percentage Over Time History results over all seismic events, for each response parameter. These parameters have the units of percentage as defined above. For ready reference one page of the moment table for BM3 and one page of the mean value moment table for the RHR problem are presented in Tables 4 and 5 respectively. The format for these tables is the same as the format used to present results in NUREG/CR-3811.

For the Z-bend, BM1, BM2 and BM3 only one seismic event was considered in the evaluations. For these, in the third column of each table are listed the time history (TH) estimates for the response quantity (see Table 4). In all remaining columns the entries are the percentages by which the respective response spectra (RS) estimates exceed the time history value. In the column headed URS, the response estimates were obtained from a uniform support motion run using the envelope response spectra. In the remaining columns, cases 1-14, the response estimates were obtained using independent support motion response spectrum methods, with cases 1 and 2 corresponding to algebraic combination between group contributions, cases 3-8, corresponding to the SRSS combination between group contributions and cases 9-14 corresponding to absolute combination between group contributions. The differences between cases, for a given group combination strategy, reflect the different sequences in performing the combination over groups, modes and directions.

For the RHR and AFW problems thirty-three seismic events were considered. Statistical methods were used to reduce the data set for each response parameter to the mean value and standard deviation of the percentage of exceedance. Three sets of tables were developed for these problems corresponding to the mean value, the standard deviation and mean

value minus one standard deviation, to characterize the variance of response with different earthquake inputs. Further, in these tables, the column corresponding to the time history estimate is deleted and a typical table (see Table 5) has fifteen columns of results corresponding to the URS solution and ISM solution cases 1-14.

At the completion of this study BNL was advised that the ISM/PVRC spectra provided for use as input to the AFW problem were misordered. Consequentially all the ISM/PVRC response spectrum evaluations developed by BNL for the AFW problem were in error: since those results were not consistent with the time history data sets provided for this problem. All the ISM/PVRC response spectrum results, both tables and figures, were therefore deleted from the study results. The NUREG/CR-3811 ISM/uniform damping results for the AFW problem were verified to be a correct and consistent data set.

b. Cross Comparison Results

In the earlier study of ISM methods coupled with uniform damping, the time history estimates of response based on uniform damping were considered to be the best estimates of true response and were used as the basis of comparison to evaluate the candidate response spectrum methods. The adequacy of the time history estimate in that calculational mode was not questioned since it is considered to represent the state-of-the-art and is accepted in licensing applications.

In this study the time history estimates of response based on variable damping were considered to be the best estimates of true response and used for comparison, a procedure completely analogous to the earlier study. In this case, however, the time history estimates are considered to represent new, unproven technology and their adequacy is the subject of concern. In order to provide an acceptable basis to assess the response spectrum results in the current study, in light of this concern, an additional set of result data tables were developed. In the new tables, labeled cross comparison, the time history estimates of response based on uniform damping, developed in the earlier study, were considered as the best estimate of response and used as the basis of comparison for the ISM/PVRC response spectrum cases. The cross comparison tables have the same format as the basic study data tables and are included as Appendix II to this report.

c. Graphical Results

To augment the data tables, selected portions of the data are presented in graphical form. Two different graphical formats are used, one depicting the lower bound of the statistical results, the other depicting the variation of results over all locations. In both formats the response parameter shown is the Degree of Exceedance (DOE), which is the response parameter tabulated for the given problem reduced by a factor of 100. For the problems involving a single seismic event

$$\text{DOE} = (\text{RS-TH})/\text{TH}$$

Table 4 - Representative Moment Results, BM3 Problem

 * BM3 MODEL *

EARTHQUAKE NO. 1

*PIPE END MOMENTS(INERTIA COMPONENT)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	12	.15088E+04	-12	2	0	26	24	24	26	24	26	49	48	50	50	51	53
2	18	.15221E+04	-23	-5	-7	19	17	17	19	17	19	42	40	42	42	43	44
3	12	.39393E+04	-11	-10	-14	-7	-11	-11	-7	-11	-7	2	-1	2	3	4	8
4	12	.18762E+04	36	39	33	47	41	41	47	41	47	67	61	65	69	68	75
5	18	.23021E+04	30	31	23	34	27	26	34	26	34	49	42	46	52	50	58
6	12	.55550E+04	5	13	7	26	21	21	26	21	26	43	38	41	45	44	49
7	18	.49414E+04	4	13	8	28	23	23	28	23	28	45	41	43	48	46	51
8	12	.55959E+04	58	54	43	51	39	39	51	39	51	61	50	56	65	61	73
9	12	.53167E+04	47	42	37	39	34	34	39	34	39	62	58	63	66	67	72
10	12	.71477E+04	47	46	36	46	37	37	46	37	46	58	48	52	61	57	67
11	12	.56136E+04	4	30	27	66	64	63	66	63	66	98	96	99	100	100	102
12	12	.11144E+05	-25	8	7	50	49	49	50	49	50	84	84	85	84	85	85
13	18	.92378E+04	-20	13	12	55	55	55	55	55	55	90	90	91	91	91	92
14	12	.15264E+05	-38	-19	-20	6	6	6	6	6	6	31	30	32	32	32	33
15	12	.37011E+04	54	71	70	105	104	104	105	104	104	152	151	156	155	157	159
16	18	.37962E+04	50	53	52	70	69	69	70	69	70	110	109	115	113	117	118
17	12	.43505E+04	69	77	76	106	104	104	106	104	104	148	147	158	154	160	161
18	12	.50019E+04	-6	10	9	39	39	38	39	38	39	71	71	74	73	75	75
19	18	.42058E+04	2	11	10	31	30	30	31	30	30	60	60	64	63	65	66
20	12	.13425E+05	-9	20	20	66	66	65	66	65	66	105	104	107	106	107	108
21	12	.34184E+04	49	39	37	71	69	68	71	68	69	105	104	108	111	123	124
22	12	.26479E+04	95	95	93	146	143	142	146	142	143	198	197	202	203	220	221
23	18	.26131E+04	90	89	87	138	136	134	138	134	135	189	187	193	194	209	210
24	12	.23848E+04	74	73	71	116	114	113	116	113	113	163	161	167	168	178	179
25	12	.74489E+03	350	214	204	198	184	176	198	176	179	222	210	226	253	263	266
26	18	.88979E+03	240	141	133	133	122	115	133	115	117	154	145	159	177	189	192
27	12	.16175E+04	48	10	7	13	9	7	13	7	8	28	25	29	38	49	50
28	12	.24281E+04	-5	-21	-22	-9	-10	-10	-9	-10	-10	6	5	9	11	22	23
29	18	.23535E+04	-1	-19	-19	-5	-6	-6	-5	-6	-6	10	9	14	14	27	28
30	12	.55960E+04	144	68	64	61	55	52	61	52	52	73	69	71	90	98	99
31	12	.10129E+05	84	91	89	140	137	136	140	136	137	193	191	197	200	205	207
32	12	.97823E+04	102	101	98	148	145	143	148	143	145	203	200	207	211	216	219
33	12	.99482E+04	103	93	90	133	130	128	133	128	130	186	182	189	194	198	202
34	12	.95631E+04	-2	32	32	85	84	84	85	84	84	127	126	128	128	131	132
35	18	.10034E+05	6	35	35	86	85	85	86	85	85	128	128	130	130	133	134
36	12	.69445E+04	76	24	19	35	30	29	35	29	34	47	43	48	50	72	78
37	12	.97476E+04	52	17	13	36	32	32	36	32	35	55	52	57	57	78	83

FORCE/MOMENT CODE

1 = element force
 6 = element moment i end

12 = element moment j end
 18 = element moment j end (elbow)

Table 5 - Representative Moment Results, RHR Problem

.....
 * RHR511 MODEL *

 ** MEAN VALUES **

TOTAL NO. OF EARTHQUAKES: 33

*MOMENTS AND FORCES(INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	6	83	42	42	34	33	33	34	33	33	128	127	156	154	184	185
2	6	115	66	66	123	122	122	123	122	122	325	324	378	399	452	452
3	12	111	49	48	112	112	112	112	112	112	312	311	364	387	440	440
6	12	19	50	49	92	92	92	92	92	92	266	265	314	328	378	379
9	12	126	36	36	99	98	98	99	98	98	281	280	321	344	383	384
16	12	477	51	51	104	104	104	104	104	104	259	298	344	377	418	418
19	12	93	36	35	161	160	160	161	160	160	417	416	449	509	543	544
20	12	82	37	36	190	190	190	190	190	190	477	476	501	578	603	603
21	12	64	25	24	145	144	144	145	144	144	391	390	425	484	520	521
22	6	89	42	40	156	156	156	156	156	156	407	406	430	499	524	525
32	12	49	14	13	189	189	189	189	189	189	478	477	479	581	583	583
33	12	37	13	13	185	185	185	185	185	185	469	469	474	571	575	576
36	12	107	56	55	210	210	210	210	210	210	513	512	530	625	646	647
39	12	49	18	18	196	196	196	196	196	196	494	494	497	601	605	605
42	12	44	12	12	191	191	191	191	191	191	483	483	485	587	588	588
47	12	169	30	29	148	147	147	148	147	148	390	389	415	481	504	507
54	12	319	45	43	125	123	123	125	123	124	333	331	373	412	448	452
59	12	80	40	35	21	15	13	21	13	19	91	82	116	126	151	161
60	6	77	31	30	106	105	105	106	105	105	306	306	338	386	423	424
61	12	73	24	24	156	156	156	156	156	156	412	412	438	509	538	538
62	12	33	19	19	146	146	146	146	146	146	393	392	418	484	514	514
70	12	146	82	71	165	161	160	165	160	161	403	399	456	490	539	542

FORCE/MOMENT CODE

1 = element force
 6 = element moment i end

12 = element moment j end
 18 = element moment j end (elbow)

For the problems involving multiple seismic events the DOE is the mean value of the above quantity developed by averaging over the responses for all earthquake inputs.

Figures 7 through 10 show the statistical variation of response with earthquake input. These show the displacement, acceleration, moment and support force results respectively for the RHR problem. The abscissae of each figure represents the different response spectrum cases considered while the ordinate represents the degree of exceedance associated with each of the procedures. The dashed horizontal line corresponds to the time history (TH) solution and is assumed to represent the true response. Only two to four response estimates for different points on the model are plotted. These data exhibit the degree of exceedance for those points that exhibit the minimum mean value for all points in the model. Other mean value data for the respective response parameter would fall above the plotted values. The data plotted then define the lower bound of the mean value of the response parameter. Each plot entry shows a vertical line. The center of the line is the mean value, and the line extends one standard deviation above and below this value. These figures correspond identically to those used to present the data in NUREG/CR 3811, the earlier study.

Figures 11 through 20 show the variation of response with location in the piping systems. Two figures are presented for each piping problem studied, one depicting dynamic moment results for the problem, the other depicting dynamic support forces for the problem. On each figure three plots of data are shown. The data presented in the center plot on each figure corresponds to the results of this study, the data presented in the lower plot on each figure corresponds to the results developed in the earlier study considering uniform damping, while the data presented in the upper plot on each figure are the cross comparison results obtained when the DOE parameter is calculated using the response spectrum estimate based on PVRC damping (this study) and the time history estimate based on uniform damping (earlier study). The data presented in each case is all the significant results for the parameter. For the Z-bend, BM1, BM2 and BM3 the actual results are plotted, while for the RHR problem, the mean values of the response components are plotted. As compared to the first figure set, these figures show the total range and dispersion of all significant data for each problem and each study.

For the Z-bend and BM1 through BM3 problems, results with magnitudes approached zero were not depicted on Figures 11 through 20. The elimination of these small responses was based on the considerations that, first, they do not control design and, second, that they could introduce misleadingly large DOE values into the data plots. Inordinately large DOE values could occur since as the time history estimate of a response approached zero, division by zero could produce large values even for small differences between the response spectrum and time history estimates. It was felt that the inclusion of these large magnitude DOE estimates would cause a misleading increase in the dispersion of the data shown on the figures.

When drawing conclusions from Figures 11 through 20 careful consideration of the damping levels applicable to each data plot should be given. In particular, when considering the cross comparison plots for problems BM1, BM2 and BM3, it should be realized that since the uniform time history estimate was calculated using 1% damping and the response spectrum estimates were calculated using PVRC damping, poor correspondence between these response estimates could be expected. This poorer correspondence is evident as a greater degree of dispersion in the cross-comparison plots for these problems.

Since the ISM/FVRC results for the AFW problem were found to be in error, no data plots corresponding to PVRC damping or cross comparison could be developed for this problem. However, plots showing the variation of the moment and support force responses from the earlier study, with location, were prepared. These are shown for reference on Figure 21, with the moment responses presented in the upper plot and the support force data presented in the lower plot.

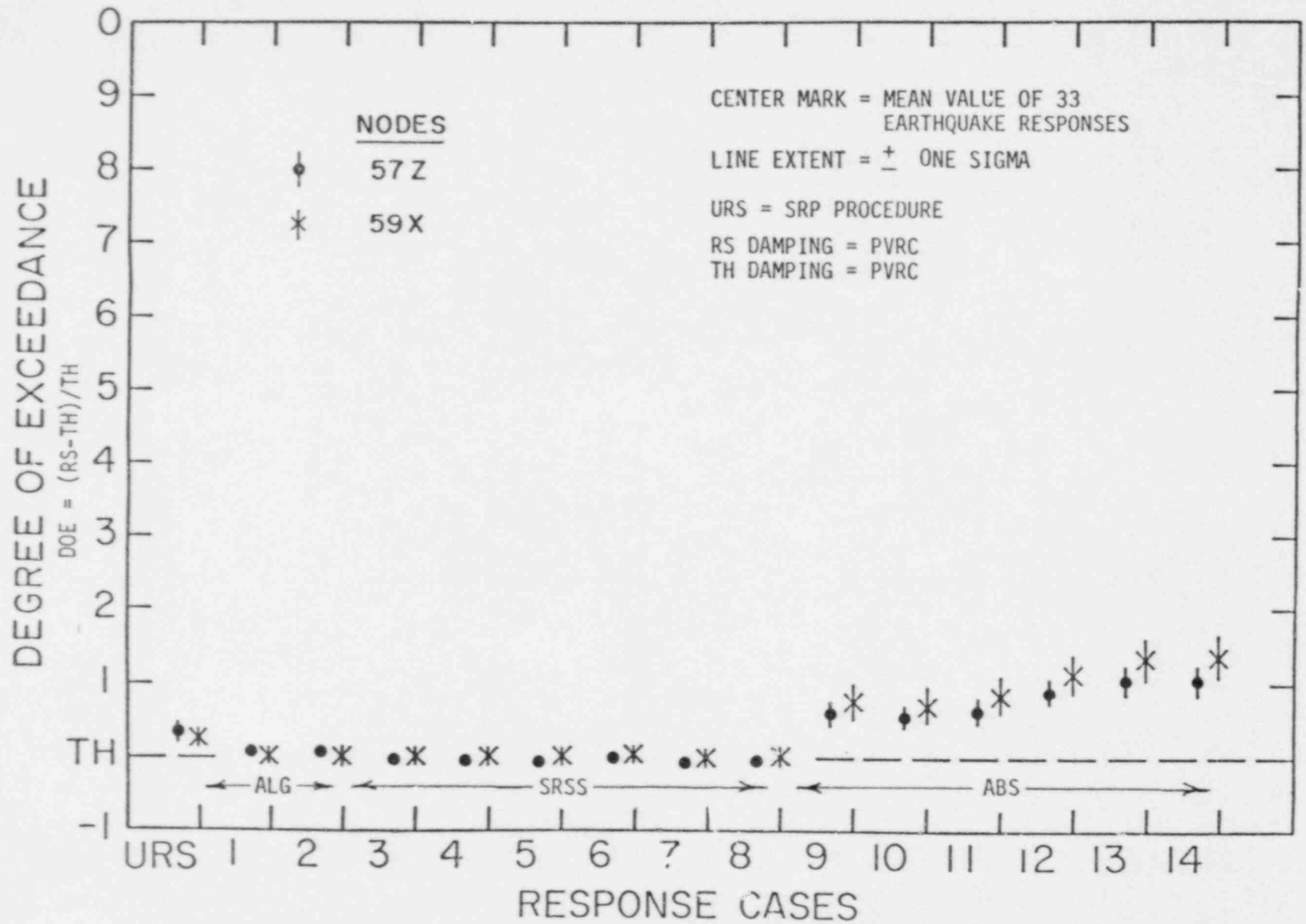


Figure 7 - PVRC Damping RHR Dynamic Displacement

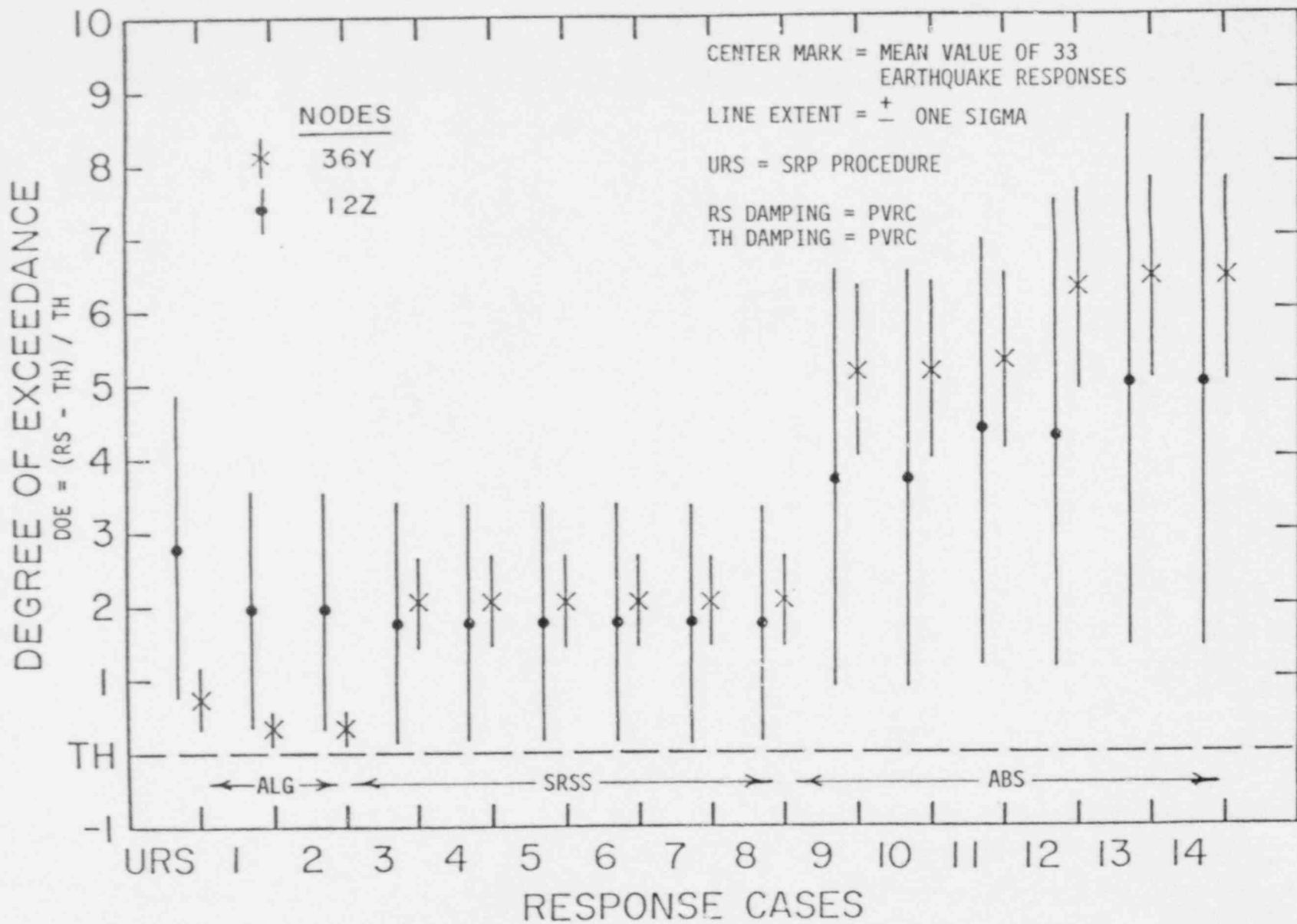


Figure 8 - RHR Dynamic Acceleration

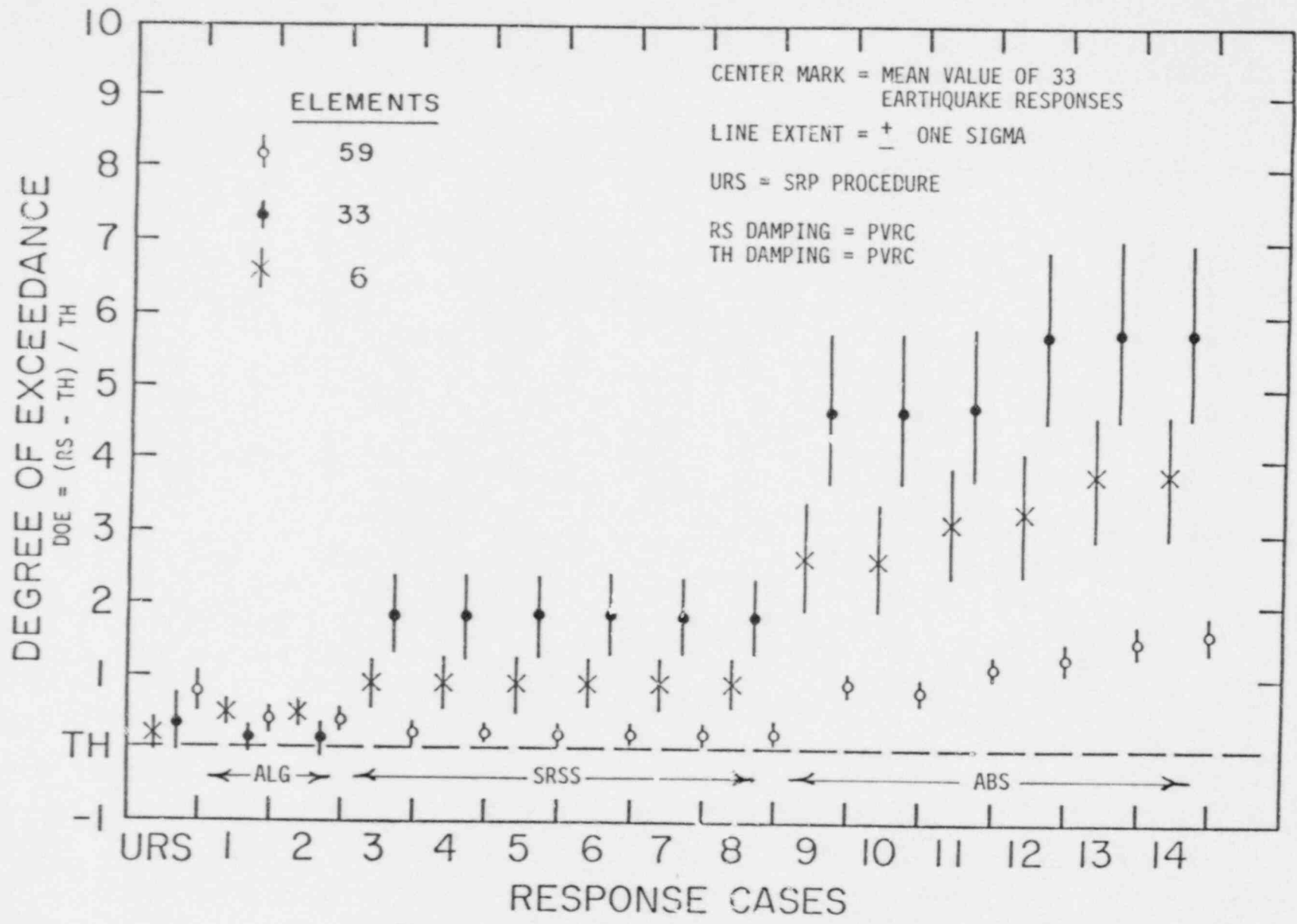


Figure 9 - PVRC Damping RHR Dynamic Support Force Responses

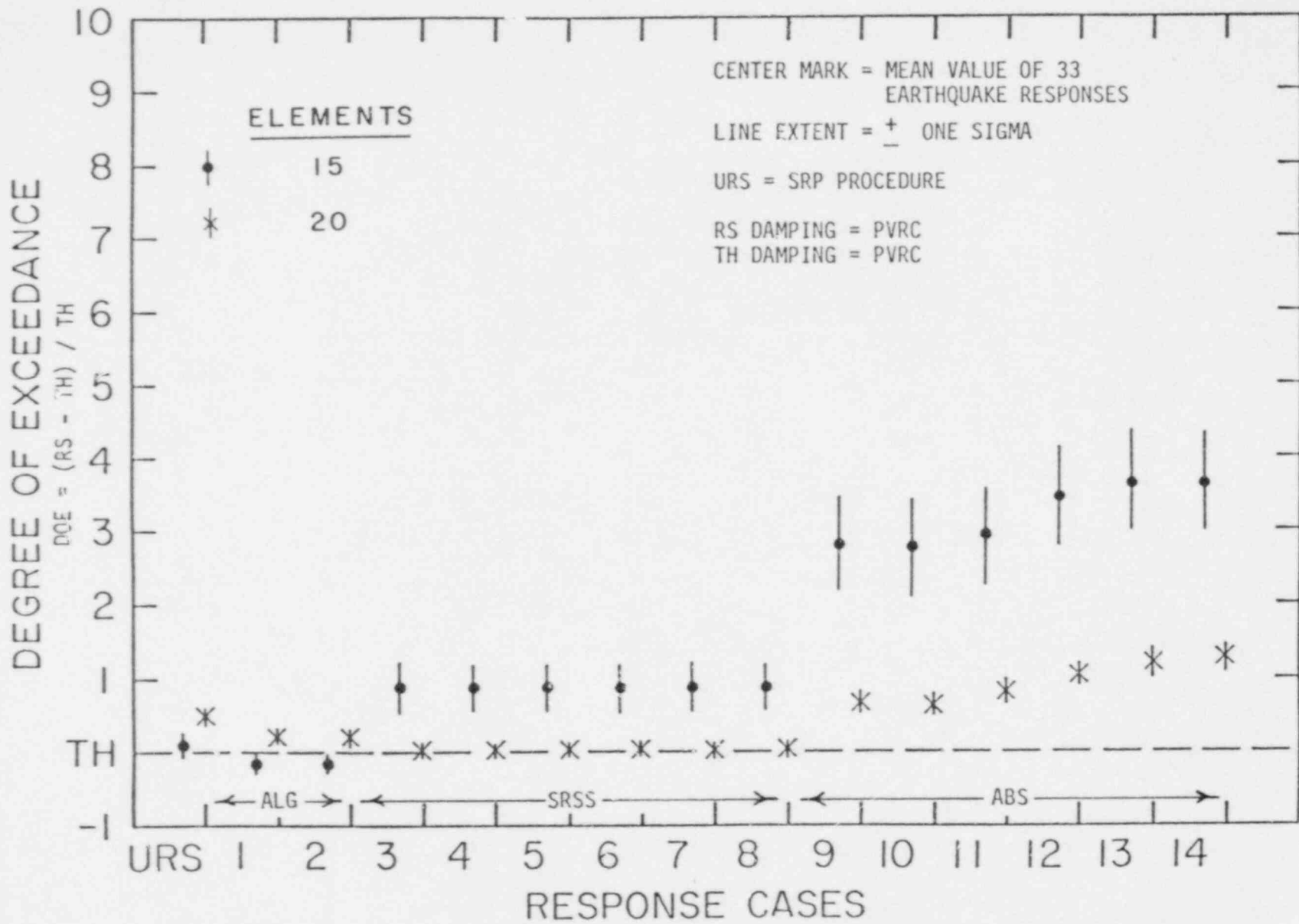


Figure 10 - PVRC Damping RHR Dynamic Moment

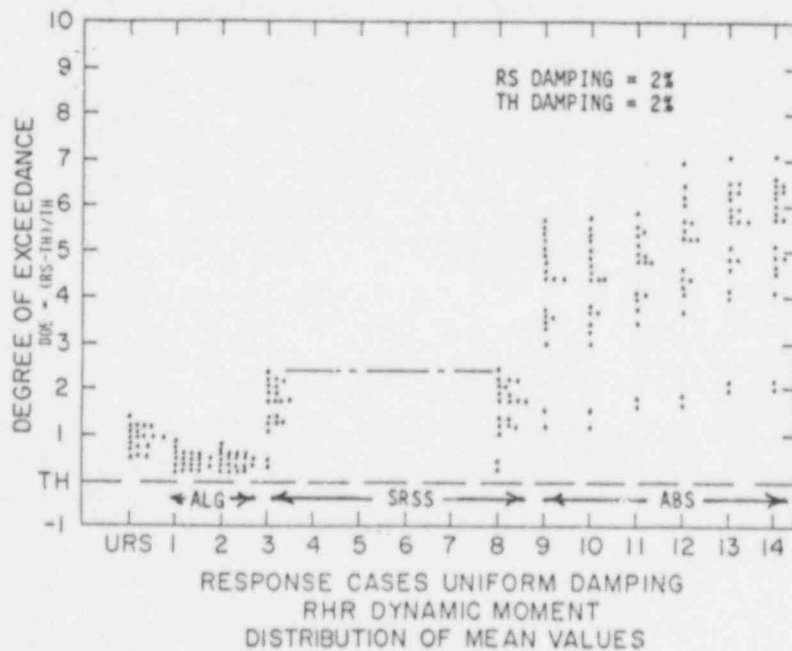
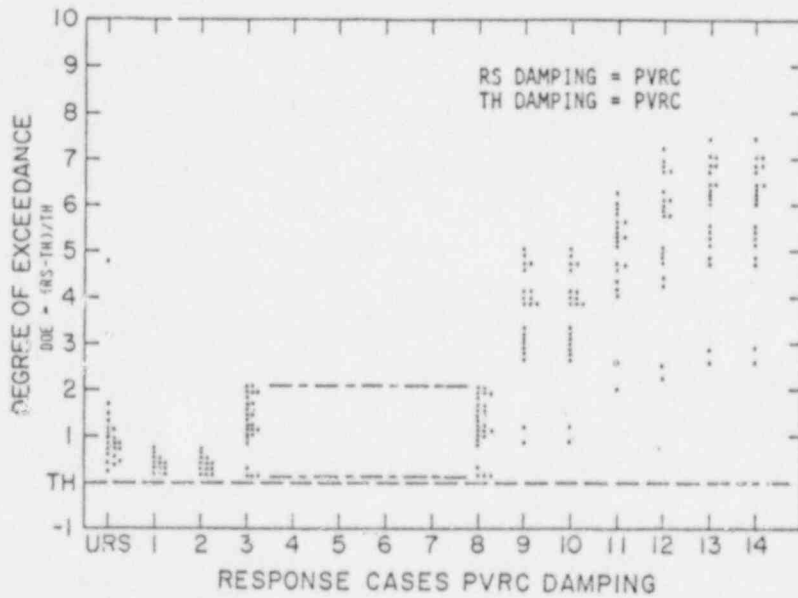
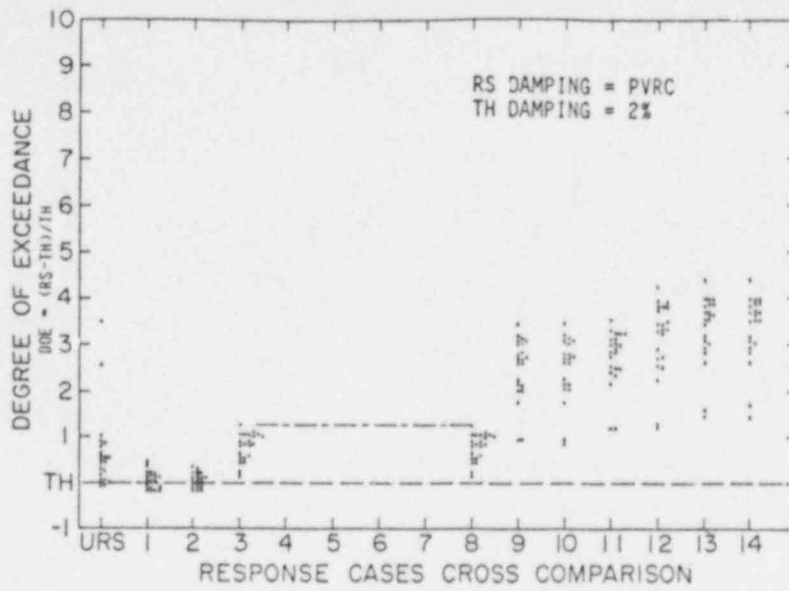


Figure 11

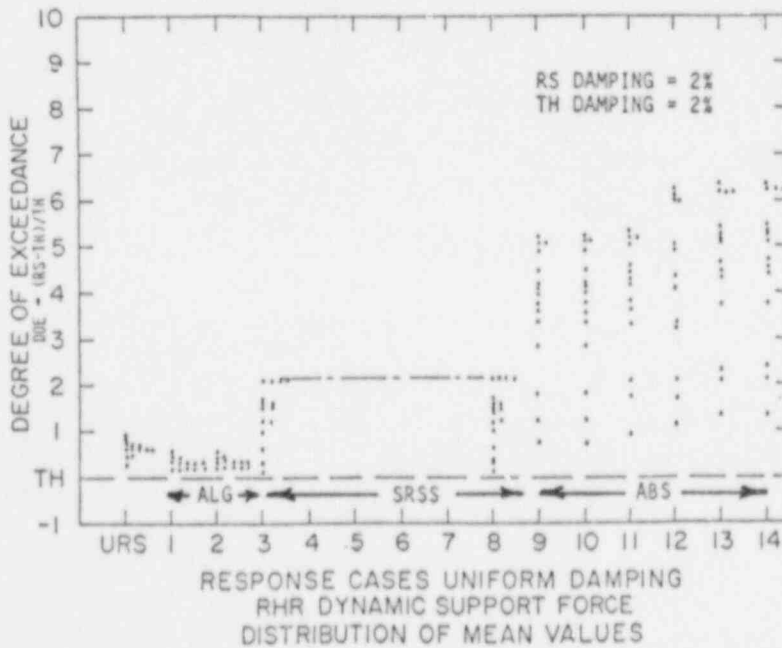
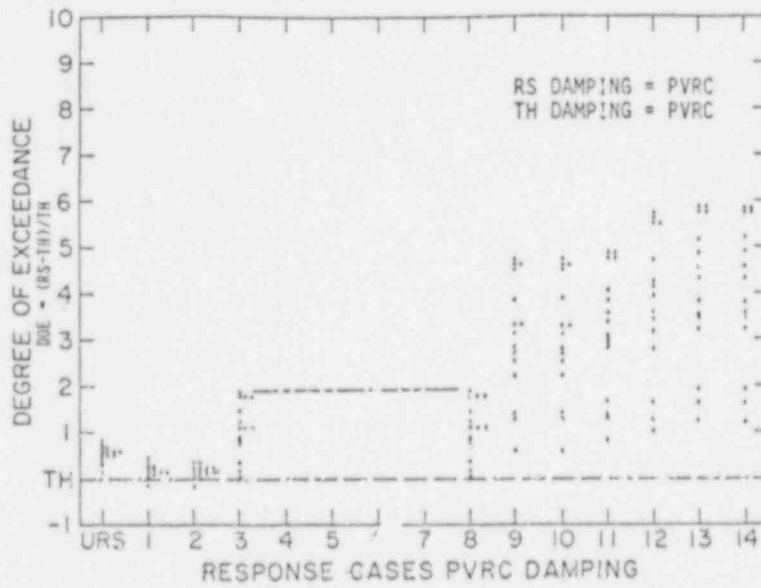
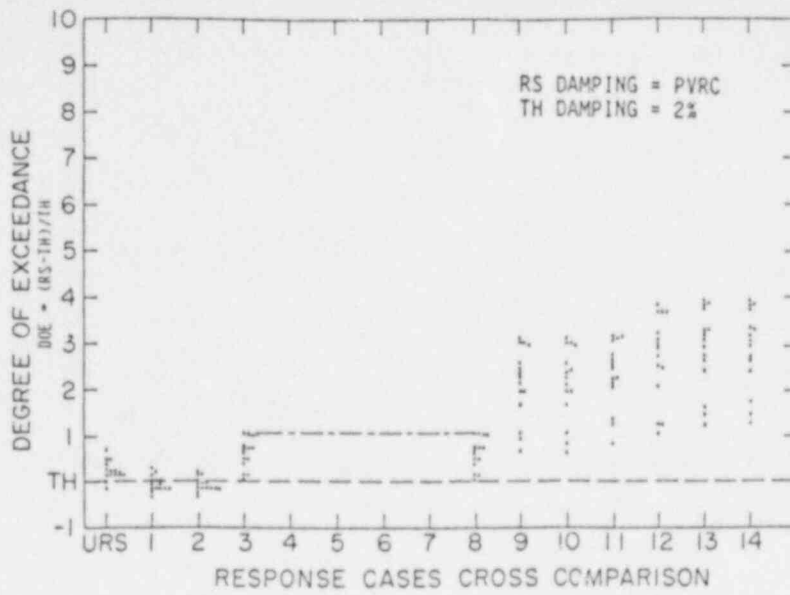


Figure 12

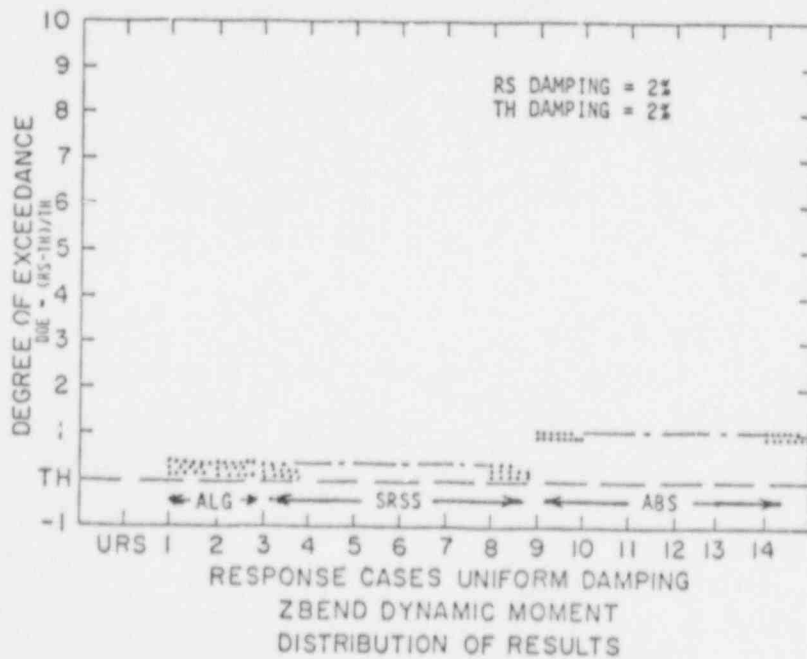
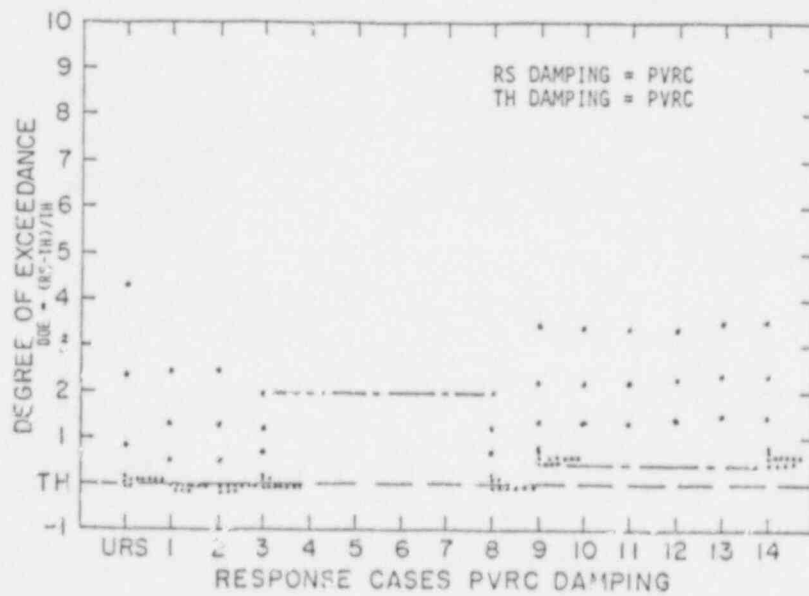
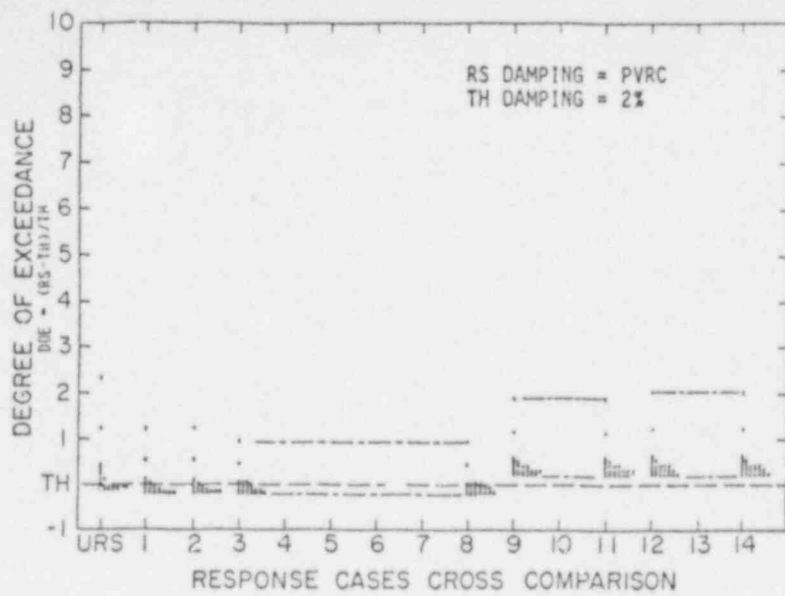


Figure 13

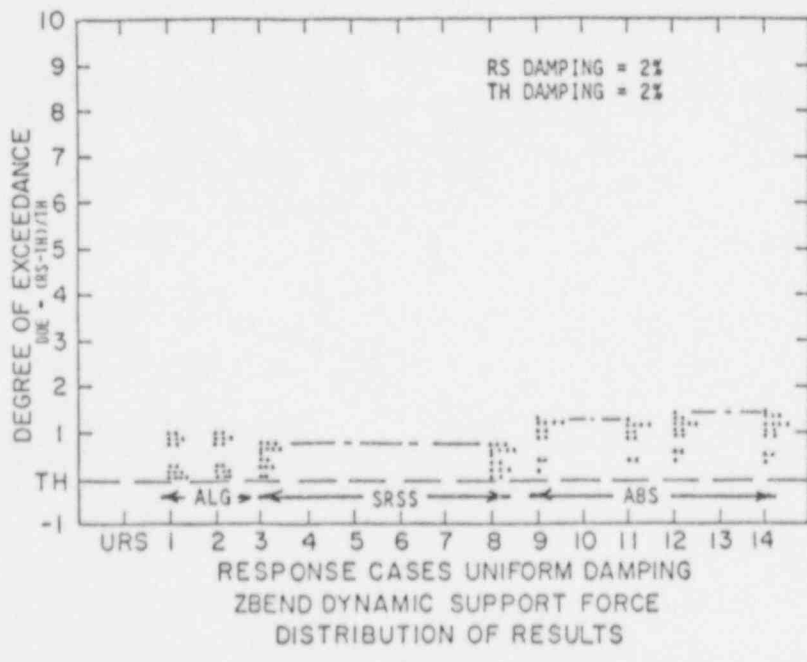
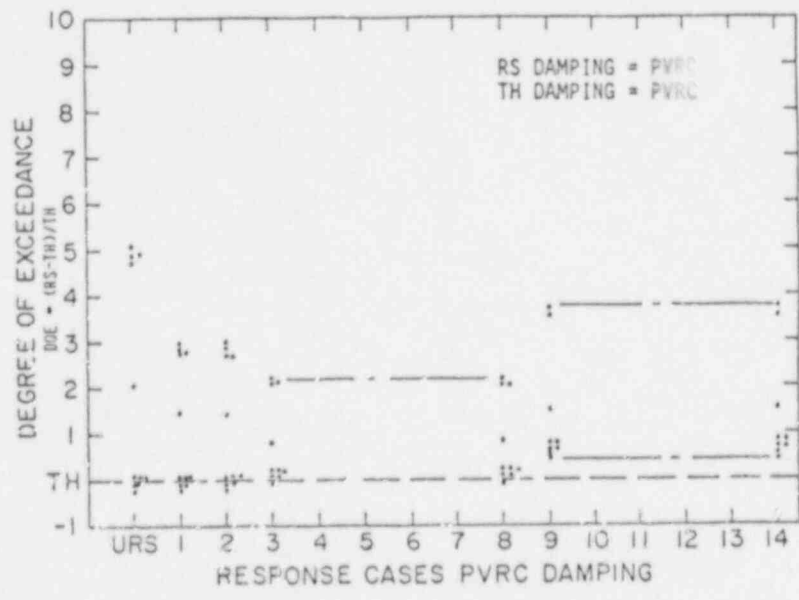
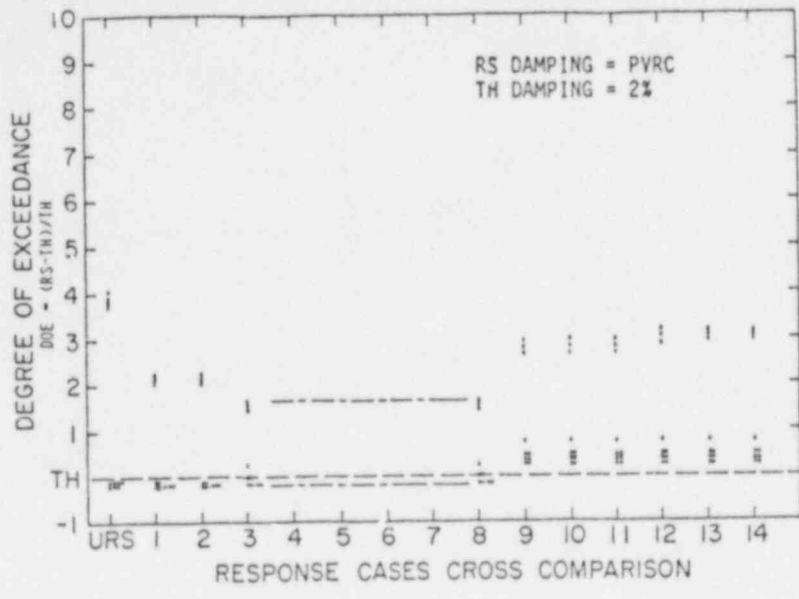


Figure 14

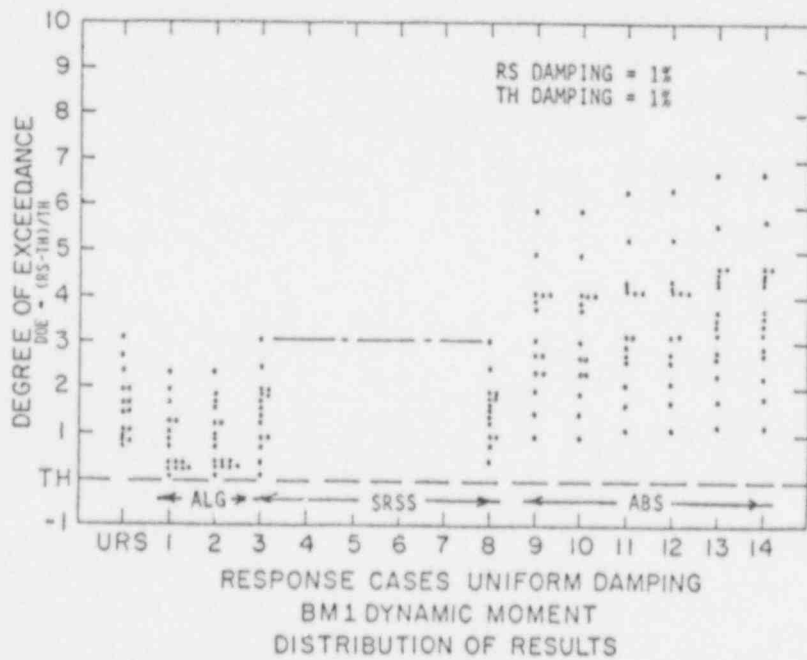
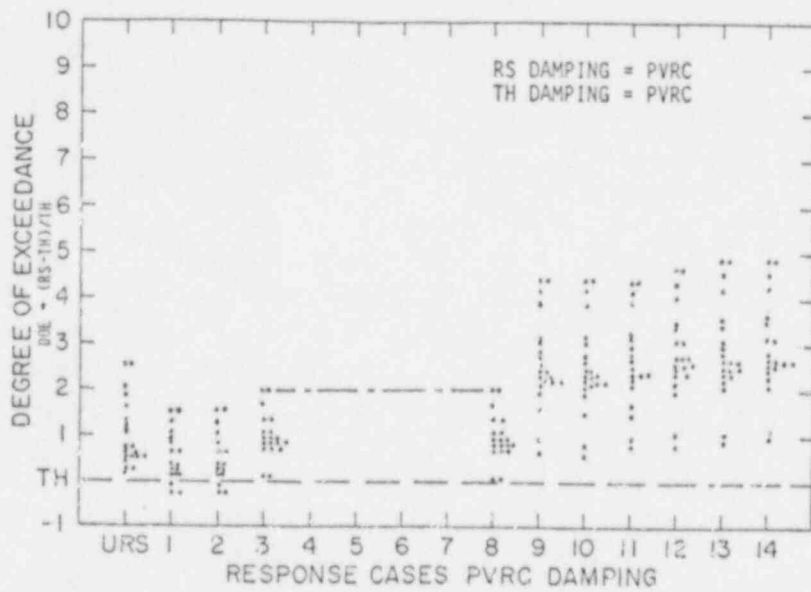
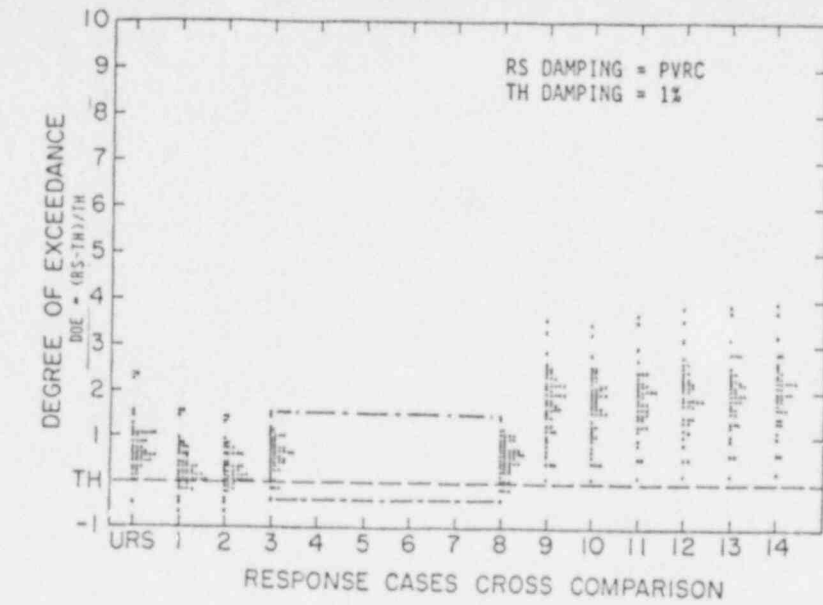


Figure 15

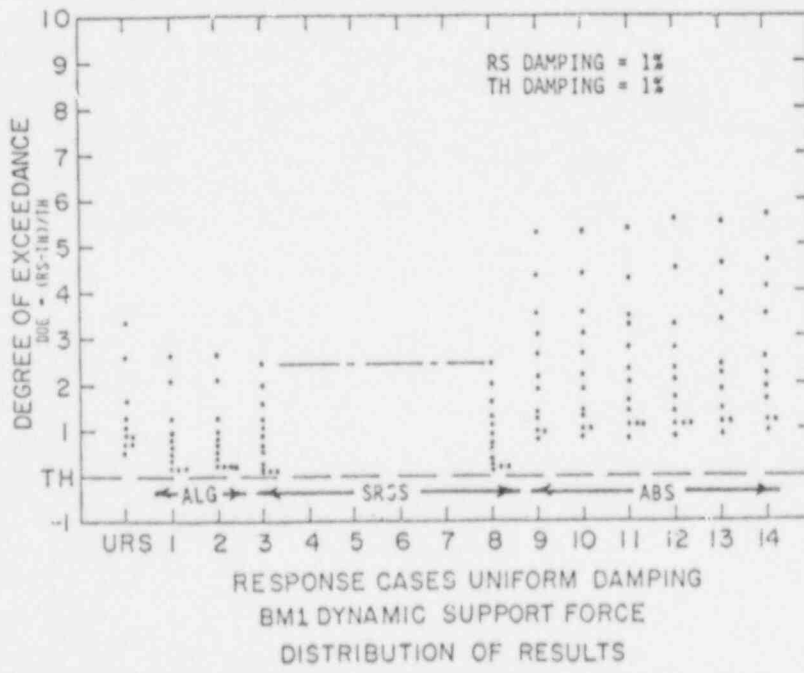
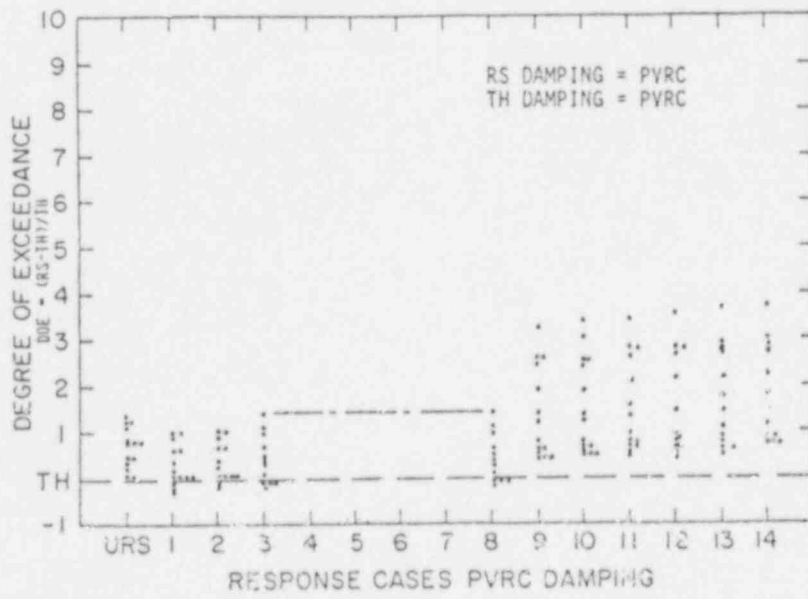
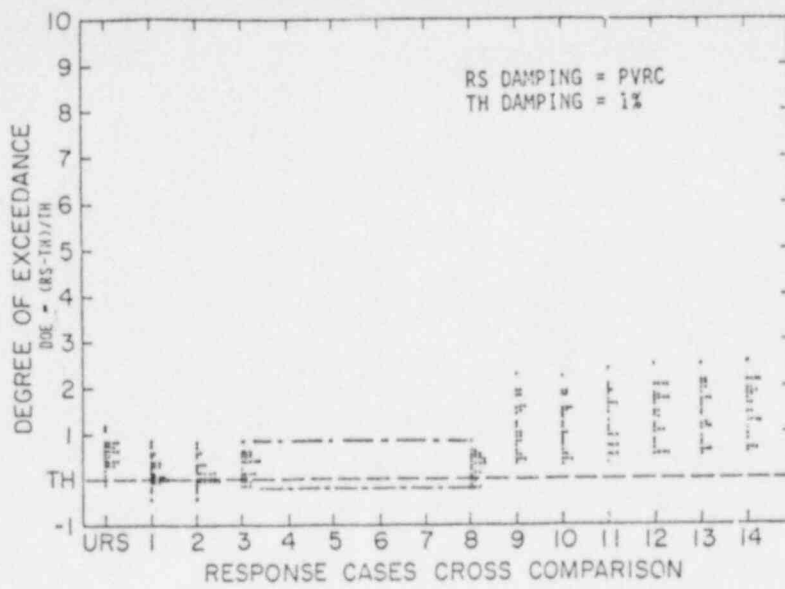


Figure 16

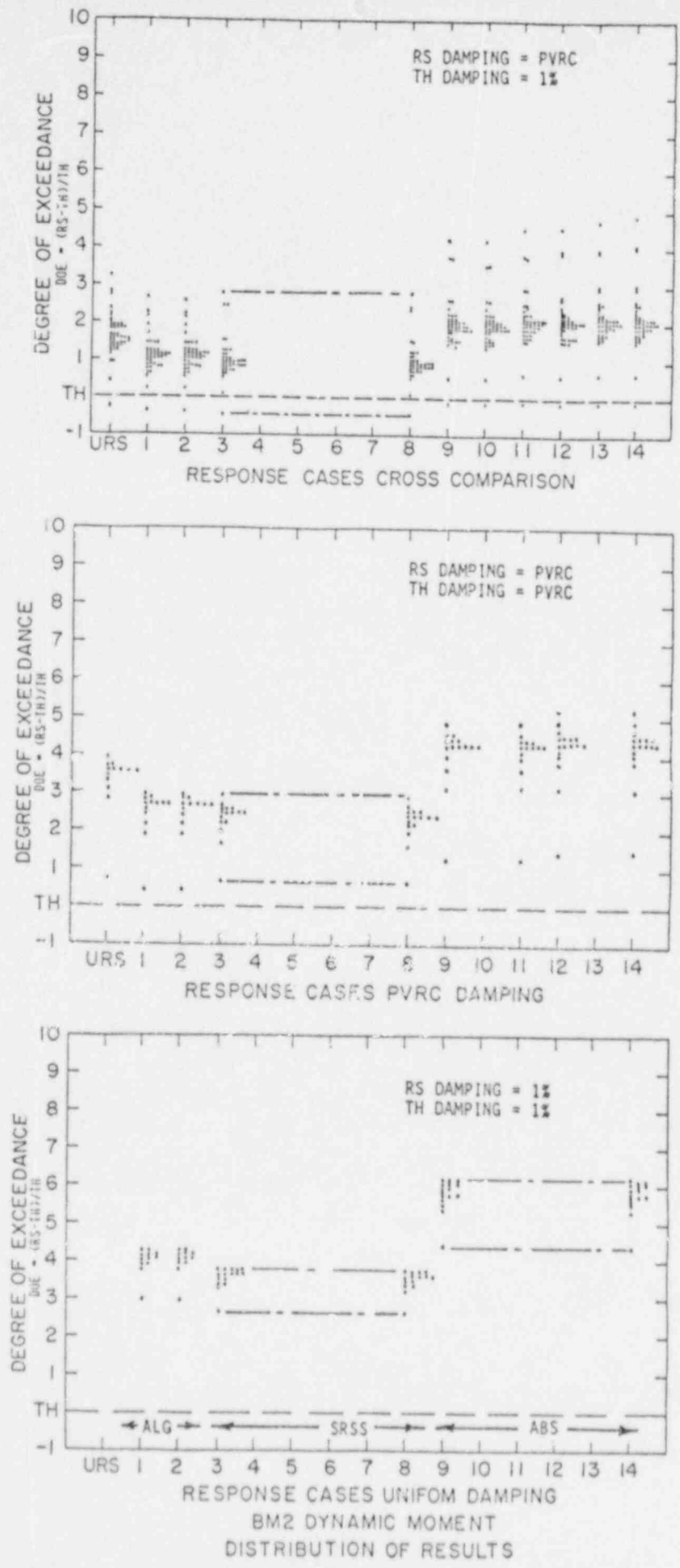


Figure 17

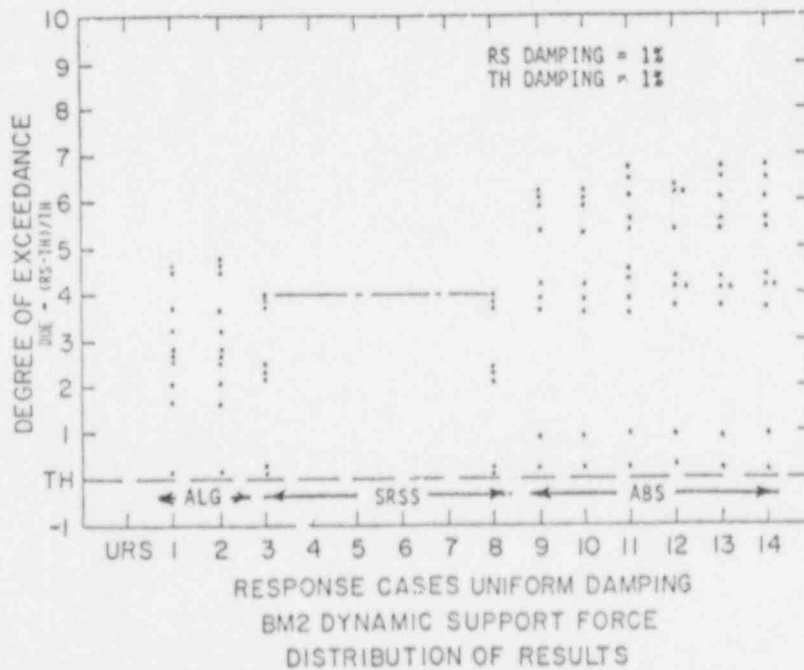
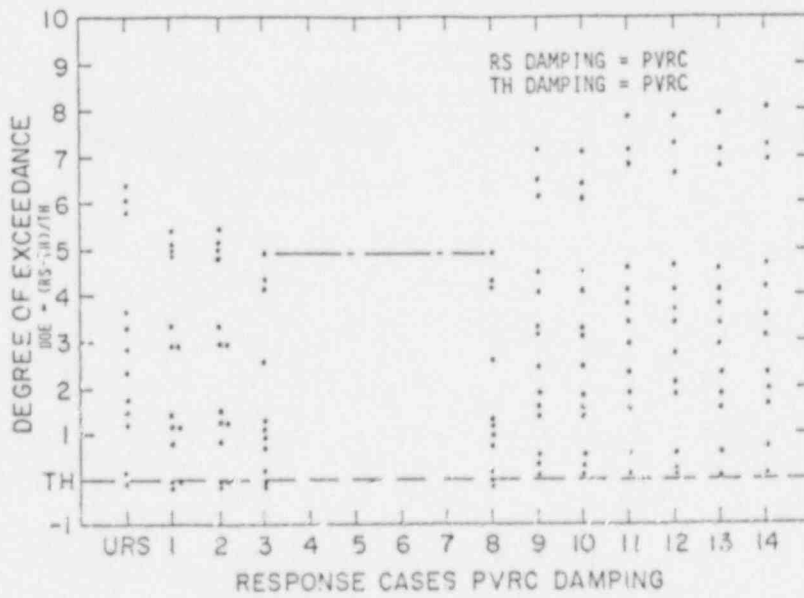
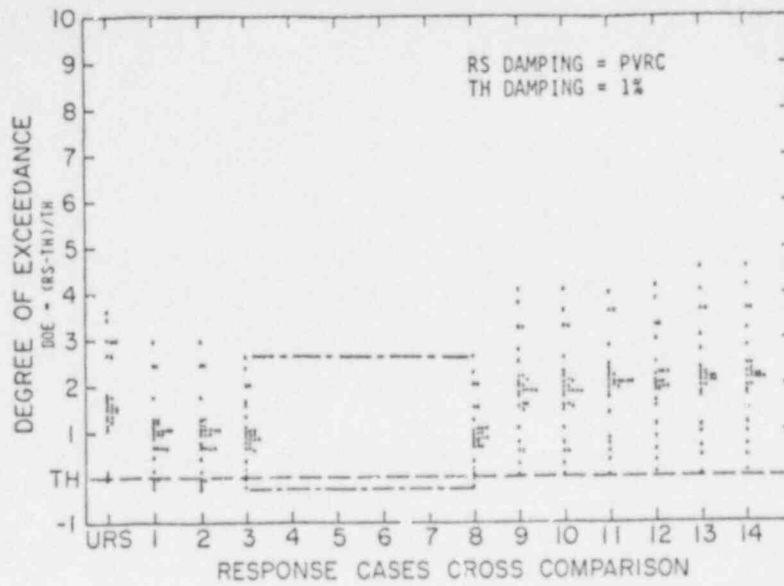


Figure 18

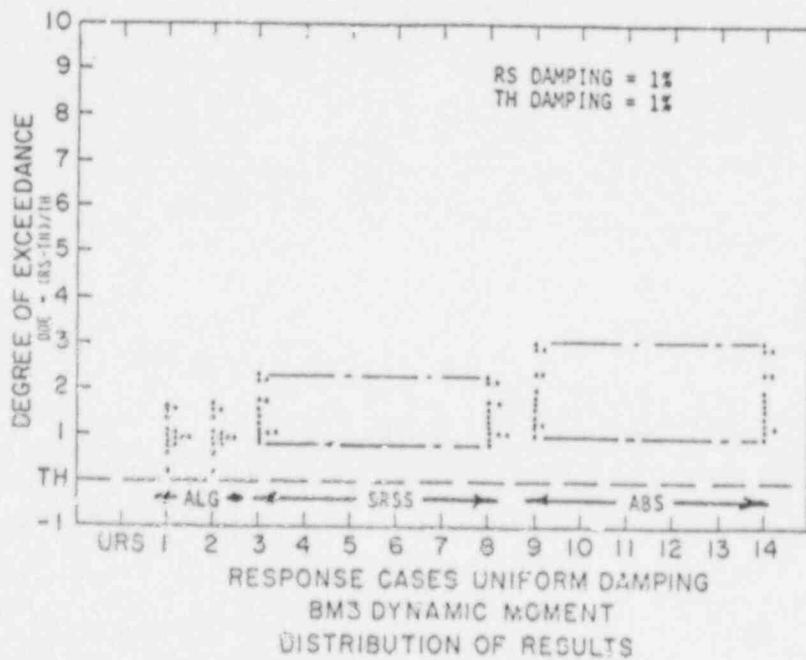
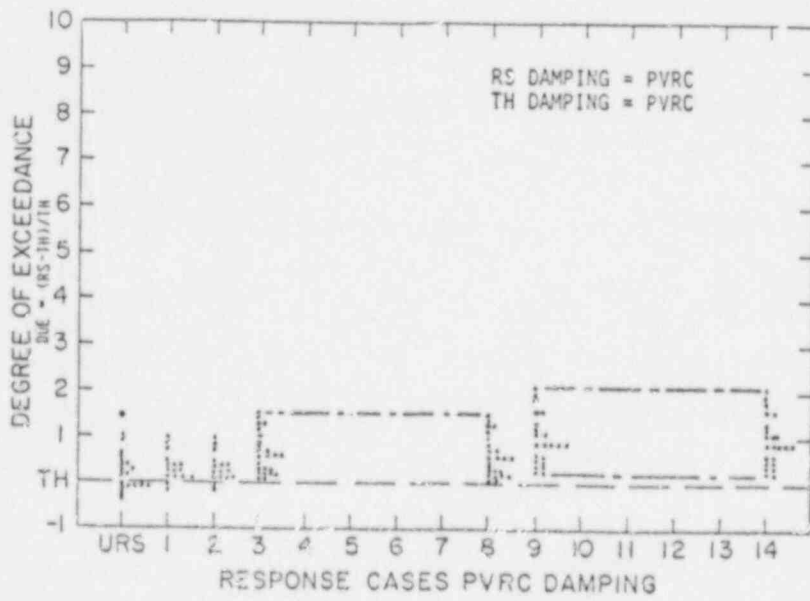
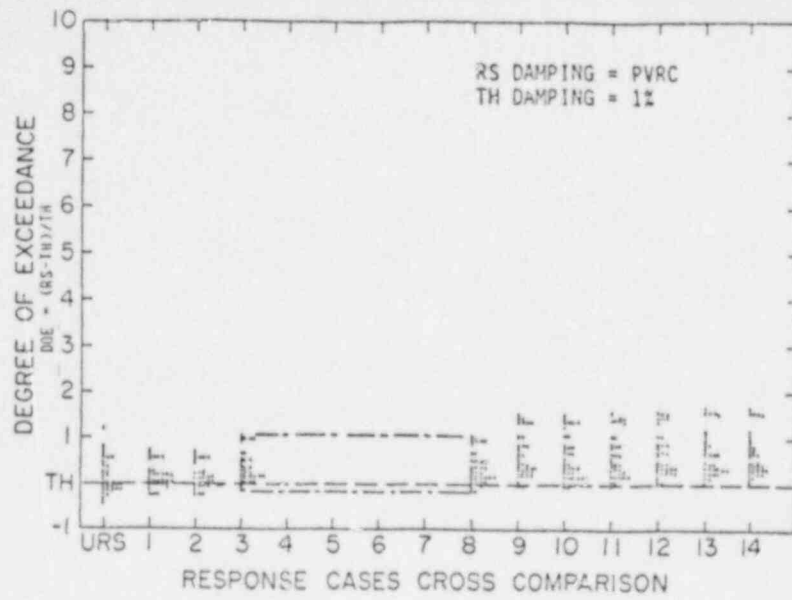


Figure 19

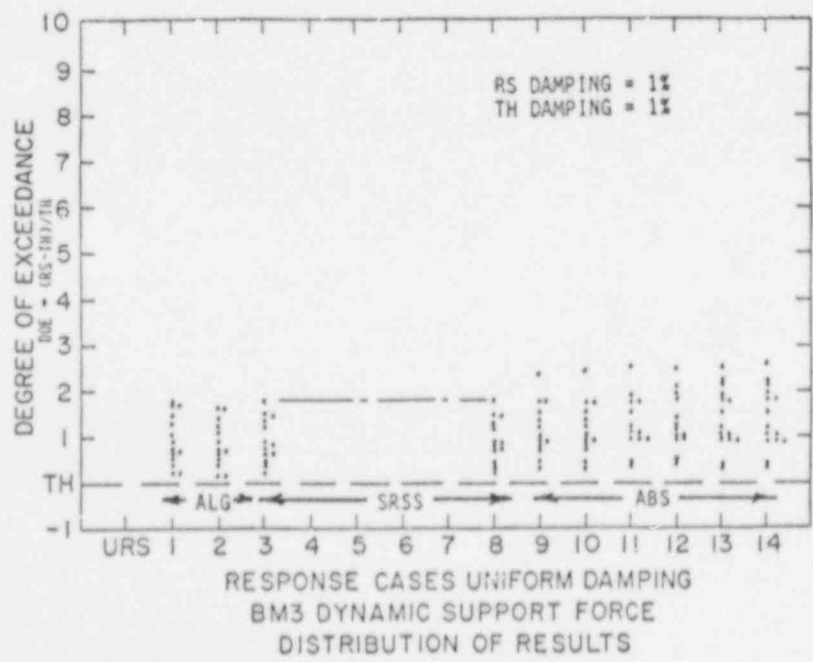
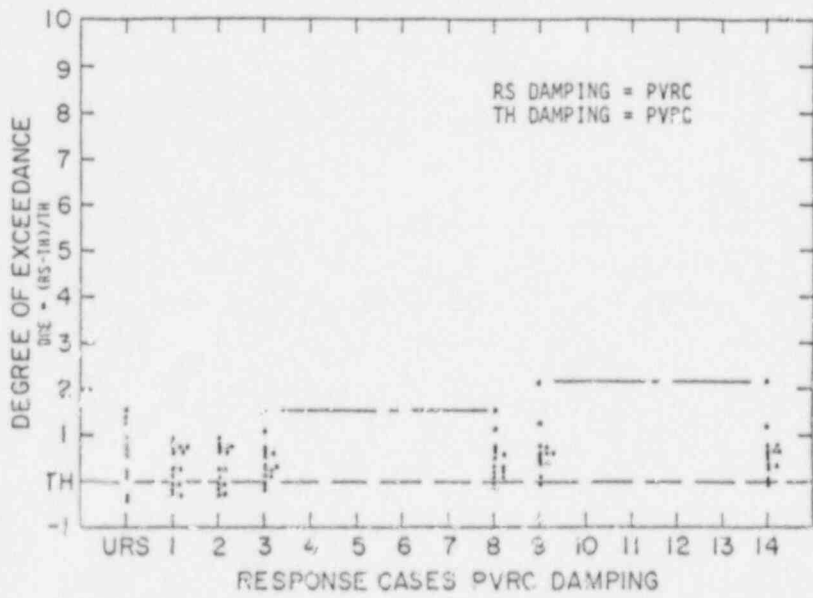
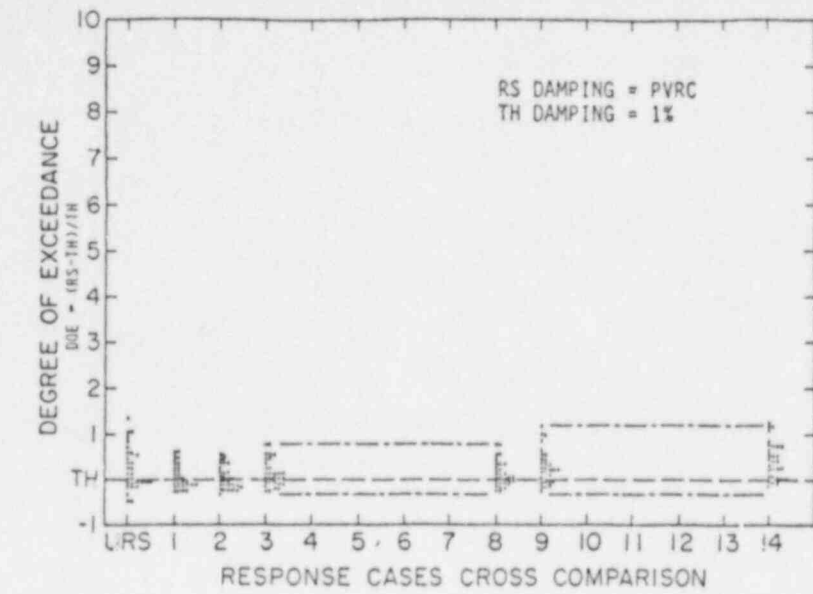


Figure 20

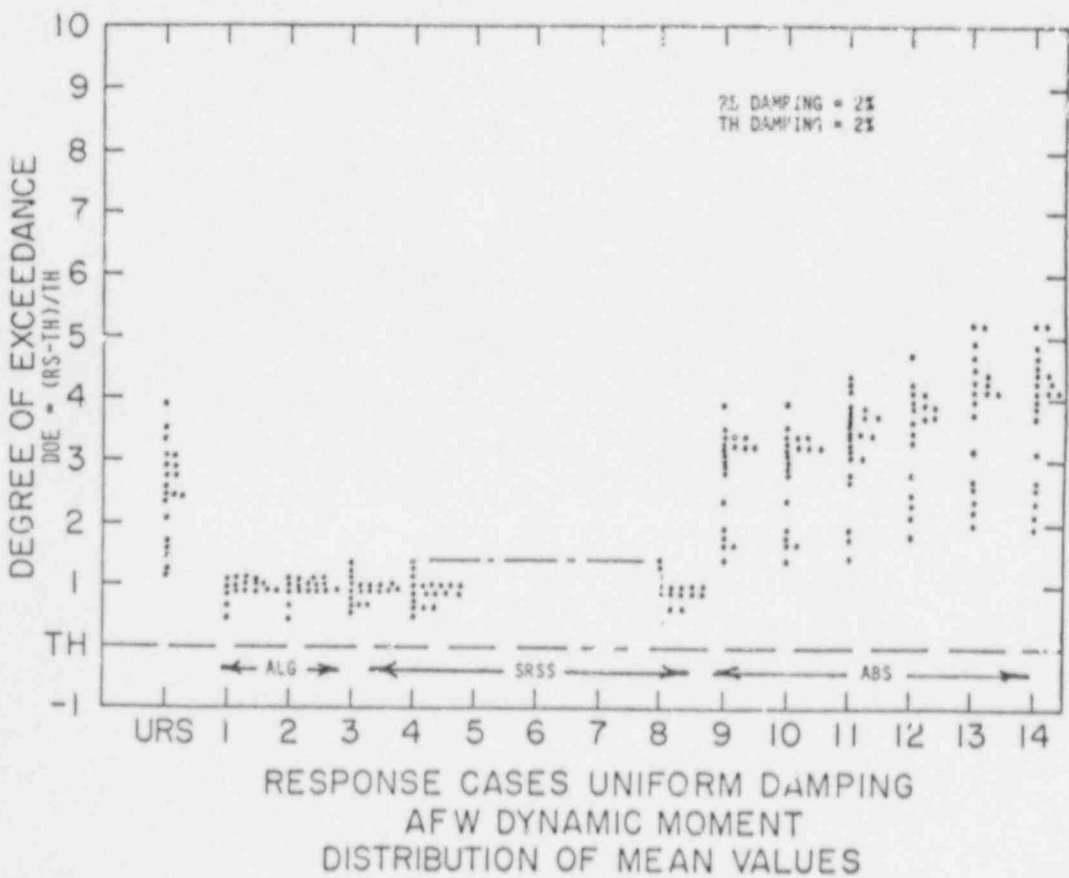
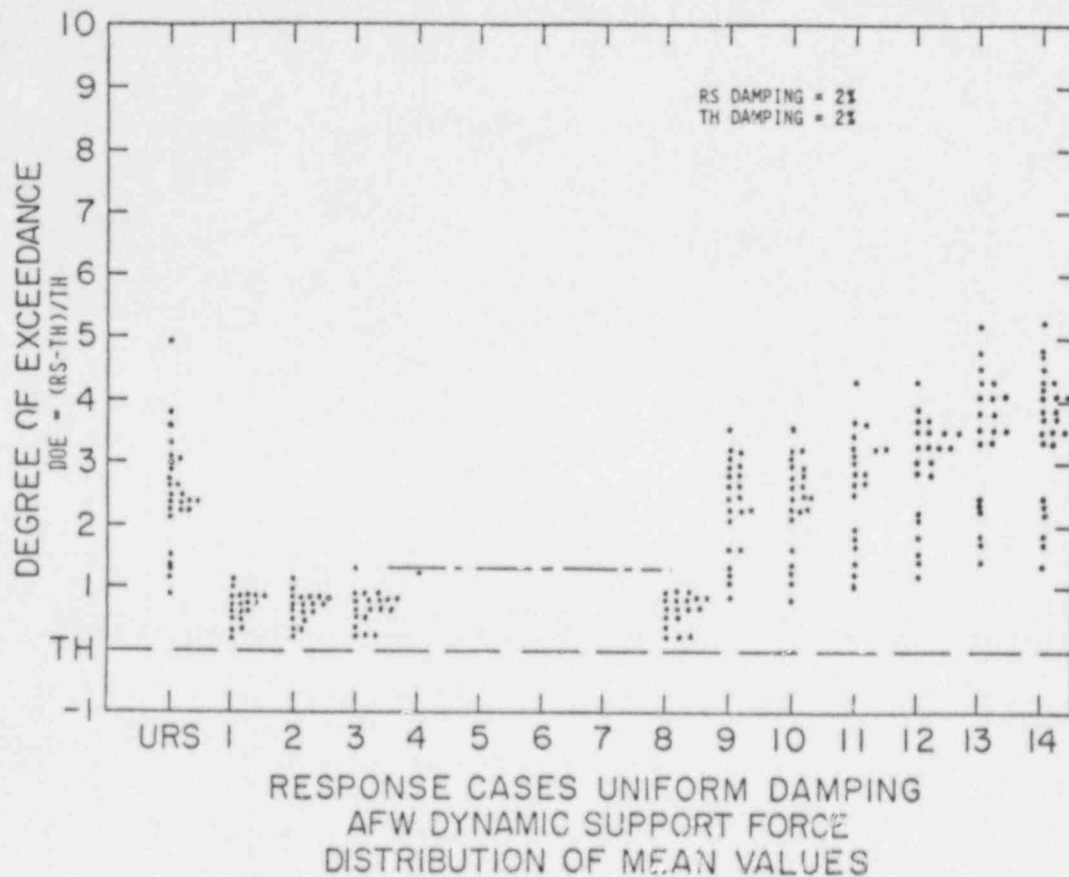


Figure 21

5.0 DISCUSSION OF RESULTS

The data summarized in the figures can be used to form some assessment of four characteristics of the study results. Namely, the conservatism associated with each method, the impact of PVRC damping, the dispersion of data for each method and the relative merit of each method as gauged by comparison to the corresponding envelope spectrum calculation. The ideal method would be conservative and exhibit a small dispersion of results at the same level or just exceeding the baseline time history results. A small dispersion shows a consistency of the results with a quantifiable degree of accuracy relative to the time history analyses. It should be noted that comparing one baseline time history analysis with another could show some dispersion due to computer round off and differences in algorithms.

a. Levels of Conservatism

Considering the first characteristic, the conservatism associated with each method, a review of Figures 7 through 10 for the RHR problem will indicate some instances of underprediction of the time history results for all parameters other than acceleration. This is true for the URS case as well as cases 1-2, corresponding to algebraic combination between group contributions, and cases 3-8 corresponding to SRSS combination between the group contributions. Only the case 9-14 results, corresponding to absolute combination between the group contributions, are consistently above the time history estimates. The conventional envelope spectrum (URS) solution appears to exhibit results which are comparable to those developed using SRSS combination, although in extremes, it provided the least conservative, or alternately, the most conservative estimate of a response quantity.

The ordering or hierarchy of the conservatism exhibited by the results is, as demonstrated by the following discussions, as expected. For the general case, the group contributions to a specific response parameter will consist of an array of both positive and negative quantities. If there is a relatively even distribution between these signed quantities the algebraic combination between them will yield the lowest estimate of response, the SRSS combination, the greater positive mean estimate of response and the absolute combination, the greatest estimate of response (as observed). In those cases where the quantities are mostly of like sign, the ordering between the algebraic and SRSS combination will shift and the estimate based on algebraic combination will approach the estimate based on absolute combination.

The ordering of the results from the URS method must be considered separately and can best be gauged when the procedure used to form this estimate is considered. In this procedure, algebraic combination is used to sum between the group contributions with however the envelope spectra used to develop the group contributions. This estimate then will always exceed that developed using algebraic combination but its rank against the SRSS and absolute combination procedures is both problem and spectra

dependent. For a problem where the group contributions are all of like sign, this procedure will provide the most conservative estimate of response. For the general case, it will provide conservative estimates tempered by the degree to which the envelope spectrum exceeds the group spectra. If the results of this study are any gauge, the URS method provides an estimate most comparable to that provided by the ISM/SRSS method.

A review of the data tables for the BNL problem set (Z bend, BM1, BM2 and BM3) indicate that the same trends are apparent for these problems as were apparent for the RHR problem. Further, a review of Figures 11 through 20 show that the moment and support force data plots substantiate these observations, possibly showing them more clearly. From Figures 13 through 20 the frequency of underestimates for the BNL problem set indicates:

- a. The BM2 results are most conservative.
- b. The BM1 and Z bend results show similar degrees of conservatism, but each are less conservative than BM2.
- c. Of the original problem set, the BM3 results are least conservative, with some indications of underestimates appearing even for the absolute group combination method (cases 9-14).

The results for BM3, when first reviewed, were felt to be anomalous. In the entire previous study no instances of underestimates with the ISM method and absolute group combinations were noted. However, after careful consideration it was realized that, since the directional inputs for this problem were totally correlated and since SRSS combination was used over directional components, the occurrence of underestimates was indeed possible. To test this hypothesis a study with a simple bend and identical input waves was undertaken. It was found that by manipulating the phasing between the directional components for that problem the degree of conservatism achieved, with the response spectrum methods, could be varied from good to poor.

Summarizing all the observations, algebraic combination between groups provides the least conservative results, followed by SRSS combination, followed by absolute combination, which provides the most conservative results. The envelope spectrum method is seen to provide underestimates of time history results at a frequency relatively comparable to that exhibited by the ISM method with SRSS combination between group contributions. Clearly, it does not provide results as conservative as those developed using the ISM method with absolute combination.

b. Impact of PVRC Damping

Figures 11 through 20, presenting both the data developed in the earlier study based on uniform damping and the data developed in this study based on PVRC damping, are particularly useful in assessing the impact of

PVRC damping. Reviewing Figures 11 and 12 for the RHR problem and comparing the center and lower data plots will indicate very little perceptible difference between the two data sets. The one obvious difference is the indication of some underestimates of support force time history results, for cases 1 and 2, with PVRC damping. A review of similar data on Figures 13 through 20, for the BNL problem set, shows, on the other hand, a distinct and consistent difference between the PVRC and uniform data plots. On all figures, the DOE results based on PVRC damping appear to be lower than the DOE results based on uniform damping. This is true for the envelope spectrum estimate of results (URS), as well as for all the ISM cases studies.

To further facilitate comparisons of results, the mean and standard deviation, of the BNL problem set DOE results and the Zion problem set (RHR,AFW) DOE results, were computed. The data set operated on for the Zion problem was, in fact, the mean DOE results (the mean of the parameter over thirty-three seismic events) and for the AFW problem only the uniform damping data was available. The data are presented in Table 6 for the Zion problem set, and Table 7, for the BNL problem set. The tables are clearly labeled and have a format similar to that used for the study results. For uniform damping, the URS solution was not always developed and consequently that column is blank.

A problem by problem comparison, of mean value data between the PVRC and uniform damping results, will show that the mean values of the DOE estimates, based on PVRC damping, are almost consistently below the corresponding estimates for uniform damping. This is true essentially for all response parameters and all problems. The differences appear greatest for the BM2 problem, a downward shift of 100 on the DOE scale, and least for the RHR problem, a downward shift of 10/20 on the DOE scale. The exceptions are, the URS case for the RHR problem, and all data, except support force, for the Z bend. For the Z bend, the upward shift of mean value for support force is offset by a greater dispersion in the PVRC data, as indicated by the standard deviation entry, with a resultant downward shift of the data defining the lower bound for support force. The tabulated data substantiates, the observation drawn from the figures, that the DOE results based on PVRC are lower than the DOE results developed considering uniform damping.

In summary, for reasons that cannot be established, a response spectrum estimate based on the PVRC damping recommendations, provide response estimates that more closely approach a time history estimate based on PVRC damping, than a response spectrum estimate based on uniform damping, approaches a time history estimate based on uniform damping. Since this was observed for both the URS cases, as well as the ISM cases, the effect is inferred to be associated with the damping assumption, rather than with the calculational method.

Table 6

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 * MEAN VALUE AND STANDARD DEVIATION OF ZION PROBLEM SET MEAN DATA *
 *

			(INERTIA COMPONENT)																	
MODEL			URS	1	2	3	CASE NUMBERS (DEGREE OF EXCEEDANCE, PERCENTAGE)										11	12	13	14
							4	5	6	7	8	9	10							
			** UNIFORM DAMPING **																	
RHRSI1	DISPL	MEAN	66	29	28	146	146	146	146	146	146	383	382	405	466	490	491			
		ST-DV	0	0	0	2	2	2	2	2	2	0	6	6	7	7	7			
	ACCEL	MEAN	457	336	326	364	354	345	364	345	352	710	691	769	871	942	956			
		ST-DV	34	29	30	23	23	22	23	22	23	30	37	37	47	47	48			
	MOMENT	MEAN	90	44	43	164	163	163	164	163	163	418	417	446	507	536	537			
		ST-DV	10	6	5	4	3	3	4	3	3	6	5	10	6	10	10			
	FORCE	MEAN	49	22	22	47	47	47	47	47	47	93	93	95	105	108	108			
		ST-DV	1	1	1	0	0	0	0	0	0	1	1	3	1	3	3			
AFWSG1	DISPL	MEAN	229	58	55	67	66	61	67	61	61	244	242	275	304	337	359			
		ST-DV	15	2	1	3	3	3	3	3	3	17	17	18	20	21	21			
	ACCEL	MEAN	525	215	205	239	234	213	239	213	210	514	506	608	631	741	749			
		ST-DV	11	11	11	19	19	17	19	17	17	14	14	7	11	5	5			
	MOMENT	MEAN	244	85	83	88	88	84	88	84	85	284	283	321	350	387	388			
		ST-DV	20	0	0	3	3	3	3	3	3	26	26	31	30	35	35			
	FORCE	MEAN	199	55	55	59	58	58	59	58	58	110	110	119	128	138	138			
		ST-DV	26	2	2	0	0	0	0	0	0	5	5	6	6	8	8			
			** PVRC **																	
RHRSI1	DISPL	MEAN	55	22	21	124	124	123	124	123	124	338	338	360	416	440	441			
		ST-DV	0	0	0	2	2	2	2	2	2	6	6	6	7	7	7			
	ACCEL	MEAN	651	494	479	495	480	468	495	468	477	923	895	986	1134	1213	1233			
		ST-DV	51	43	44	36	36	35	36	35	35	60	59	58	74	73	73			
	MOMENT	MEAN	111	37	35	138	137	137	138	137	138	366	365	395	450	479	481			
		ST-DV	7	9	7	5	5	5	5	5	5	8	7	13	8	13	13			
	FORCE	MEAN	37	15	15	35	35	35	35	35	35	70	70	72	79	81	82			
		ST-DV	0	1	1	0	0	0	0	0	0	0	0	1	0	1	1			

52

Table 7

.....
 * MEAN VALUE AND STANDRD DEVIATION OF BNL PROBLEM SET DATA *
 *

(INERTIAL COMPONENT)

MODEL			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
			CASE NUMBERS (DEGREE OF EXCEEDANCE, PERCENTAGE)															
** UNIFORM DAMPING **																		
BM1	DISPL	MEAN	195	126	123	176	173	171	176	171	174	372	368	401	411	426	432	
		ST-DV	2	4	3	1	1	1	1	1	1	1	1	1	2	1	2	2
	ACCEL	MEAN	375	260	252	253	247	242	253	242	247	489	482	520	538	553	564	564
		ST-DV	15	12	11	6	6	6	6	6	6	6	9	9	10	10	10	11
	MOMENT	MEAN	203	127	123	171	168	165	171	165	169	368	363	397	407	419	428	428
		ST-DV	14	11	11	9	10	10	9	10	9	17	17	18	17	19	18	18
FORCE	MEAN	160	98	95	114	112	109	114	109	112	267	263	291	297	309	316	316	
	ST-DV	18	18	19	14	14	14	14	14	14	14	28	28	28	27	27	27	
BM2	DISPL	MEAN		343	341	308	306	305	308	305	307	503	500	524	521	536	540	540
		ST-DV		14	14	11	11	11	11	11	11	15	15	11	14	12	12	12
	ACCEL	MEAN		2720	2692	2594	2554	2523	2594	2523	2565	3536	3483	3604	3652	3660	3740	3740
		ST-DV		197	195	186	183	182	186	182	184	248	244	248	251	250	255	255
	MOMENT	MEAN		358	357	315	314	314	315	314	315	516	515	530	530	541	543	543
		ST-DV		8	8	7	7	7	7	7	7	11	11	11	11	11	11	11
FORCE	MEAN		300	299	270	267	266	270	266	268	440	437	471	457	480	485	485	
	ST-DV		20	20	15	16	16	15	16	16	26	27	21	26	22	21	21	
BM3	DISPL	MEAN		112	108	130	126	124	130	124	127	166	161	168	176	187	190	190
		ST-DV		3	3	4	4	4	4	4	3	6	6	6	7	5	4	4
	ACCEL	MEAN		1643	1629	1646	1630	1625	1646	1625	1636	1708	1692	1720	1737	1768	1783	1783
		ST-DV		71	74	71	74	74	71	74	70	76	80	81	78	82	78	78
	MOMENT	MEAN		111	107	137	133	132	137	132	134	179	175	181	186	195	198	198
		ST-DV		6	6	5	6	6	5	6	5	7	8	8	8	4	3	3
FORCE	MEAN		77	72	87	82	81	87	81	85	111	107	115	119	131	135	135	
	ST-DV		14	14	10	10	9	10	9	9	8	8	9	11	11	10	10	
ZBEND	DISPL	MEAN		53	53	87	38	38	38	38	38	91	91	92	105	108	108	
		ST-DV		37	37	33	33	33	33	33	33	33	38	38	38	37	36	36
	ACCEL	MEAN		145	140	114	113	104	114	104	105	202	201	205	231	236	237	237
		ST-DV		151	145	115	114	103	115	103	104	162	162	163	179	177	177	177
	MOMENT	MEAN		27	27	33	33	33	33	33	33	102	102	103	104	104	104	104
		ST-DV		9	9	11	11	11	11	11	11	10	10	10	12	12	12	12
FORCE	MEAN		47	47	39	39	39	39	39	39	95	95	97	107	110	110	110	
	ST-DV		31	31	26	26	26	26	26	26	32	32	32	29	28	28	28	

53

Table 7 (CONT)

.....
 *
 * MEAN VALUE AND STANDRD DEVIATION OF BNL PROBLEM SET DATA *
 *

(INERTIAL COMPONENT)

MODEL			URS	1	2	3	CASE NUMBERS (DEGREE OF EXCEEDANCE, PERCENTAGE)										14
							4	5	6	7	8	9	10	11	12	13	
** PVRC **																	
BM1	DISPL	MEAN	110	60	57	104	101	99	104	99	102	254	249	268	281	287	294
		ST-DV	1	0	0	3	3	3	3	3	3	3	6	6	6	7	7	7
	ACCEL	MEAN	376	245	235	233	226	220	233	220	225	445	436	471	494	508	521
		ST-DV	14	10	9	4	3	3	4	3	4	4	4	5	6	6	6
	MOMENT	MEAN	91	43	41	79	76	73	79	73	76	209	204	222	233	239	246
		ST-DV	8	7	7	6	7	7	6	7	6	12	12	12	12	13	13
FORCE	MEAN	103	52	48	66	63	60	66	60	63	180	176	196	204	214	220	
	ST-DV	4	0	0	6	7	6	6	6	6	6	13	14	13	13	13	
BM2	DISPL	MEAN	350	250	240	233	230	229	233	229	232	396	391	417	416	429	435
		ST-DV	13	9	9	6	6	6	6	6	6	7	7	4	5	4	4
	ACCEL	MEAN	3569	2968	2936	2831	2786	2750	2831	2750	2798	3856	3795	3933	3989	3996	4087
		ST-DV	224	212	210	200	197	195	200	195	198	266	261	266	268	268	274
	MOMENT	MEAN	291	215	214	194	193	192	194	192	193	345	342	360	358	368	371
		ST-DV	12	9	9	7	7	7	7	7	7	11	11	10	11	11	10
FORCE	MEAN	328	222	221	208	205	203	208	203	206	348	343	380	368	389	396	
	ST-DV	0	6	6	2	3	3	2	3	3	9	10	5	8	5	4	
BM3	DISPL	MEAN	81	58	54	72	68	66	72	66	69	98	94	100	106	114	117
		ST-DV	2	1	2	3	3	3	3	3	2	4	4	4	5	3	3
	ACCEL	MEAN	1002	1377	1362	1372	1356	1349	1372	1349	1361	1439	1422	1452	1466	1495	1511
		ST-DV	4	38	41	38	40	39	38	39	37	44	46	47	46	48	46
	MOMENT	MEAN	35	30	27	51	47	47	51	47	49	77	74	79	82	87	89
		ST-DV	1	3	3	3	3	3	3	3	3	4	4	5	5	2	2
FORCE	MEAN	48	28	24	36	32	31	36	31	34	54	50	56	59	67	70	
	ST-DV	16	5	6	3	2	2	3	2	2	2	2	3	3	3	3	
ZBEND	DISPL	MEAN	200	154	154	108	108	108	108	108	108	206	206	207	230	233	233
		ST-DV	24	15	15	10	10	10	10	10	10	10	14	14	14	16	16
	ACCEL	MEAN	354	247	240	179	177	169	179	169	170	299	297	305	347	352	354
		ST-DV	3	10	11	12	13	13	12	13	13	21	21	28	16	23	23
	MOMENT	MEAN	23	6	6	10	10	10	10	10	10	66	66	66	67	68	68
		ST-DV	3	1	1	1	1	1	1	1	1	2	2	2	2	2	2
FORCE	MEAN	216	127	127	94	94	93	94	93	93	185	185	187	205	209	209	
	ST-DV	76	43	43	32	32	32	32	32	32	48	48	48	49	48	48	

45

c. Dispersion of Results

The amount of scatter in the ratio's of spectral analysis predictions to time history analysis predictions provides one measure of accuracy of the spectral analysis methods. Ideally this scatter or dispersion should become smaller as the methods become more sophisticated. As a goal for the development of design criteria sufficient conservatism should exist to accommodate the dispersion inherent with the analysis method.

The dispersion of the DOE values for each problem for both the earlier and present studies, can again be assessed by reviewing Figures 11 through 20 and Tables 6 and 7. A review of the figures indicates that the dispersion evident in the PVRC results, is equivalent to or less than, the dispersion evident in the uniform damping results, although the differences seem minor. A comparison of the tabulated standard deviation data for the uniform and PVRC damping cases indicates essentially no difference for the RHR problem, and seemingly small differences for the BNL problems, with the PVRC cases in general showing the smaller values. The greatest observed differences occurred for the Z bend.

Although the differences in the standard deviation appear small, the impact they have on data dispersion can be gauged from Figure 15, BML problem moment. For this response parameter, the average difference in the standard deviation, for cases 9-14, was 10, with the PVRC cases exhibiting the lower values. A review of the figure will indicate that the increased dispersion of the uniform damping results is easily distinguished.

Another aspect of dispersion, the difference in the dispersion between the candidate methods, can also be assessed. A review of the figures and data indicates:

- a. little variation in dispersion with the sequence of combination between response components and a given combination method between groups
- b. approximately equivalent dispersions for the ISM/ALG and ISM/SRSS methods
- c. greatest dispersion for the ISM/ABS method

The large dispersion exhibited by the ISM/ABS method is of some interest. It is considered to simply reflect the fact that this method can provide both an estimate of response comparable to that provided by the ISM/ALG method as well as an extremely conservative estimate of response. The less conservative estimate occurs when most group contributions to a response parameter have like sign, while the very conservative estimate occurs when the group contributions are equally distributed in sign. For the first case the ISM/ABS and ISM/ALG solutions will show an approximately equivalent degree of exceedance while for the second case the ISM/ABS

method will show a much larger degree of exceedance. A review of the result figures show that the distribution of the ISM/ABS results indeed range from a overlapping with the ISM/ALG results to very conservative results. How any of these response estimates compare to the actual time history estimates of response are dependent on the exact characteristics of the input forcing functions and the problem geometry.

The dispersion exhibited by the URS method is not consistent. On average it seems to be of a level equivalent to the ISM/SRSS or ISM/ALG methods. For some problems, however, it is as large as that exhibited by the ISM/ABS method. In the discussions above a basis was presented to show that the URS could provide response estimates that ranged in value from those provided by the ISM/ABS method to those provided by the ISM/ALG method. The response estimates developed with the method then could be expected to exhibit a dispersion that ranged over the extremes for both these calculational methods. This is the dispersion evident in the data set.

In summary the degree of dispersion varies as a function of group combination method, is essentially constant for a given group combination method, is minimum for either the ISM/ALG or ISM/SRSS methods and is clearly greatest for the ISM/ABS method. Regarding the URS method, on average, it exhibits a degree of dispersion comparable to the ISM/SRSS method but will, at times, exhibit a much greater dispersion.

d. ISM vs. URS method

Comparisons, between the response estimates developed with the candidate ISM methods and the response estimates developed with the corresponding envelope spectrum evaluations, were made above. The URS method was observed to underestimate the time history results at a frequency comparable to that exhibited by the ISM/SRSS methods. Stated differently, the URS method was observed to be no more conservative than the ISM/SRSS method, when lower bound points were considered.

Regarding the dispersion of results, the URS method was again considered to be comparable to the ISM/SRSS method. However, for this characteristic, the URS method was found to be less consistent and instances of dispersion as great as that provided by the ISM/ABS method were observed. In the instances of greater dispersion, the conservatism associated with the upper bound points increased (i.e., dispersion increase was associated with an upward shift, on the DOE scale, of the upper bound points).

Considering the impact of the PVRC damping recommendations, although the URS results for uniform damping were not developed for all problems, a review of the results, where available, indicated that the impact on the URS method was the same as the impact on the candidate ISM methods. Specifically, that impact was a reduction in the level of conservatism and the degree of dispersion.

In conclusion, the URS method is considered to provide an array of response estimates bracketed between the arrays of those estimates provided by the ISM/SRSS method and the ISM/ABS method, with the estimates most often corresponding to the ISM/SRSS results.

e. Impact of Cross Comparison

A comparison of the upper cross comparison data plots to the center and lower data plots, on Figures 11 through 20, indicates that the lower bound DOE results are slightly lower and the dispersion is different, for the cross comparison data. The lowering of the lower bound, is slight, but does signify a reduction in the level of conservatism for each method. This lowering signifies that the time history estimate of response based on a uniform damping of 2% (1% for BM1, BM2 and BM3) is greater than the corresponding time history estimate based on variable damping ranging from 5% to 2%. Considered in this way, the lowering of the DOE results should be expected, with the degree of reduction being problem specific. For these problems, the reductions were not large.

Regarding the dispersion of the data, a substantial increase in dispersion is clearly evident for problems BM1, BM2 and BM3, while a small reduction in dispersion is evident for the RHR and Z-bend problems. The increase for BM1, BM2 and BM3 reflects the fact that, the damping value of 1% used in the uniform time history solutions, for these problems, does not correspond with any damping value used in the response spectrum solutions. As such, good correspondence between these solutions should not be expected and is reflected as greater dispersion. For the RHR and Z-bend problems, 2% uniform damping was used, which corresponds to the lower bound for damping for the variable damping evaluations. With this correspondence of damping level between the two solutions, some correspondence between the solution results should be expected and seems to be reflected as comparable levels of dispersion.

With the exception of the effects noted above, the cross comparison results correspond reasonably well with the study results. The trends observed in the study results are all equally evident in the cross comparison results. On this basis, the cross comparison results do not alter the observations and comments presented in the above discussion of results, nor should they impact on conclusions.

6.0 SUPPORTING STUDIES

A number of additional studies were undertaken in support of this effort. One was a major study, conducted in parallel with this effort to evaluate the impact of PVRC damping on the time history estimates of response. The others were smaller studies undertaken to investigate special topics, or to recast the data into alternate formats. A description of each effort is provided below.

a. Impact of the PVRC Damping Proposal on the Seismic Time History Response of Piping Systems

In assessing the adequacy of the various response spectrum, calculational options, comparisons were made to the time history estimates of the response components. These were considered to represent the true response. For the Z-bend, BM1, BM2 and BM3 problems, the time history results were developed at BNL using the independent support motion time history algorithms in the PSAFE2 computer code, modified to incorporate frequency dependent damping. For the ZHR problem, all time history results were developed by Brian J. Benda and James J. Johnson (now of EQE) using the SMACS computer code, and the Zion structure and piping models originally developed in the Seismic Safety Margins Research Program (SSMRP). Both Benda and Johnson participated in the original studies, developing the time history for the Zion system problems, under a contract with LLNL. In that effort they catalogued the modeling, time history and spectrum data for the Zion systems. The results of those efforts were transmitted to BNL through LLNL and were incorporated in the work presented in NUREG/CR-3811. Since the current work extends the NUREG/CR-3811 studies to include the PVRC damping criteria, economical considerations dictated that the same personnel perform the updated time history analyses for the Zion problems. These pertinent results were transmitted to BNL and are incorporated in the result tables presented in Appendix I of this report.

In a separate but parallel effort, Benda and Johnson were requested to assess the impact of the PVRC damping recommendations on the time history estimates. This assessment was accomplished by comparing the time history response estimates developed considering variable damping, to the time history response estimates, for the same problems, developed considering various levels of constant damping. The results of the effort are described in Appendix III of this report.

Although the complete Benda and Johnson report is included in Appendix III for review, the following paragraph from the executive summary is reproduced here since it presents a concise description of the study and results.

"Three piping system models (AFW, RHR, RCL) were considered. The characteristics of the models in terms of size, stiffness and complexity represent a range of nuclear piping configurations. However, the three models were relatively low frequency in that their fundamental modes were below 4 Hz. These three systems have been studied extensively in past investigations. Piping response in the form of nodal accelerations and displacements and element forces and moments were determined.

Multiple time history analysis cases were studied. The analysis methodology was the same for each case, only the damping value assigned to the three piping systems changed. The first case employed the PVRC variable damping proposal for all piping systems. Subsequent cases assumed constant damping values for each piping system analysis -- 1%, 2%, 4%, 5% and 10% damping for the AFW and RHR systems and 2%, 3%, 4%, 5% and 10% damping for the RCL system.

The results of the analyses indicated that the effect of PVRC variable damping did not significantly vary from one piping system to the next. There was also little variation with respect to response type - nodal accelerations and displacements and element forces and moments were affected similarly. As to be expected, the effect of PVRC damping is most apparent when compared to piping system response that assumed the lower constant damping values. As the constant damping values increase, the difference between the PVRC and the constant damping results decrease. Little difference is seen between the PVRC damping results and those that assumed a constant 5% damping. This is due to the low frequency nature of the piping systems considered here and to the fact that the PVRC proposal specifies damping equal to 5% of critical for modal frequencies below 10 Hz. When 10% damping is assumed, lower bound response values for all piping systems are obtained."

b. Correlation Between Support Group Inputs

The degree of correlation between the support group inputs used for the RHR and AFW systems, in the ISM study (NUREG/CR-3811), was determined by processing the time history records of support point displacements for these systems. The correlation between support group inputs in each coordinate direction as well as the correlation of support group inputs between coordinate directions were determined. That is, for a given seismic event, the degree of correlation between each support group X input and all other support group X inputs as well as the degree of correlation between each support X input and all support group Y inputs, and all support group Z inputs, were determined. For the AFW problem, 15 separate support groups were considered, while for the RHR problem, 9 support groups were considered. The results were summarized in 132 tables listing the calculated correlation coefficients between all support groups.

With a correlation coefficient of 1.0 indicating perfect correlation and using the criteria that a correlation coefficient below 0.5 is indicative of poor or weak correlation, a review of all the tables lead to the following observations.

For the AFW system,

1. All the X and Y inputs are almost perfectly correlated within directions. The only exceptions occur for support group 3 in earthquakes 5, 15 and 30.
2. The degree of correlation between the Z inputs varied. Strong correlation exists between group 1 and groups 12-15. Variable to weak correlation exists between groups 2-11 and the remaining groups.
3. The degree of correlation between the X and Y inputs is consistently weak.
4. The Z inputs show strong correlation with either the X or Y inputs, but not with both. In general, a greater number of support groups show strong correlation between the X and Z inputs than between the Y and Z inputs.

For the RHR system,

5. With the exception of the first group, the X, Y and Z inputs are nearly perfectly correlated within directions.
6. The correlation coefficient for the first group against the other groups, ranged above 0.5 for the X inputs, above 0.48 for the Y inputs and from 0.01 to 0.7 for the Z inputs.

7. The degree of correlation between the X and Y inputs ranged from weak to strong with, however, the correlation being weak in the greater number of cases.
8. The degree of correlation between the X and Z inputs are in general strong, with the group 1 X inputs showing weaker correlation than the group 4 and group 7 X inputs.
9. The degree of correlation between the Y and Z inputs ranged from weak to strong, with the correlation being weak in the greater number of cases.

The observations present a mixed picture. For no problem was the degree of correlation consistently weak or strong. Instead each problem represented a mixed mode. In general the degree of correlation within directions was strong. Also, better correlation existed between the horizontal inputs (X and Z) than between the horizontal and vertical inputs (X or Z and Y).

Owing to the mixed degree of correlation observed, the impact of the correlation of the inputs on the results of the ISM study (NUREG/CR-3811) cannot be assessed. However, it is felt that the degree of correlation observed is comparable to the degree of correlation to be expected in any nuclear system. As such, the ISM study results are felt to be indicative of the results to be expected for real systems.

c. SMACS/PSAFE Comparison Study

Time history estimates of piping response developed with either SMACS or PSAFE2 are considered to represent the best estimate of true response and were used to gauge the adequacy of the candidate ISM response spectrum methods. In an effort to confirm the adequacy of the two computer methods in the time history analysis mode, the time history response of the RHR problem for earthquake number 1 was determined using each computer method and the predicted response estimates compared.

The subtasks in this effort included:

- a. Using SMACS, the time history response of the RHR piping system to the ground motion designated earthquake No. 1 in the ISM studies was derived. This evaluation was identical to that performed by EQE for the ISM/PVRC studies and was repeated to derive complete time history traces of the response quantities.
- b. From the SMACS run, the time history records of the RHR piping system support point accelerations were extracted. This data formed the input for the subsequent PSAFE2 run.
- c. Using PSAFE2 the time history response of the RHR piping system to earthquake No. 1, using the support point acceleration data developed in the SMACS run as input, was derived. This run was, in fact, performed twice. In the first run all the computational options (modal approximation, damping, etc.), including the integration time step size, were taken identical to those used in the SMACS run. In the second run, the analysis was repeated using an integration time step size 1/10 the integration time step used in the first run.

A sample of the comparison of results for the case where the integration time step used in the PSAFE2 run was identical to that used in the SMACS run is shown in Figure 22. On the figure, the upper trace is the time history estimate of response developed with SMACS, the center trace is the estimate of response developed with PSAFE2 and the lower trace is the algebraic difference between the SMACS and PSAFE2 estimates, all plotted to the same scale. As can be seen, the degree of agreement between the SMACS and PSAFE2 results, in this case, is poor with differences of the order of 25% evident. For other points, elements and response parameters, differences as large as 100% were noted. Based on these results alone, one could conclude that the response estimates developed with these computer methods are unsatisfactory.

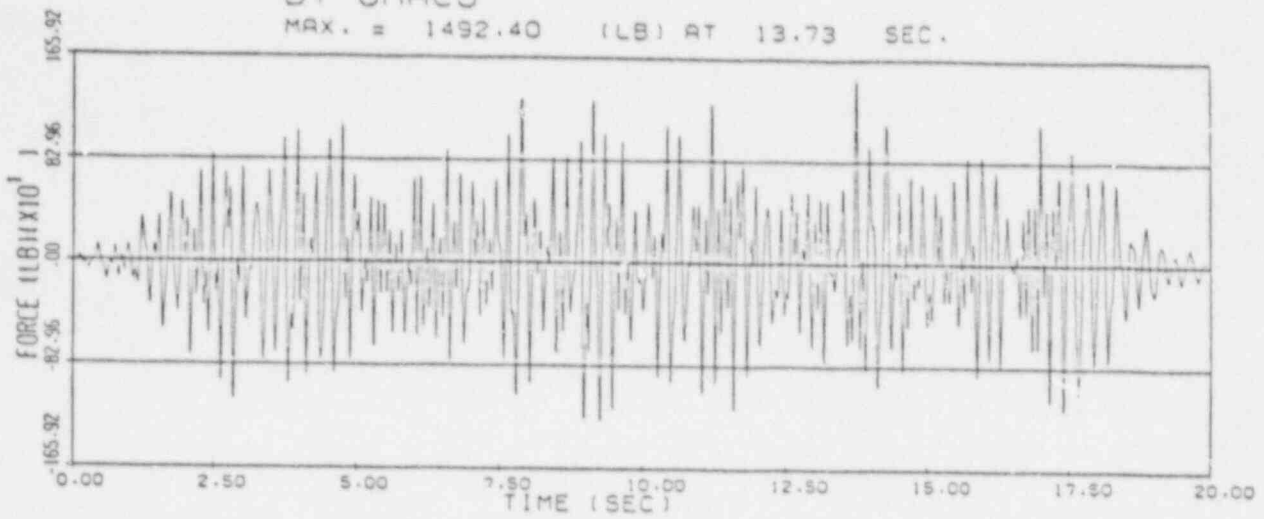
Although a number of potential sources for the differences noted in the above case were advanced, the most probable error source was felt to be the coarseness of the integration time step used in the PSAFE2 analysis.

That is, it was anticipated that the SMACS results were correct and the PSAFE2 results were in error. To test this hypothesis, a second PSAFE2 analysis was made with the integration time step reduced by an order of magnitude, from 0.01 sec to 0.001 sec. The comparison of results for this case, for the same element presented in Figure 22, is presented in Figure 23. This figure has the same format as Figure 22, with an additional trace depicting the percent difference as a function of time added as the lower most trace. A review of the difference trace (third from top) will indicate that the differences between the two solutions were essentially non-existent. Large differences seem to be apparent in the percentage difference trace, but close scrutiny will indicate these occur only when response quantities are negligible small. Overall, the degree of agreement achieved in this case is excellent, confirming that the differences noted in the first were due to the coarse integration time step used in the PSAFE solution.

In summary, excellent agreement was found to exist between the time history results developed with SMACS and PSAFE2. Since these two computer methods are entirely different, this excellent agreement confirms the accuracy of both methods. Further, the accuracy of the SMACS results were found to be independent of integration time step size, as long as the time step was at least as fine as the time step used to define the input. The accuracy of the PSAFE2 solution, however, was shown to be sensitive to integration time step size, with a value of 0.001 sec., or 1/3 the period of the highest frequency mode considered (33 Hz), being adequate. It is important to note that the fine integration time step was used with PSAFE2, to develop all the time history results used in the ISM study.

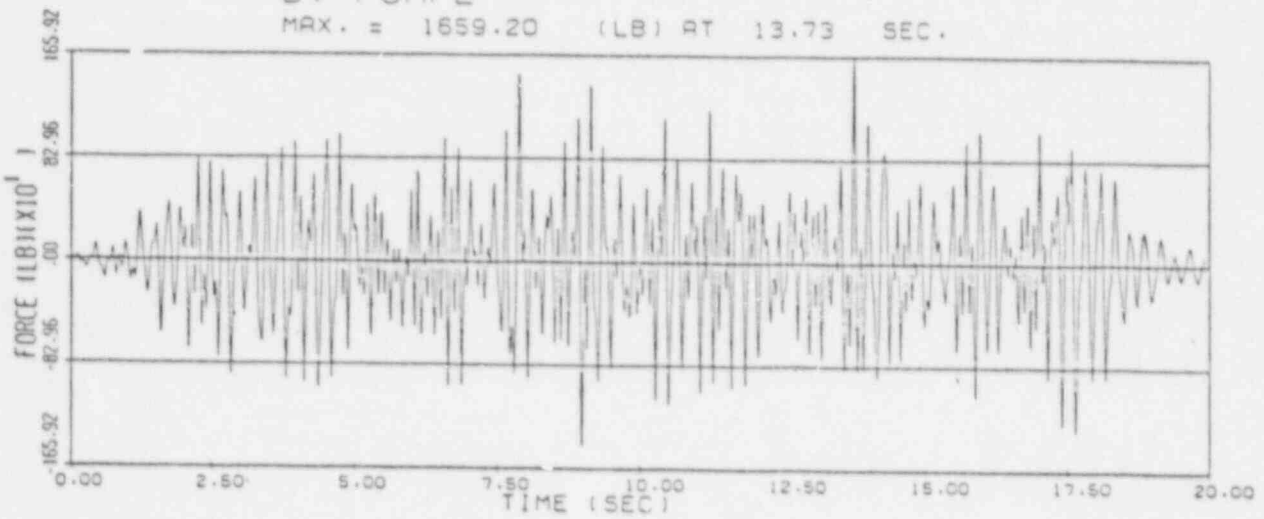
FORCE AT SUPP NO. 13
BY SMACS

MAX. = 1492.40 (LB) AT 13.73 SEC.



BY PSAFE

MAX. = 1659.20 (LB) AT 13.73 SEC.



SMAC-PSAFE

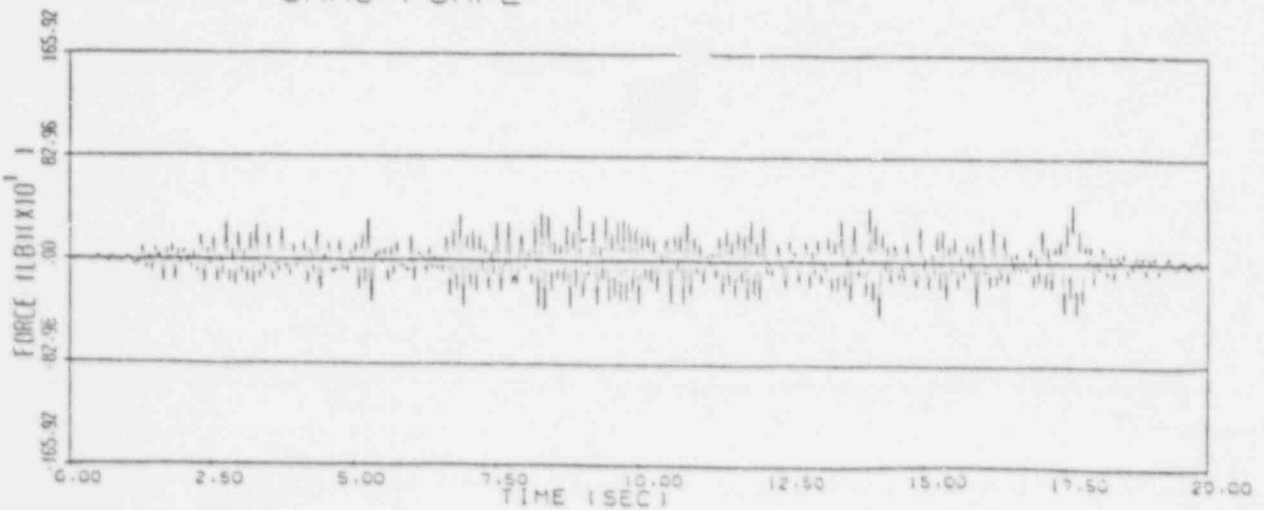
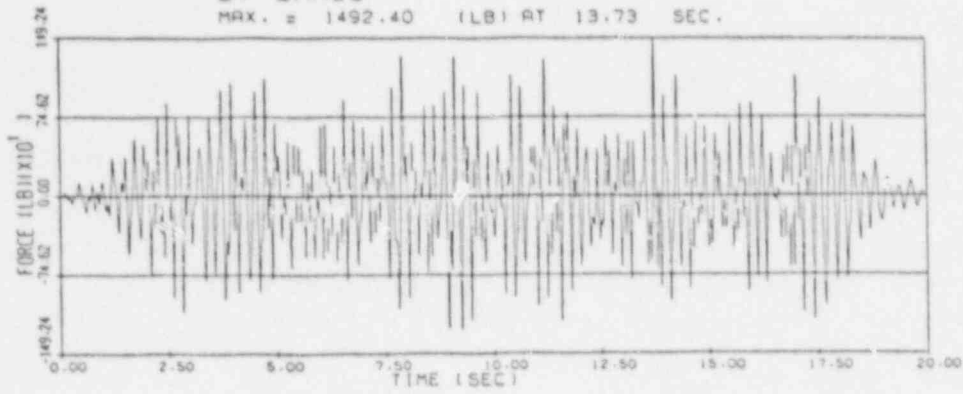


Figure 22

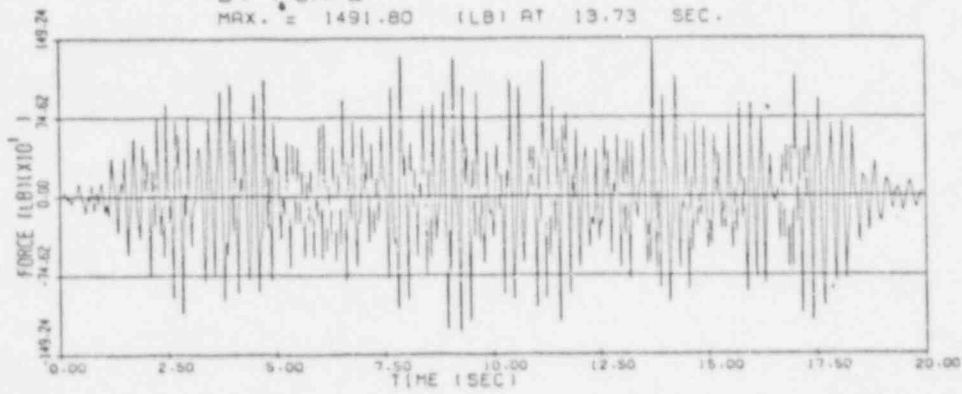
FORCE AT SUPP NO. 13
BY SMACS

MAX. = 1492.40 (LB) AT 13.73 SEC.

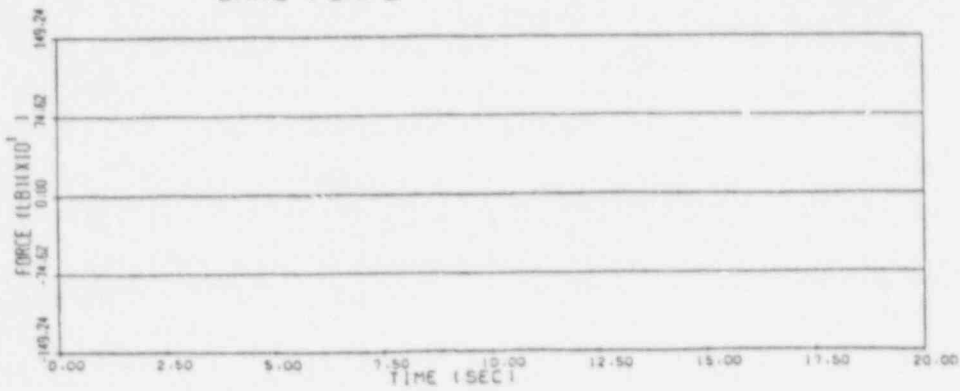


BY PSAFE

MAX. = 1491.80 (LB) AT 13.73 SEC.



SMAC-PSAFE



(SM-PS)/PS

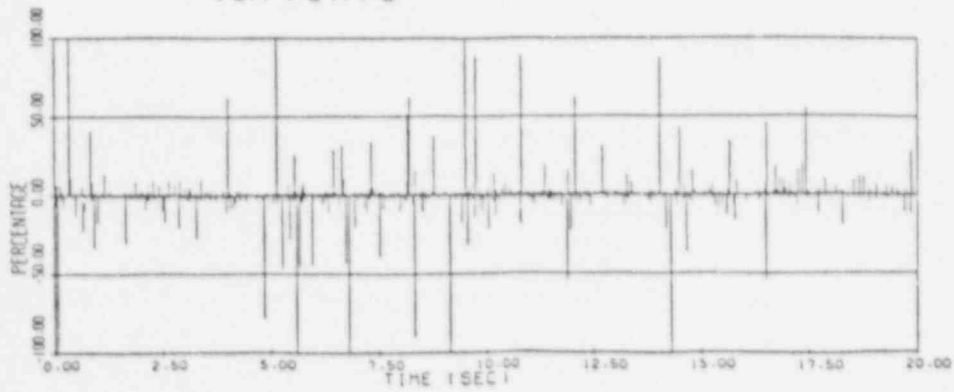


Figure 23

d. Stress Table Development

The basic results of this study, and the earlier study considering uniform damping, are the tables of the degree of exceedance for the seismically induced displacements, accelerations, resultant moments and support forces. Of this data the resultant moment and support force results are the most indicative of the impact the candidate methods will have on actual piping design. An even better data base for this purpose would include tabulations of the seismically induced pipe stresses. Since the pipe stress results can be developed directly from the tabulated moment results, stress tables corresponding to both the earlier and current studies, were developed.

The tables developed have the same format as the moment result table with, however, the column identifying element type indicating whether the element is a straight pipe length, bend or tee. For the bends and tee's, stress intensification factors given by:

$$i = 1.47/h^{.667}$$

$$h = t R/r^2 \text{ for elbows}$$

$$h = 4 \cdot t/r \text{ for tees}$$

where

t = wall thickness
R = bend radius
r = mean pipe radius

were used in the stress computations.

The compilation of stress tables are included as Appendix IV. As noted, tables for both uniform damping and frequency dependent damping are included. On each table, the column headed STRESS (TH), is the stress estimate based on the time history evaluation. The entries under the heading URS or Cases 1 through 14, are the percentages by which the response spectrum estimate exceeded the tabulated time history estimate. Each table is clearly labeled to distinguish between problem, damping case and seismic event. For some problems, in the uniform damping study, a URS solution was not developed, and the columns headed URS were deleted from those tables.

For ready reference a sample pipe stress result table for problem BM3 and PVRC damping, is presented in Table 8. This table is in fact the stress table corresponding to the sample moment result table presented in Table 4. Referring to both tables, it will be noted that all the degree of exceedance entries, columns headed URS and Cases 1 through 14, are identical in the two tables. This is as expected since the stress is directly proportional to the resultant moment. The differences in the tables are the entries in the element type column and the time history result column. A review of the data in the time history columns will show that there is not necessarily a correspondence of maximum stress and maximum moment. This reflects the fact that pipe section properties and stress intensity factors, which are used in the computation of stress, may vary from element to element.

A review of all the tables will show that, although there is some reordering of the maximum results, all the trends exhibited in the moment results, are equally evident in the stress results. The stress tables, then, cast the results in a different format, but do not alter them.

Table 8 - Representative Pipe Stress Results, BM3 Problem

 * BM3 MODEL *

 PVRC DAMPING

EARTHQUAKE NO.		*PIPE STRESSES (INERTIA COMPONENT)															
1																	
ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1	ST	.46937E+03	-12	2	0	26	24	24	26	24	26	49	48	50	51	53	
2	BEND	.27923E+03	-23	-5	-7	19	17	17	19	17	19	42	40	42	43	44	
3	ST	.67966E+02	-11	-10	-14	-7	-11	-11	-7	-11	-7	2	-1	2	4	8	
4	ST	.32371E+02	38	39	33	47	41	41	47	41	47	67	61	65	68	76	
5	BEND	.39719E+02	30	31	23	34	27	28	34	28	34	49	42	46	52	60	
6	ST	.95842E+02	5	13	7	26	21	21	26	21	26	43	38	41	45	44	
7	BEND	.85255E+02	4	13	8	28	23	23	28	23	28	45	41	43	48	46	
8	ST	.96548E+02	58	54	43	51	39	39	51	39	51	61	50	56	61	73	
9	ST	.91731E+02	47	42	37	39	34	34	39	34	39	62	58	63	66	72	
10	ST	.12332E+03	47	46	36	46	37	37	46	37	46	68	68	99	100	102	
11	ST	.96853E+02	4	30	27	66	64	63	66	63	66	98	98	99	100	102	
12	ST	.19227E+03	-25	8	7	50	49	49	50	49	50	84	84	85	84	85	
13	BEND	.15936E+03	-20	13	12	55	55	55	55	55	55	90	90	91	91	92	
14	ST	.26335E+03	-30	-19	-20	6	6	6	6	6	6	31	30	32	32	33	
15	ST	.63856E+02	54	71	70	105	104	104	105	104	104	152	151	156	157	159	
16	BEND	.65497E+02	50	53	62	70	69	69	70	69	70	110	109	115	113	118	
17	ST	.32958E+04	69	77	78	108	104	104	108	104	104	148	147	168	164	161	
18	ST	.37693E+04	-6	10	9	39	39	38	39	38	39	71	71	74	75	76	
19	BEND	.31862E+04	2	11	10	31	30	30	31	30	30	50	50	64	63	66	
20	ST	.10170E+05	-9	20	20	68	68	65	68	65	68	105	104	107	106	108	
21	ST	.25897E+04	49	39	37	71	69	68	71	66	69	105	104	108	111	123	
22	ST	.20060E+04	95	95	93	146	143	142	146	142	143	198	197	202	203	220	
23	BEND	.19796E+04	90	89	87	138	136	134	138	134	135	189	187	193	194	209	
24	ST	.18067E+04	74	73	71	116	114	113	116	113	113	163	161	167	168	178	
25	ST	.55431E+03	350	214	204	198	184	176	198	176	179	222	218	226	253	263	
26	BEND	.87408E+03	240	141	133	133	122	115	133	115	117	154	145	159	177	189	
27	ST	.12254E+04	48	10	7	13	9	7	13	7	8	28	25	29	38	49	
28	ST	.18395E+04	-5	-21	-22	-9	-10	-10	-9	-10	-10	6	5	9	11	22	
29	BEND	.17830E+04	-1	-19	-19	-5	-6	-6	-5	-6	-6	10	9	14	14	27	
30	ST	.42394E+04	144	68	64	61	55	52	61	52	52	73	69	71	90	98	
31	ST	.76735E+04	84	91	89	140	137	136	140	136	137	193	191	197	200	205	
32	ST	.74108E+04	102	101	98	148	145	143	148	143	145	203	200	207	211	216	
33	ST	.75365E+04	103	93	90	133	130	128	133	128	130	186	182	189	194	198	
34	ST	.72448E+04	-2	32	32	85	84	84	85	84	84	127	128	128	128	131	
35	BEND	.76015E+04	6	35	35	88	85	85	88	85	85	128	128	130	130	133	
36	ST	.52610E+04	78	24	19	35	30	29	35	29	34	47	43	48	50	72	
37	ST	.73846E+04	52	17	13	36	32	32	38	32	35	65	52	57	57	83	

e. Impact of Phasing Between Correlated Inputs

As mentioned in the previous section, a small study was performed to assess the impact of phasing between the directional components of correlated group inputs. The study was undertaken to investigate the seemingly anomalous results obtained for the BM3 problem, specifically the fact that, for this problem, underestimates occurred even when the support group inputs were combined by the absolute sum procedure, refer to Figure 20.

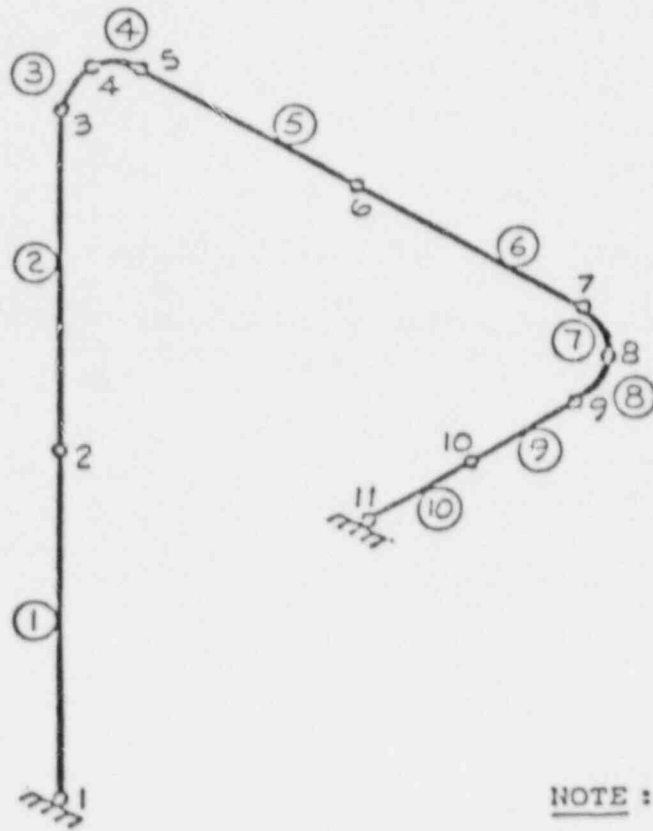
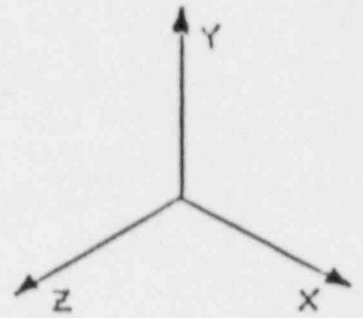
In the study, a configuration designated the Hovgaard bend, Figure 24, was excited using the two totally correlated BM3 support group inputs, node 1 experiencing the group 1 excitation, node 11, the group 2 excitation. For the evaluations, the modal approximation was limited to the first three modes with frequencies of 7.1, 14.9 and 20.1 Hz respectively, spanning the range of the PVRC recommendations. The phasing of the directional components were varied from completely in-phase to completely out-phase and the response of the system computed.

It was found that by manipulation of phasing between the directional components, the degree of conservatism achieved with the response spectrum methods, could be varied. For this particular problem the least conservative results were produced when the inputs were out-phase. These results corroborated the results observed for BM3.

f. Non-Uniform Damping, Unexpected Effect on Response

Another mini study was limited to a simple review of the data tables. An early comparison of the time history results based on PVRC damping, to the time history results based on uniform damping, for the BM1 problem, revealed that some of the estimates of pipe moment for the PVRC case, including the highest moment, exceeded those based on uniform damping. This result was considered unlikely and possibly indicative of calculational errors. A review of the result tables for the RHR problem, however, revealed further examples of this effect. The phenomena is considered to be associated with the specific character of the excitation functions enhanced by the modal characteristics of the problem.

As an example of how this phenomena may occur, consider a response quantity whose magnitude is established by two modes, one associated with a frequency of 10 Hz, the other with a frequency of 20 Hz. Further assume that the undamped modal amplifier for the lower mode, is a positive 1 unit, and for the higher mode, a negative 1 unit. For any value of uniform damping, this response quantity will be null. For PVRC damping, however, the response will be a finite negative quantity reflecting the lower damping associated with the higher frequency. In actual systems, the effect of non-uniform damping on numerous modes, can produce the same effect, yielding higher response with the greater PVRC damping levels.



NOTE :
CIRCLED NUMBERS ARE
ELEMENT NUMBERS.

Figure 24 - Hovgaard Bend

Summary of Observations

The methods and procedures presented in this report represent alternate approaches for calculating the seismic response of multiply-supported sub-systems such as piping. They are based on mathematical formulations developed for systems subjected to multiple independent excitations, the independent support motion (ISM) method, and on a frequency dependent definition of damping, for piping, recommended by the Pressure Vessel Research Committee (PVRC).

The results of this study and NUREG/CR-3811 provide a response margins data base which may be used to assess the relative adequacy of response estimates developed with ISM methods using various combination procedures and either PVRC or Regulatory Guide 1.61 damping. The salient observations from the study can be summarized as:

1. The use of PVRC damping did not change the relative response margins of the ISM combination procedures (URS and cases 1-14) established in NUREG/CR-3811. Algebraic sum group combination still provided the least conservative results, followed by SRSS group combination, followed by absolute sum group combination, which provided the most conservative results. Further, the observations in NUREG/CR-3811 regarding the sequence of combination for the dynamic component of response remained the same.
2. ISM/PVRC estimates of response using SRSS combination between support groups exhibited a degree of conservatism comparable to that from response estimates developed using the accepted URS/PVRC method.
3. The dispersion, or spread, of results with piping location provides a measure of the consistency or accuracy of each analysis method. The results showed that the degree of dispersion of the ISM response estimates varied as a function of the group combination method. It was minimum when either algebraic sum or SRSS group combination was used and was greatest when absolute sum group combination was used. The URS method exhibited a degree of dispersion which was typically comparable to the ISM method with SRSS group combination but which could at times be as great as the ISM method with absolute sum group combination.
4. For reasons that have not been established, the response spectrum estimates based on the PVRC damping recommendations exhibit less relative conservatism than the response spectrum estimates based on uniform damping. That is, a response spectrum estimate based on PVRC damping more closely approaches a time history estimate based on PVRC damping than a response spectrum estimate based on uniform damping approaches a time history estimate based on uniform damping. The downward shift was of the order 0.1 to 0.2 on the degree of exceedance scale used to depict the results.

Summary of Observations (Cont)

5. The ISM/PVRC response estimates show less relative conservatism when compared to the time history results based on the uniform damping used in NUREG/CR-3811. This downward shift was in accordance with the levels of damping involved (i.e. 1% or 2% constant damping was used to develop the NUREG/CR-3811 time history results).
6. Based on the Benda and Johnson study, the impact of PVRC damping on time history estimates did not significantly vary between piping systems or between response parameters within a given system. The PVRC damping results were found to be very comparable to the uniform 5% damping results. Other trends in time history response, as damping varied, are described in Appendix III.

Considering observations 1 and 2 above, the ISM/PVRC calculational procedures are seen to exhibit orderly characteristics. Based on observations 1, 2, and 3, response estimates developed using the ISM/PVRC response spectrum method with SRSS combination between groups seem very comparable to those developed using the URS/PVRC procedure. When the response estimates between these two methods differed, the estimates developed using the ISM method were preferable since they exhibited less dispersion and provided a closer approach to the time history result. The same trends were noted in the earlier study of ISM methods and were the basis for the recommendation advancing the SSRS sum rule between group contributions in NUREG/CR-3811. In this case, the observations support the use of the ISM/PVRC response spectrum method, with SRSS combination between groups, equally as well.

Comparison to Other Studies

In a recent research project conducted by Westinghouse Electric Corp. and sponsored by EPRI [14], the correlation between test and analysis results for piping subjected to multiple support input motions was assessed. Specifically, estimates of response developed using the ISM response spectrum method with SRSS and ABS combination between groups, the URS response spectrum method and the time history method, based on both uniform and PVRC damping, were compared to shake table test results for the system. A review of the result tables indicated:

1. A few localized cases where the URS method underestimated measured response by a small amount.
2. A few cases (in the same location as above) where the ISM/SRSS method underestimated measured response.
3. When the same spectra was used, the URS predictions were generally the same or higher than the ISM/SRSS predictions, but in a few cases the URS predictions were lower.
4. No cases where the ISM/ABS method underestimated measured response.
5. Cases where the time history method underestimated measured response.
6. Note that either 2% uniform damping with unbroadened spectra or PVRC damping with broadened spectra were used for the analyses. In general, the ISM/SRSS predictions using 2% uniform damping with unbroadened spectra are lower than the ISM/SRSS predictions developed using PVRC damping with broadened spectra i.e. the effect of broadening the spectra was greater than the effect of increased damping.

Observations 1 and 4 are consistent with observations made in the BNL studies where comparisons were made to analytical results. These findings show that the same trends are evident when comparisons are made to test results providing substantiation of the BNL observations against physical data.

Observation 5 shows that even the time history method accepted by the NRC to serve as a baseline method in the evaluation of alternate methods can be nonconservative. Other cases where the time history baseline method was observed to be nonconservative are described in the BNL Piping Benchmark Program Report (NUREG/CR-4291), [15].

Comparison to Other Studies (Continued)

The Westinghouse investigators conclude that the ISM response spectrum method with SRSS summation between support group contributions, used with PVRC damping and broadened spectra, provides an acceptable estimate of system response and its use, by industry, was recommended in lieu of either the URS or ISM method with ABS combination between groups. Further they observed that the ISM method with ABS combination between groups provided estimates of response, which would be unfavorable for use by industry. The BNL study results substantiate this observation.

Although it is very conservative, it is known that the ISM/ABS method is being used in some licensing applications, such as BWR Class 1 piping system evaluations [16] and evaluations involving use of the overlap method. Apparently, in special circumstances, the trends between the URS and ISM/ABS methods, noted in the BNL and Westinghouse investigations, are reversed. For the case involving the BWR piping this reversal is most probably due to the fact that the envelope spectra corresponded to one group input whose spectra exhibited amplitudes that far exceeded the amplitudes exhibited by the spectra associated with the other group inputs.

CONCLUSIONS

The results of this study, complimented by NUREG/CR-3811, provide a analytical response margins data base that can be used in evaluating the appropriateness of the alternate ISM procedures and be use of PVRC damping with the ISM method. Although the problem data set does not cover all possible piping system geometries the data set is roughly equivalent to that used by the Piping Review Committee in making its separate decisions on the ISM method and PVRC damping. It is hoped that this new information will likewise be used to establish a regulatory position, or guidance, for the use of PVRC damping with the ISM method.

Based on the results, the following conclusions were reached:

1. The ISM/PVRC calculational procedures were found to exhibit orderly characteristics with levels of conservatism comparable to those obtained with the ISM/uniform damping procedures. The ISM/PVRC procedures are therefore deemed to be acceptable and all the BNL recommendations for the ISM/uniform damping procedures presented in NUREG/CR-3811 are considered to apply equally as well.
2. The ISM/ABS method provides the most conservative estimates of response. These estimates however exhibit the greatest degree of dispersion indicating poor consistency with the baseline time history estimates of response.
3. The ISM/SRSS/PVRC procedure provides estimates of response which show small dispersions and levels of conservatism comparable to the NRC accepted URS/PVRC procedure. It is considered by BNL to provide an acceptable estimate of response.

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APPENDIX I

APPENDIX I

Dynamic Response Tables

Page

- Table Descriptors
- RHR Model
- Displacement Responses
- Mean Values
- Standard Deviations
- Mean - 1 STD Deviation
- Acceleration Responses
- Mean Values
- Standard Deviations
- Mean - 1 STD Deviation
- Result Pipe Moment Responses
- Mean Values
- Standard Deviations
- Mean - 1 STD Deviation
- Support Force Responses
- Mean Values
- Standard Deviations
- Mean - 1 STD Deviation
- Z-Bend Model
- Displacement Responses
- Acceleration Responses
- Resultant Pipe Moment Responses
- Support Force Responses
- BM1 Model
- Displacement Responses
- Acceleration Responses
- Resultant Pipe Moment Responses
- Support Force Responses

APPENDIX I

Page

●	BM2 Model	.....
	●	Displacement Responses	.....
	●	Acceleration Responses	.....
	●	Resultant Pipe Moment Responses	.....
	●	Support Force Responses	.....
●	BM3 Model	.....
	●	Displacement Responses	.....
	●	Acceleration Responses	.....
	●	Resultant Pipe Moment Responses	.....
	●	Support Force Responses	.....

DESCRIPTION OF THE DIFFERENT COMBINATIONS
CONSIDERED IN THE DYNAMIC ANALYSIS:

CASE NUMBER	COMBINATION SEQUENCE
1	:GROUP(ALG)-DIRECTION-MODES
2	:GROUP(ALG)-MODES-DIRECTION
3	:GROUP(SRSS)-DIRECTION-MODES
4	:GROUP(SRSS)-MODES-DIRECTION
5	:MODES-GROUP(SRSS)-DIRECTION
6	:DIRECTION-GROUP(SRSS)-MODES
7	:MODES-DIRECTION-GROUP(SRSS)
8	:DIRECTION-MODES-GROUP(SRSS)
9	:GROUP(ABS)-DIRECTION-MODES
10	:GROUP(ABS)-MODES-DIRECTION
11	:MODES-GROUP(ABS)-DIRECTION
12	:DIRECTION-GROUP(ABS)-MODES
13	:MODES-DIRECTION-GROUP(ABS)
14	:DIRECTION-MODES-GROUP(ABS)

NOTES:

FOR ALL OF THE ABOVE CASES:

- 1) COMBINATION OF MODAL RESPONSES IS BY SRSS WITH A CLUSTERING FACTOR OF 0.1.
- 2) COMBINATION OF DIRECTIONAL COMPONENTS IS BY SRSS.

ABBREVIATIONS, AND SYMBOLS	DESCRIPTION
T.H.	TIME HISTORY DATA
DISP.	DISPLACEMENT (INERTIA COMPONENT)
ACC(DY)	ACCELERATION (INERTIA COMPONENT)
URS	UNIFORM RESPONSE SPECTRUM
FORCE CODES	
1	SUPPORT FORCE (INERTIA COMPONENT)
6	I-END MOMENT (INERTIA COMPONENT)
12	J-END MOMENT (INERTIA COMPONENT)
18	J-END MOMENT (INERTIA COMPONENT, ELBOW ELEMENT)

 * RHR511 MODEL *

 ** MEAN VALUES **

TOTAL NO. OF EARTHQUAKES: 33

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	1	129	78	77	110	109	106	110	106	107	296	293	357	378	446	448
6	2	110	64	63	75	74	73	75	73	73	219	217	276	273	333	334
6	3	81	41	41	31	30	30	31	30	30	121	120	149	145	175	175
9	1	82	39	39	93	93	93	93	93	93	274	273	327	349	391	391
9	2	86	43	42	135	134	134	135	134	134	363	362	410	451	502	503
9	3	82	41	41	32	32	31	32	31	32	124	123	153	149	178	179
12	1	84	41	41	79	79	79	79	79	79	241	241	294	300	350	350
12	2	73	33	32	136	135	135	136	135	135	368	367	407	457	502	503
12	3	88	46	46	50	50	50	50	50	50	170	169	215	209	256	256
16	1	87	45	45	36	35	35	36	35	35	132	132	166	160	197	198
16	2	59	25	25	187	187	187	187	187	187	470	470	485	567	583	583
16	3	84	41	41	80	80	80	80	80	80	242	242	295	301	351	351
19	1	47	13	12	130	130	130	130	130	130	361	360	385	448	480	480
19	2	59	25	25	187	187	187	187	187	187	470	470	485	567	583	583
19	3	46	12	11	129	128	128	129	128	128	357	357	382	443	475	475
22	1	48	13	13	129	129	129	129	129	129	360	360	384	447	480	480
22	2	59	23	23	171	171	171	171	171	171	438	438	455	530	552	552
22	3	50	20	20	197	197	197	197	197	197	493	493	507	597	607	607
23	1	48	13	12	129	129	129	129	129	129	359	359	383	446	478	478
23	2	59	23	23	171	171	171	171	171	171	438	438	456	530	553	553
23	3	50	19	19	192	191	191	192	191	191	483	482	498	585	597	597
35	1	36	11	11	191	191	191	191	191	191	483	483	483	587	587	587
35	2	39	13	13	194	194	194	194	194	194	490	490	491	596	596	596
35	3	73	37	30	96	89	88	96	88	91	226	216	249	289	330	337
36	1	36	11	11	189	189	189	189	189	189	480	480	481	584	584	584
36	2	39	13	13	194	194	194	194	194	194	490	490	490	596	596	596
36	3	38	12	12	192	192	192	192	192	192	487	487	488	592	592	592
39	1	36	10	10	187	187	187	187	187	187	476	476	477	579	580	580
39	2	36	11	11	190	190	190	190	190	190	483	483	483	587	587	587
39	3	42	16	14	153	152	152	153	152	152	391	390	400	479	492	493
42	1	37	11	11	180	180	180	180	180	180	461	461	464	561	565	565
42	2	35	10	10	132	182	182	182	182	182	465	465	469	565	567	568
42	3	45	18	16	145	143	143	145	143	144	369	367	380	453	470	471
45	1	39	12	12	179	179	179	179	179	179	459	459	463	558	563	563
45	2	39	10	10	153	152	152	153	152	153	404	404	427	494	505	507
45	3	45	19	17	162	161	161	162	161	161	407	406	418	498	511	512
50	1	47	17	17	190	190	190	190	190	190	481	481	489	585	592	593
50	2	44	12	11	94	93	93	94	93	94	279	278	325	348	380	382
50	3	46	15	13	126	125	125	126	125	126	344	343	382	424	450	452
57	1	37	9	8	130	129	129	130	129	129	356	355	369	437	456	457
57	2	51	17	14	7	3	2	7	2	6	72	67	115	103	135	142
57	3	31	7	6	-3	-5	-7	-3	-7	-6	58	53	61	90	104	107

4-1

 * RHRSI1 MODEL *

 ** MEAN VALUES **

TOTAL NO. OF EARTHQUAKES: 33

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
59	1	27	4	2	3	1	0	3	0	1	78	74	86	113	135	139
59	2	57	21	17	5	0	-2	5	-2	4	63	55	100	92	118	127
59	3	28	4	2	28	26	25	28	25	26	135	132	147	179	207	210
67	1	53	13	12	67	66	66	67	66	66	239	239	266	319	341	341
67	2	71	29	29	156	156	156	156	156	156	405	405	431	490	521	521
67	3	48	14	12	141	140	140	141	140	140	379	378	399	466	488	489
68	1	56	15	13	59	59	58	59	58	59	221	220	247	295	318	319
68	2	76	33	33	155	155	155	155	155	155	402	401	431	486	519	519
68	3	49	15	14	142	142	142	142	142	142	382	381	406	467	494	495

 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** STANDARD DEVIATION **

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	1	31	19	19	28	28	27	28	27	27	57	57	62	65	70	71
6	2	23	18	18	29	29	29	29	29	29	57	57	64	65	73	73
6	3	24	18	18	22	22	22	22	22	22	41	41	46	44	49	49
9	1	29	14	14	37	37	37	37	37	37	75	75	79	84	89	89
9	2	30	17	17	39	39	39	39	39	39	78	78	81	88	91	91
9	3	15	19	19	24	24	24	24	24	24	43	43	48	47	52	52
12	1	27	14	14	33	33	33	33	33	33	67	67	71	75	80	80
12	2	27	14	14	33	33	33	33	33	33	67	67	68	74	77	77
12	3	22	16	16	24	24	24	24	24	24	48	48	54	54	60	60
16	1	24	18	18	22	22	22	22	22	22	41	40	46	44	51	51
16	2	35	22	22	61	61	61	61	61	61	119	119	120	133	133	133
16	3	28	14	14	32	32	32	32	32	32	67	67	71	75	79	79
19	1	24	10	10	29	29	29	29	29	29	58	58	59	64	65	65
19	2	35	22	22	61	61	61	61	61	61	119	119	120	133	133	133
19	3	22	9	9	29	29	29	29	29	29	57	57	58	62	62	62
22	1	24	10	10	29	29	29	29	29	29	58	58	59	64	65	65
22	2	31	18	18	51	51	51	51	51	51	100	100	101	110	112	112
22	3	37	20	20	56	56	56	56	56	56	110	110	110	124	124	124
23	1	24	10	10	29	29	29	29	29	29	58	58	59	64	65	65
23	2	31	18	18	51	51	51	51	51	51	99	99	100	109	111	111
23	3	35	18	18	50	51	51	50	51	51	99	99	99	110	110	110
35	1	40	19	19	52	52	52	52	52	52	102	102	102	116	116	116
35	2	42	19	19	50	50	50	50	50	50	98	98	98	114	114	114
35	3	19	11	10	18	17	17	18	17	17	40	40	43	44	45	46
36	1	40	19	19	52	52	52	52	52	52	101	101	101	116	116	116
36	2	42	19	19	50	50	50	50	50	50	98	98	98	114	114	114
36	3	42	19	19	51	51	51	51	51	51	101	101	101	117	117	117
39	1	39	19	19	52	52	52	52	52	52	102	102	102	116	116	116
39	2	41	19	19	51	51	51	51	51	51	99	99	99	114	114	114
39	3	27	17	17	51	51	51	51	51	51	102	102	102	113	112	112
42	1	37	19	19	54	54	54	54	54	54	106	106	106	120	120	120
42	2	38	18	18	48	48	48	48	48	48	95	95	95	109	109	109
42	3	24	16	16	49	49	49	49	49	49	98	99	98	109	107	107
45	1	36	19	19	54	54	54	54	54	54	106	106	106	120	120	120
45	2	37	15	14	36	36	36	36	36	36	72	72	72	85	85	85
45	3	29	15	15	46	46	46	46	46	46	92	92	92	102	101	101
50	1	39	20	20	55	55	55	55	55	55	107	107	108	123	123	123
50	2	31	13	13	22	23	23	22	23	23	46	46	48	56	56	56
50	3	34	13	13	27	27	27	27	27	27	55	55	56	66	66	66
57	1	25	13	13	35	35	35	35	35	35	68	68	68	74	74	74
57	2	27	13	12	10	9	9	10	9	10	16	15	19	21	21	22
57	3	11	6	6	8	7	7	8	7	7	15	15	16	18	20	21

9-1

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 * RHR511 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** STANDARD DEVIATION **

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
59	1	9	6	6	11	11	11	11	11	11	23	23	25	26	28	29
59	2	26	12	12	10	9	9	10	9	10	15	13	16	20	19	20
59	3	11	8	8	20	20	20	20	20	20	42	42	43	45	47	47
67	1	35	14	14	23	23	23	23	23	23	52	52	56	63	65	65
67	2	31	19	19	48	48	48	48	48	48	94	94	97	104	108	108
67	3	28	13	13	37	37	37	37	37	37	73	73	75	83	83	83
68	1	30	11	11	23	23	23	23	23	23	50	50	55	58	62	62
68	2	31	20	20	48	48	48	48	48	48	95	95	99	105	110	110
68	3	25	14	14	37	37	37	37	37	37	73	73	74	78	80	80

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 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** MEAN - 1XSTD. DEVIATION **

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	1	97	59	58	82	81	79	82	79	79	239	236	294	312	375	377
6	2	86	45	45	45	45	44	45	44	44	161	159	212	207	260	261
6	3	57	23	22	8	7	7	8	7	7	80	79	103	101	125	126
9	1	53	25	25	56	56	56	56	56	56	198	198	248	255	301	301
9	2	55	25	25	95	95	94	95	94	94	284	283	329	363	411	411
9	3	56	22	22	8	7	7	8	7	8	81	80	104	102	126	127
12	1	56	27	27	46	46	46	46	46	46	174	174	223	224	270	270
12	2	46	18	18	102	101	101	102	101	101	300	300	338	382	425	426
12	3	66	29	29	25	25	25	25	25	25	121	121	160	154	195	195
16	1	63	27	27	13	13	13	13	13	13	91	91	119	115	146	147
16	2	23	3	3	126	125	125	126	125	125	350	350	364	433	449	449
16	3	56	27	27	47	47	47	47	47	47	175	175	224	226	271	271
19	1	23	3	2	101	100	100	101	100	101	303	302	326	384	415	415
19	2	23	3	3	126	126	126	126	126	126	350	350	364	433	449	449
19	3	23	3	2	99	99	99	99	99	99	300	299	324	381	412	412
22	1	23	3	2	100	100	100	100	100	100	302	302	325	383	414	414
22	2	28	4	4	119	119	119	119	119	119	337	337	354	419	440	440
22	3	13	0	0	140	140	140	140	140	140	383	382	396	472	482	482
23	1	23	2	2	100	100	100	100	100	100	301	301	324	382	413	413
23	2	28	4	4	120	120	120	120	120	120	338	338	355	421	442	442
23	3	14	1	0	141	140	140	141	140	140	383	383	398	474	486	486
35	1	-3	-8	-8	138	138	138	138	138	138	381	381	381	471	471	471
35	2	-3	-6	-6	144	144	144	144	144	144	392	392	392	482	482	482
35	3	53	25	20	77	71	71	77	71	73	186	176	206	245	284	290
36	1	-3	-8	-8	137	137	137	137	137	137	378	378	379	468	468	468
36	2	-3	-6	-6	144	144	144	144	144	144	392	392	392	481	482	482
36	3	-3	-7	-7	141	141	141	141	141	141	386	386	386	474	475	475
39	1	-3	-8	-8	134	134	134	134	134	134	373	373	374	462	463	463
39	2	-4	-8	-8	139	139	139	139	139	139	383	383	383	472	472	472
39	3	15	-1	-2	102	101	100	102	100	101	289	288	298	366	380	381
42	1	0	-8	-8	125	125	125	125	125	125	355	355	358	441	445	445
42	2	-3	-8	-8	133	133	133	133	133	133	369	369	373	456	457	458
42	3	21	1	0	96	94	94	96	94	95	270	268	281	344	362	364
45	1	2	-7	-7	124	124	124	124	124	124	352	352	356	438	443	443
45	2	1	-4	-4	116	116	116	116	116	116	331	331	354	408	420	421
45	3	16	3	1	116	115	114	116	114	115	315	314	326	396	409	411
50	1	8	-2	-3	135	135	135	135	135	135	374	373	381	462	469	469
50	2	12	0	-2	71	70	70	71	70	71	232	231	277	292	323	325
50	3	12	1	0	98	98	97	98	97	98	288	287	325	358	383	385
57	1	11	-3	-4	95	94	94	95	94	94	287	286	300	363	382	383
57	2	23	4	1	-3	-6	-7	-3	-7	-3	56	51	96	81	113	119
57	3	20	1	0	-11	-13	-15	-11	-15	-14	42	38	44	72	83	86

 * RHR511 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** MEAN - 1XSTD. DEVIATION **

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
59	1	18	-2	-3	-7	-9	-11	-7	-11	-10	54	50	60	86	106	109
59	2	31	8	5	-5	-10	-11	-5	-11	-6	48	41	83	72	99	107
59	3	16	-4	-5	7	6	4	7	4	5	93	90	103	134	160	162
67	1	18	-1	-2	43	42	42	43	42	42	187	186	209	255	275	276
67	2	39	9	9	107	107	107	107	107	107	310	310	333	386	412	412
67	3	19	1	0	103	103	103	103	103	103	305	304	324	382	405	405
68	1	26	3	2	36	35	35	36	35	36	170	169	191	236	255	256
68	2	44	12	12	106	106	106	106	106	106	307	306	332	380	408	409
68	3	23	1	0	105	104	104	105	104	104	309	308	331	389	414	415

 * RHRIS1 MODEL *

 ** MEAN VALUES **

TOTAL NO. OF EARTHQUAKES: 33

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	1	2277	1840	1816	1702	1655	1585	1702	1585	1618	3021	2920	2982	3837	3823	3879
6	2	1384	1110	1095	1019	991	950	1019	950	969	1846	1786	1872	2348	2363	2395
6	3	513	393	389	354	345	334	354	334	340	682	664	773	845	916	926
9	1	428	324	320	306	299	288	306	288	293	611	596	697	766	851	860
9	2	1395	1114	1099	1038	1009	966	1038	966	986	1885	1824	1895	2400	2432	2467
9	3	601	467	461	422	412	397	422	397	404	803	781	893	1005	1069	1082
12	1	271	192	191	181	179	177	181	177	178	391	387	477	469	560	563
12	2	1284	1021	1007	959	932	892	959	892	911	1751	1693	1769	2227	2277	2311
12	3	280	197	196	176	175	174	176	174	175	371	369	439	428	502	503
16	1	358	263	261	237	233	228	237	228	231	474	465	559	565	645	650
16	2	218	146	143	235	233	230	235	230	231	533	528	586	644	717	720
16	3	235	160	160	151	151	151	151	151	151	340	339	412	397	476	477
19	1	152	86	81	168	162	162	168	162	164	416	409	467	516	572	577
19	2	217	146	142	235	232	229	235	229	231	532	527	585	642	716	719
19	3	152	85	79	165	158	158	165	158	160	406	398	460	500	554	560
22	1	157	91	86	170	164	163	170	163	166	420	413	472	522	584	589
22	2	147	83	80	195	194	194	195	194	194	472	471	512	564	605	606
22	3	215	124	117	252	247	240	252	240	244	593	586	723	681	792	800
23	1	158	91	86	170	164	163	170	163	166	420	413	473	522	585	589
23	2	146	83	79	194	193	193	194	193	193	470	469	510	563	604	605
23	3	241	143	130	270	259	251	270	251	257	619	605	747	713	825	838
35	1	77	39	38	211	211	211	211	211	211	521	521	549	632	652	653
35	2	73	35	34	207	207	207	207	207	207	515	515	528	627	640	641
35	3	471	351	322	393	368	357	393	357	369	706	660	807	871	1064	1096
36	1	73	35	35	205	205	205	205	205	205	509	509	527	618	634	634
36	2	75	37	35	207	207	207	207	207	207	516	516	532	629	643	643
36	3	279	180	155	270	261	256	270	256	259	627	615	729	757	842	851
39	1	93	48	47	200	200	200	200	200	200	498	498	522	605	631	632
39	2	134	81	72	234	230	228	234	228	233	554	548	610	670	708	724
39	3	229	167	155	251	237	236	251	236	242	423	401	454	532	600	613
42	1	152	86	85	184	184	184	184	184	184	462	462	507	569	619	619
42	2	371	266	244	301	277	272	301	272	296	582	552	735	704	849	896
42	3	258	190	177	270	254	252	270	252	259	452	428	501	569	661	676
45	1	185	112	110	194	192	191	194	191	193	472	469	532	582	657	663
45	2	733	554	528	478	455	442	478	442	467	871	838	1095	1047	1260	1308
45	3	348	258	238	319	301	296	319	296	305	553	526	646	695	842	868
50	1	548	369	324	431	403	397	431	397	414	826	791	939	1016	1181	1216
50	2	730	551	527	469	450	438	469	438	457	858	831	1065	1036	1263	1304
50	3	755	564	533	509	489	473	509	473	489	865	836	1191	1175	1450	1491
57	1	2088	1665	1641	1414	1379	1339	1414	1339	1358	2310	2232	2382	2817	3028	3072
57	2	704	540	518	412	381	374	412	374	408	648	600	682	780	805	856
57	3	3887	3108	3081	2574	2521	2443	2574	2443	2470	4133	3995	4006	5030	4996	5052

01-1

 * RHRSI1 MODEL *

 ** MEAN VALUES **

TOTAL NO. OF EARTHQUAKES: 33

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
59	1	3767	3011	2984	2500	2447	2370	2500	2370	2400	4016	3879	3906	4887	4876	4943
59	2	725	551	520	429	389	380	429	380	421	697	639	761	841	904	970
59	3	3520	2819	2792	2347	2295	2224	2347	2224	2253	3774	3645	3692	4595	4614	4682
67	1	370	244	221	263	249	244	263	244	251	606	589	712	771	873	892
67	2	176	102	96	206	203	202	206	202	203	492	489	566	586	652	655
67	3	766	550	465	502	456	448	502	448	456	864	799	963	1106	1256	1275
68	1	364	239	214	262	248	243	262	243	250	601	584	722	755	867	885
68	2	183	106	100	211	207	205	211	205	207	500	495	582	592	665	669
68	3	288	188	162	240	222	220	240	220	225	494	472	574	607	696	710

 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** STANDARD DEVIATION **

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	1	934	791	778	752	729	699	752	699	716	1318	1273	1288	1667	1649	1677
6	2	748	637	627	605	587	563	605	563	576	1065	1031	1060	1347	1338	1359
6	3	395	336	331	328	320	310	328	310	315	582	568	635	715	747	757
9	1	234	200	197	202	197	190	202	190	194	362	353	392	448	474	480
9	2	518	441	433	433	419	401	433	401	412	773	748	763	976	971	989
9	3	466	400	394	391	381	367	391	367	374	696	677	744	862	887	900
12	1	163	131	130	137	135	133	137	133	135	246	243	287	289	330	332
12	2	408	340	334	336	326	311	336	311	320	603	584	597	760	758	772
12	3	205	160	160	161	160	159	161	159	160	281	280	325	316	361	362
16	1	277	227	224	227	222	218	227	218	221	396	389	452	467	513	519
16	2	85	71	69	94	92	91	94	91	92	177	175	191	206	226	227
16	3	140	109	109	116	115	115	116	115	115	208	208	245	236	274	274
19	1	57	36	35	58	57	57	58	57	58	115	114	128	134	145	146
19	2	85	70	69	93	92	91	93	91	92	177	175	191	206	225	227
19	3	59	38	36	60	59	58	60	58	59	117	116	131	135	147	148
22	1	58	37	36	58	57	57	58	57	57	115	114	128	134	147	148
22	2	64	51	49	85	85	84	85	84	85	164	164	175	185	197	198
22	3	70	52	51	97	96	94	97	94	94	195	194	232	214	246	248
23	1	58	37	36	58	57	57	58	57	58	115	114	128	134	147	148
23	2	63	50	49	85	84	84	85	84	84	163	163	175	185	197	197
23	3	72	53	50	91	90	87	91	87	88	183	182	217	203	232	235
35	1	43	25	25	66	66	66	66	66	66	129	129	132	148	149	149
35	2	39	22	22	59	59	59	59	59	59	117	117	117	133	134	134
35	3	186	159	149	166	157	153	166	153	157	286	273	326	347	414	426
36	1	39	23	23	64	64	64	64	64	64	126	126	127	143	143	143
36	2	39	22	22	59	59	59	59	59	59	118	118	118	134	135	135
36	3	67	54	49	85	84	83	85	83	83	167	166	190	190	209	211
39	1	32	23	23	62	62	62	62	62	62	123	123	124	137	138	138
39	2	52	30	29	64	63	63	64	63	64	126	126	131	146	149	150
39	3	88	73	70	97	93	92	97	92	94	159	153	174	193	214	219
42	1	41	34	33	68	68	68	68	68	68	135	135	143	150	159	159
42	2	127	112	104	130	123	121	130	121	128	231	223	287	268	313	328
42	3	97	80	76	99	95	94	99	94	96	162	156	184	198	229	234
45	1	52	44	44	74	74	73	74	73	74	146	145	158	164	181	183
45	2	459	390	374	354	341	333	354	333	347	602	583	753	704	845	873
45	3	133	111	105	124	119	117	124	117	120	213	206	251	260	309	318
50	1	206	174	158	190	181	178	190	178	184	334	321	375	399	463	476
50	2	451	381	367	341	331	323	341	323	333	580	565	713	684	822	846
50	3	438	363	346	341	330	320	341	320	329	608	593	741	721	869	892
57	1	1272	997	985	831	812	791	831	791	799	1313	1269	1338	1589	1695	1715
57	2	472	409	395	331	311	307	331	307	328	478	448	505	560	579	612
57	3	3323	2611	2588	2142	2099	2039	2142	2039	2058	3382	3267	3273	4097	4071	4110

I-12

 * RHR511 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** STANDARD DEVIATION **

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
59	1	3117	2441	2419	2006	1965	1909	2006	1909	1928	3167	3059	3076	3836	3829	3873
59	2	454	394	373	323	298	292	323	292	318	484	449	528	572	616	656
59	3	2782	2185	2164	1800	1762	1712	1800	1712	1730	2844	2746	2774	3445	3459	3501
67	1	115	75	69	78	75	73	78	73	75	157	153	181	192	212	217
67	2	81	65	62	102	101	100	102	100	101	197	196	224	222	247	248
67	3	239	177	156	164	153	151	164	151	153	262	246	292	331	377	382
68	1	130	100	92	103	99	97	103	97	99	203	198	236	248	277	283
68	2	83	67	64	103	102	101	103	101	101	199	198	230	225	252	254
68	3	86	69	62	76	71	70	76	70	72	131	126	151	157	178	181

 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** MEAN - 1XSTD. DEVIATION **

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	1	1343	1048	1038	949	925	885	949	885	902	1702	1646	1694	2169	2173	2201
6	2	636	472	468	413	403	386	413	386	392	780	754	811	1001	1024	1036
6	3	117	57	57	25	25	24	25	24	24	99	96	138	130	168	168
9	1	193	124	123	103	101	98	103	98	99	248	243	305	318	377	379
9	2	877	672	665	604	589	565	604	565	574	1112	1075	1132	1423	1460	1478
9	3	135	66	67	31	31	30	31	30	29	107	103	149	143	182	181
12	1	108	60	60	44	43	43	44	43	43	145	144	189	179	230	231
12	2	875	681	673	622	606	581	622	581	591	1147	1109	1172	1466	1519	1538
12	3	75	36	36	15	15	15	15	15	15	89	89	114	111	140	141
16	1	80	36	36	10	10	10	10	10	10	77	76	106	97	131	131
16	2	132	75	73	141	140	138	141	138	139	356	352	394	437	491	493
16	3	94	51	51	35	35	35	35	35	35	131	131	167	160	202	202
19	1	94	49	45	109	105	104	109	104	106	300	295	339	307	427	430
19	2	132	75	73	141	139	137	141	137	138	355	352	393	436	490	492
19	3	92	47	42	105	99	99	105	99	101	288	282	329	365	407	411
22	1	99	53	49	111	107	106	111	106	108	304	298	344	387	437	441
22	2	83	32	30	109	109	109	109	109	109	307	307	336	378	407	408
22	3	145	72	66	155	150	146	155	146	149	398	392	491	467	546	552
23	1	99	54	50	111	107	106	111	106	108	304	298	344	387	437	441
23	2	82	32	30	109	109	108	109	108	109	307	306	335	378	407	407
23	3	168	90	79	178	168	164	178	164	168	435	423	530	509	593	603
35	1	34	13	13	145	145	144	145	144	145	391	391	416	484	502	503
35	2	33	12	12	147	147	147	147	147	147	398	398	411	493	506	506
35	3	284	191	173	227	210	204	227	204	212	413	386	480	523	650	670
36	1	34	11	11	141	141	141	141	141	141	383	383	400	475	490	491
36	2	36	14	13	147	147	147	147	147	147	398	396	413	494	507	508
36	3	211	126	106	185	177	173	185	173	175	459	449	538	567	632	640
39	1	60	24	24	137	137	137	137	137	137	374	374	397	467	493	493
39	2	81	50	43	170	166	164	170	164	169	427	421	478	524	559	573
39	3	140	94	85	154	144	143	154	143	147	263	247	280	339	385	394
42	1	111	52	51	116	116	115	116	115	115	327	326	364	418	459	460
42	2	243	153	139	171	154	150	171	150	167	350	328	448	435	536	568
42	3	161	110	100	170	159	158	170	158	162	289	272	316	371	431	447
45	1	133	67	65	120	118	117	120	117	119	325	323	374	417	475	480
45	2	274	164	153	123	113	109	123	109	119	269	254	341	342	414	434
45	3	215	146	133	194	181	178	194	178	184	339	319	395	434	532	550
50	1	342	194	165	240	222	218	240	218	229	492	469	564	617	717	739
50	2	279	169	159	127	119	115	127	115	123	277	265	352	352	441	457
50	3	316	200	186	168	158	152	168	152	160	357	343	449	453	580	598
57	1	816	667	656	583	566	547	583	547	558	996	962	1044	1228	1332	1357
57	2	231	130	123	80	69	67	80	67	79	169	152	177	220	225	244
57	3	564	496	492	431	421	403	431	403	412	751	727	732	933	924	941

 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** MEAN - 1XSTD. DEVIATION **

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
59	1	650	569	564	493	481	461	493	461	471	848	820	830	1051	1047	1070
59	2	270	157	146	105	90	87	105	87	102	213	190	232	268	288	313
59	3	737	633	627	546	533	511	546	511	522	930	899	917	1150	1155	1181
67	1	254	168	151	184	174	170	184	170	175	449	436	531	579	661	675
67	2	94	37	33	104	102	101	104	101	102	295	292	341	363	404	406
67	3	527	372	309	338	302	297	338	297	303	601	553	671	774	878	892
68	1	233	139	121	159	149	146	159	146	150	398	385	486	507	589	601
68	2	100	39	35	107	104	104	107	104	105	300	296	351	367	412	414
68	3	202	119	100	164	150	149	164	149	153	362	345	423	450	518	528

 * RHRSI1 MODEL *

 ** MEAN VALUES **

TOTAL NO. OF EARTHQUAKES: 33

*MOMENTS AND FORCES(INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	6	83	42	42	34	33	33	34	33	33	128	127	156	154	184	185
2	6	115	66	66	123	122	122	123	122	122	325	324	378	399	452	452
3	12	111	49	48	112	112	112	112	112	112	312	311	364	387	440	440
6	12	19	50	49	92	92	92	92	92	92	266	265	314	328	378	379
9	12	126	36	36	99	98	98	98	98	98	281	280	321	344	383	384
16	12	477	51	51	104	104	104	104	104	104	299	298	344	377	418	418
19	12	93	36	35	161	160	160	161	160	160	417	416	449	509	543	544
20	12	82	37	36	190	190	190	190	190	190	477	476	501	578	603	603
21	12	64	25	24	145	144	144	145	144	144	391	390	425	484	520	521
22	6	89	42	40	156	156	156	156	156	156	407	406	430	499	524	525
32	12	49	14	13	189	189	189	189	189	189	478	477	479	581	583	583
33	12	37	13	13	185	185	185	185	185	185	469	469	474	571	575	576
36	12	107	56	55	210	210	210	210	210	210	513	512	530	625	646	647
39	12	49	18	18	196	196	196	196	196	196	494	494	497	601	605	605
42	12	44	12	12	191	191	191	191	191	191	483	483	485	587	588	588
47	12	169	30	29	148	147	147	148	147	148	390	389	415	481	504	507
54	12	319	45	43	125	123	123	125	123	124	333	331	373	412	448	452
59	12	80	40	35	21	15	13	21	13	19	91	82	116	126	151	161
60	6	77	31	30	106	105	105	106	105	105	306	306	338	386	423	424
61	12	73	24	24	156	156	156	156	156	156	412	412	438	509	538	538
62	12	33	19	19	146	146	146	146	146	146	393	392	418	484	514	514
70	12	146	82	71	165	161	160	165	160	161	403	399	456	490	539	542

91-I

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 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** STANDARD DEVIATION **

*MOMENTS AND FORCES(INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	6	24	18	18	23	23	23	23	23	23	42	42	47	45	51	51
2	6	28	17	17	43	43	43	43	43	43	86	86	90	96	101	102
3	12	33	16	16	41	41	41	41	41	41	82	82	86	92	97	97
6	12	22	15	15	35	35	35	35	35	35	72	72	76	81	85	85
9	12	32	16	16	35	36	36	35	36	36	71	71	73	77	80	80
16	12	90	20	20	27	27	27	27	27	27	56	56	60	63	67	67
19	12	24	10	9	34	34	34	34	34	34	67	67	68	71	72	72
20	12	30	16	16	47	47	47	47	47	47	91	92	92	101	101	101
21	12	23	14	14	36	36	36	36	36	36	71	71	70	73	76	76
22	6	26	13	13	33	33	33	33	33	33	66	66	68	70	73	73
32	12	43	20	20	53	53	53	53	53	53	105	105	105	122	122	122
33	12	39	19	19	51	51	51	51	51	51	101	101	101	117	117	117
36	12	32	17	17	41	41	41	41	41	41	83	83	83	93	94	94
39	12	44	19	19	47	47	47	47	47	47	93	93	93	111	111	111
42	12	42	19	19	50	50	50	50	50	50	99	99	99	114	114	114
47	12	80	17	17	32	32	32	32	32	32	66	66	67	79	80	80
54	12	69	12	12	21	21	21	21	21	21	44	45	44	51	52	52
59	12	25	13	13	11	10	10	11	10	11	16	15	16	22	22	23
60	6	30	14	14	30	30	30	30	30	30	61	61	66	67	72	72
61	12	28	11	11	27	27	27	27	27	27	55	55	56	63	63	63
62	12	20	10	10	30	30	30	30	30	30	59	59	60	65	65	65
70	12	34	23	21	36	36	36	36	36	36	72	72	79	80	86	87

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 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** MEAN - 1XSTD. DEVIATION **

*MOMENTS AND FORCES(INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	6	59	24	24	10	10	10	10	10	10	86	85	109	108	133	134
2	6	87	49	49	80	79	78	80	78	79	238	237	288	302	350	350
3	12	77	32	32	71	71	71	71	71	71	229	228	277	294	342	342
6	12	-2	34	34	56	56	56	56	56	56	193	193	238	247	293	293
9	12	94	20	19	63	62	62	63	62	62	209	208	247	267	303	304
16	12	387	31	30	77	76	76	77	76	76	242	242	283	314	350	351
19	12	69	26	25	127	126	126	127	126	126	350	348	380	438	470	471
20	12	52	20	20	143	143	143	143	143	143	385	384	409	477	501	502
21	12	40	10	10	109	108	108	109	108	108	320	319	354	410	443	444
22	6	62	28	27	123	122	122	123	122	122	341	340	362	428	451	452
32	12	5	-6	-6	135	135	135	135	135	135	372	371	373	458	460	461
33	12	-2	-6	-6	134	133	133	134	133	133	368	368	372	454	457	458
36	12	75	38	37	169	168	168	169	168	168	430	429	446	531	551	553
39	12	4	-1	-1	149	149	149	149	149	149	400	400	404	490	494	494
42	12	2	-6	-6	140	140	140	140	140	140	383	383	385	473	474	474
47	12	88	13	12	116	115	114	116	114	115	324	323	347	402	424	426
54	12	249	32	30	103	101	101	103	101	103	289	286	328	360	395	399
59	12	54	26	22	9	4	2	9	2	8	74	66	100	104	129	138
60	6	46	16	15	75	74	74	75	74	74	245	244	271	318	350	351
61	12	44	13	12	128	128	128	128	128	128	357	356	381	445	474	474
62	12	13	9	9	116	116	116	116	116	116	333	333	357	419	449	449
70	12	112	59	50	128	124	123	128	123	124	331	326	376	410	452	455

 * RHR511 MODEL *

 ** MEAN VALUES **

TOTAL NO. OF EARTHQUAKES: 33

*MOMENTS AND FORCES(INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	1	59	25	25	186	186	186	186	186	186	469	469	485	566	582	582
11	1	74	35	35	38	37	37	38	37	37	140	139	168	168	193	194
12	1	68	28	26	74	72	72	74	72	73	230	227	281	280	324	325
13	1	59	24	24	184	184	184	184	184	184	465	465	480	561	577	577
14	1	36	6	6	145	145	145	145	145	145	389	389	403	476	489	489
15	1	10	-13	-13	89	89	89	89	89	89	279	279	296	347	366	367
16	1	81	42	37	186	184	184	186	184	184	457	455	481	558	584	586
17	1	50	13	12	117	116	116	117	116	116	332	332	355	412	436	437
18	1	51	24	19	118	115	114	118	114	116	291	286	308	362	387	391
19	1	58	20	15	123	121	120	123	120	122	342	340	384	423	453	459
20	1	48	21	20	6	3	0	6	0	2	68	62	83	104	123	129
21	1	56	23	22	187	187	186	187	186	187	473	473	487	576	589	591
22	1	69	30	22	16	8	6	16	6	14	93	81	137	128	162	176
23	1	50	15	9	114	113	113	114	113	113	320	318	340	396	419	420
24	1	41	5	3	82	82	81	82	81	81	258	257	288	318	348	348

 * RHR511 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** STANDARD DEVIATION **

*MOMENTS AND FORCES(INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	1	35	22	22	61	61	61	61	61	61	120	120	121	135	135	135
11	1	24	19	19	27	27	27	27	27	27	51	51	57	55	60	60
12	1	26	16	16	28	28	28	28	28	28	57	57	62	63	66	67
13	1	34	21	21	59	59	59	59	59	59	116	116	116	129	129	129
14	1	32	15	15	36	36	36	36	36	36	71	71	72	83	84	84
15	1	16	10	10	32	32	32	32	32	32	63	63	63	65	66	66
16	1	31	16	15	40	40	40	40	40	40	79	79	81	88	88	89
17	1	20	13	13	37	37	37	37	37	37	72	72	73	78	79	79
18	1	19	13	12	33	33	33	33	33	33	70	71	72	77	75	75
19	1	31	13	13	29	29	29	29	29	29	57	57	59	67	68	68
20	1	9	6	6	7	7	6	7	6	6	13	12	14	16	17	18
21	1	36	20	20	56	56	56	56	56	56	109	109	110	123	124	124
22	1	19	13	12	12	11	10	12	10	12	20	18	24	25	27	30
23	1	25	13	12	35	35	35	35	35	35	69	69	71	75	76	76
24	1	23	15	14	26	26	26	26	26	26	52	52	55	59	63	63

 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** MEAN - 1XSTD. DEVIATION **

*MOMENTS AND FORCES(INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	
10	1	24	3	3	125	125	125	125	125	125	125	349	349	364	431	447	447
11	1	49	16	15	10	9	9	10	9	10	89	88	111	112	133	133	
12	1	42	11	10	46	44	43	46	43	44	172	170	219	216	257	258	
13	1	24	3	3	125	125	125	125	125	125	349	349	363	431	448	448	
14	1	4	-8	-9	109	109	108	109	108	109	318	318	330	393	404	404	
15	1	-6	-24	-24	56	56	56	56	56	56	215	215	232	281	300	300	
16	1	49	25	21	146	144	143	146	143	144	378	375	400	469	495	496	
17	1	29	0	-1	79	79	79	79	79	79	259	259	281	333	357	358	
18	1	32	10	7	85	81	81	85	81	83	220	215	236	285	311	316	
19	1	26	6	2	94	92	91	94	91	93	285	282	325	356	385	390	
20	1	39	15	14	0	-3	-5	0	-5	-4	55	50	69	87	106	110	
21	1	20	3	2	131	130	130	131	130	131	364	363	376	452	465	466	
22	1	50	16	10	4	-2	-4	4	-4	2	73	63	113	102	134	146	
23	1	24	2	-3	79	78	77	79	77	78	250	249	269	320	343	344	
24	1	18	-9	-11	55	55	55	55	55	55	206	205	232	258	284	285	

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.56728E-06	212	131	130	74	74	74	74	74	74	148	148	150	187	200	200
1	Y	.25816E-06	382	213	212	154	153	152	154	152	152	275	275	276	298	304	304
1	Z	.19685E-05	37	27	27	33	33	33	33	33	33	100	100	102	100	102	102
2	X	.71775E-06	212	131	130	74	74	74	74	74	74	148	148	150	187	200	200
2	Y	.95002E-06	383	214	213	154	154	153	154	153	153	275	275	277	299	304	304
2	Z	.31316E-02	31	21	21	27	27	27	27	27	27	92	92	93	92	93	93
3	X	.21459E-05	212	131	130	74	74	74	74	74	74	148	148	150	187	200	200
3	Y	.21154E-04	385	214	213	155	154	154	155	154	154	277	276	278	300	304	305
3	Z	.66087E-02	31	21	21	27	27	27	27	27	27	92	92	93	92	93	93
4	X	.34376E-05	212	131	130	74	74	74	74	74	74	148	148	150	187	200	200
4	Y	.63190E-04	386	214	214	155	155	154	155	154	154	277	277	278	300	305	305
4	Z	.13504E-01	31	21	21	27	27	27	27	27	27	92	92	93	92	93	93
5	X	.24868E-04	212	131	130	74	74	74	74	74	74	149	148	150	187	200	201
5	Y	.10495E-02	392	217	216	157	157	156	157	156	156	281	281	281	304	307	307
5	Z	.34630E-01	30	20	20	26	26	26	26	26	26	90	90	91	90	91	91
6	X	.46067E-04	213	131	131	75	75	74	75	74	74	149	149	151	188	201	201
6	Y	.17832E-03	407	225	225	164	164	164	164	164	164	292	292	293	315	317	317
6	Z	.41312E-02	29	19	19	25	25	25	25	25	25	88	88	89	88	89	89
7	X	.46598E-04	213	131	131	75	75	74	75	74	74	149	149	151	188	201	201
7	Y	.15979E-04	385	213	213	154	154	154	154	154	154	276	276	277	299	305	305
7	Z	.49491E-04	26	17	17	22	22	22	22	22	22	84	84	84	84	84	84
8	X	.47151E-04	213	131	131	75	75	74	75	74	74	149	149	151	188	201	201
8	Y	.22370E-03	404	223	223	162	162	162	162	162	162	289	289	290	312	314	314
8	Z	.43726E-02	29	19	19	25	25	25	25	25	25	88	88	88	88	88	88
8A	X	.49420E-04	213	131	131	75	75	74	75	74	74	149	149	151	188	201	201
8A	Y	.65637E-03	406	224	224	163	163	163	163	163	163	291	291	291	314	315	315
8A	Z	.12554E-01	29	19	19	25	25	25	25	25	25	88	88	88	88	88	88
9	X	.51846E-04	213	131	131	75	75	74	75	74	74	149	149	151	188	201	202
9	Y	.12257E-02	408	226	226	164	164	164	164	164	164	293	293	293	315	317	317
9	Z	.22259E-01	28	18	18	24	24	24	24	24	24	87	87	88	87	88	88
10	X	.62930E-04	214	132	131	75	75	75	75	75	75	150	150	152	189	202	202
10	Y	.48246E-02	419	233	233	170	170	170	170	170	170	301	301	301	324	325	325
10	Z	.75455E-01	28	18	18	24	24	24	24	24	24	87	87	87	87	87	87
11	X	.71497E-04	214	132	132	76	76	75	76	75	75	150	150	152	189	203	203
11	Y	.80818E-02	431	240	240	176	176	176	176	176	176	310	310	310	334	334	334
11	Z	.12055E+00	28	18	18	24	24	24	24	24	24	86	86	87	86	87	87
12	X	.71689E-04	214	132	132	76	76	75	76	75	75	150	150	152	189	203	203
12	Y	.90159E-02	435	242	242	178	178	178	178	178	178	313	313	313	337	337	337
12	Z	.13352E+00	28	18	18	24	24	24	24	24	24	86	86	87	86	87	87
12A	X	.71870E-04	215	132	132	76	76	75	76	75	75	151	150	152	189	203	203
12A	Y	.99489E-02	438	244	244	180	180	180	180	180	180	316	316	316	339	340	340
12A	Z	.14648E+00	28	18	18	23	23	23	23	23	23	86	86	87	86	87	87

1-22

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT (INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
13	X	.76338E-04	216	133	133	77	76	76	77	76	76	152	151	153	191	204	204
13	Y	.11713E-01	445	249	249	183	183	183	183	183	183	321	321	321	345	345	345
13	Z	.17109E+00	28	18	18	23	23	23	23	23	23	86	86	87	86	87	87
14	X	.12980E-02	442	251	251	183	183	183	183	183	183	319	319	320	347	356	356
14	Y	.13015E-01	457	257	257	190	190	190	190	190	190	331	331	331	355	355	355
14	Z	.20794E+00	29	18	18	21	21	21	21	21	21	83	83	83	83	83	83
15	X	.19470E-02	438	249	249	181	181	181	181	181	181	316	316	317	344	355	355
15	Y	.13015E-01	457	257	257	190	190	190	190	190	190	331	331	331	355	355	355
15	Z	.23321E+00	31	19	19	19	19	19	19	19	19	81	81	82	81	82	82
16	X	.20518E-02	439	249	249	182	182	182	182	182	182	317	317	318	344	355	355
16	Y	.13015E-01	457	257	257	190	190	190	190	190	190	331	331	331	355	355	355
16	Z	.24191E+00	31	20	20	19	19	19	19	19	19	82	82	82	82	82	82
16A	X	.21547E-02	439	250	250	182	182	182	182	182	182	317	317	318	345	355	355
16A	Y	.13014E-01	457	257	257	190	190	190	190	190	190	331	331	331	355	355	355
16A	Z	.25061E+00	32	20	20	20	20	20	20	20	20	82	82	82	82	82	82
17	X	.22040E-02	440	250	250	182	182	182	182	182	182	318	318	319	345	356	356
17	Y	.13013E-01	457	257	257	190	190	190	190	190	190	331	331	331	355	355	355
17	Z	.25707E+00	32	21	21	20	20	20	20	20	20	83	83	83	83	83	83
17A	X	.21713E-02	443	252	252	184	184	184	184	184	184	320	320	321	347	357	357
17A	Y	.13011E-01	457	257	257	190	190	190	190	190	190	331	331	331	355	355	355
17A	Z	.26645E+00	33	21	21	21	21	21	21	21	21	83	83	83	83	83	83
18	X	.20560E-02	446	253	253	185	185	185	185	185	185	322	322	323	350	358	358
18	Y	.13009E-01	457	257	257	190	190	190	190	190	190	331	331	331	355	355	355
18	Z	.27345E+00	33	22	22	21	21	21	21	21	21	84	84	84	84	84	84
19	X	.18771E-02	451	256	256	188	188	188	188	188	188	326	326	327	353	361	361
19	Y	.13008E-01	457	257	257	190	190	190	190	190	190	331	331	331	355	355	355
19	Z	.28127E+00	34	22	22	22	22	22	22	22	22	85	85	85	85	85	85
19A	X	.16962E-02	457	259	259	191	191	191	191	191	191	331	331	332	357	364	364
19A	Y	.13008E-01	457	257	257	190	190	190	190	190	190	331	331	331	355	355	355
19A	Z	.28908E+00	34	23	23	22	22	22	22	22	22	86	86	86	86	86	86
20	X	.14965E-02	465	263	263	195	195	195	195	195	195	337	337	337	363	368	368
20	Y	.13005E-01	457	257	257	190	190	190	190	190	190	331	331	331	355	355	355
20	Z	.29575E+00	35	23	23	23	23	23	23	23	23	87	87	87	87	87	87
21	X	.28723E-04	161	104	103	49	49	49	49	49	49	109	109	109	150	151	151
21	Y	.11073E-01	447	250	250	184	184	184	184	184	184	322	322	322	346	346	346
21	Z	.28102E+00	36	24	24	25	25	25	25	25	25	89	89	90	89	90	90
22	X	.19941E-04	161	104	104	49	49	49	49	49	49	109	109	110	150	151	151
22	Y	.73315E-02	439	245	245	181	181	181	181	181	181	317	317	317	340	341	341
22	Z	.22717E+00	36	24	24	25	25	25	25	25	25	90	90	90	90	90	90
23	X	.14078E-04	161	104	104	49	49	49	49	49	49	109	109	110	150	151	151
23	Y	.49770E-02	436	243	243	179	179	179	179	179	179	314	314	314	338	338	338
23	Z	.18675E+00	36	24	24	25	25	25	25	25	25	90	90	90	90	90	90

I-23

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	.13848E-04	161	104	104	49	49	49	49	49	49	109	109	110	150	151	151
24	Y	.39042E-02	435	242	242	178	178	178	178	178	178	313	313	313	337	337	337
24	Z	.16576E+00	36	24	24	25	25	25	25	25	25	90	90	90	90	90	90
24A	X	.13616E-03	161	104	104	49	49	49	49	49	49	109	109	110	150	151	151
24A	Y	.28336E-02	433	241	241	177	177	177	177	177	177	312	312	312	335	336	336
24A	Z	.14476E+00	36	24	24	25	25	25	25	25	25	90	90	90	90	90	90
25	X	.39802E-05	161	104	104	49	49	49	49	49	49	109	109	110	150	151	151
25	Y	.42224E-03	425	236	236	173	173	173	173	173	173	305	305	306	329	329	329
25	Z	.73573E-01	36	24	24	25	25	25	25	25	25	96	90	90	90	90	90
26	X	.14609E-05	161	104	104	49	49	49	49	49	49	109	109	110	150	151	151
26	Y	.30093E-04	416	231	231	169	169	169	169	169	169	299	299	299	322	323	323
26	Z	.28343E-01	36	25	25	25	25	25	25	25	25	90	90	90	90	90	90
27	X	.83097E-06	161	104	104	49	49	49	49	49	49	109	109	110	150	151	151
27	Y	.51597E-05	408	226	226	165	165	165	165	165	165	293	293	293	316	317	317
27	Z	.17002E-01	36	25	25	25	25	25	25	25	25	90	90	90	90	90	90
28	X	.65676E-06	161	104	104	49	49	49	49	49	49	109	109	110	150	151	151
28	Y	.12400E-05	397	219	219	159	159	159	159	159	159	284	284	285	307	310	310
28	Z	.32351E-05	36	24	24	26	26	26	26	26	26	91	91	93	91	93	93

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.65108E-01	529	390	374	287	284	264	287	264	267	437	431	440	524	523	526
1	Y	.28497E-01	798	619	587	447	439	399	447	399	403	664	652	653	747	740	748
1	Z	.37876E-01	421	417	417	272	272	272	272	272	272	496	496	519	496	519	519
2	X	.82377E-01	529	390	374	287	284	264	287	264	267	437	431	440	524	523	526
2	Y	.97779E-01	797	617	585	446	438	398	446	398	402	662	651	652	746	739	747
2	Z	.36360E+02	264	260	260	154	154	154	154	154	154	307	307	326	307	326	326
3	X	.24629E+00	528	390	374	287	284	264	287	264	267	437	431	440	524	523	526
3	Y	.19301E+01	793	614	582	444	437	396	444	396	401	660	649	650	744	737	745
3	Z	.99923E+02	263	260	260	154	154	154	154	154	154	307	307	326	307	326	326
4	X	.39455E+00	528	390	374	287	284	264	287	264	266	437	431	440	524	523	526
4	Y	.55618E+01	792	613	581	444	436	396	444	396	400	659	648	649	743	736	745
4	Z	.15624E+03	262	259	259	153	153	153	153	153	153	305	305	324	305	324	324
5	X	.28553E+01	528	389	373	287	283	264	287	264	266	436	430	439	523	522	525
5	Y	.66928E+02	782	603	571	439	432	392	439	392	396	653	642	644	738	733	741
5	Z	.35664E+03	217	214	214	123	123	123	123	123	123	256	256	275	256	275	275
6	X	.52991E+01	524	387	371	284	281	262	284	262	264	433	427	436	519	519	522
6	Y	.54278E+01	544	402	382	298	294	270	298	270	273	459	452	457	532	536	540
6	Z	.33849E+02	76	76	76	51	51	51	51	51	51	129	129	148	129	148	148
7	X	.53605E+01	524	386	371	284	281	262	284	262	264	433	427	436	519	518	522
7	Y	.93860E+00	608	472	464	321	319	310	321	310	311	496	493	499	567	581	583
7	Z	.26562E+00	749	754	754	725	725	725	725	725	725	1156	1156	1176	1156	1176	1176
8	X	.54247E+01	524	386	371	284	281	262	284	262	264	432	427	436	519	518	521
8	Y	.73196E+01	321	221	217	165	164	159	165	159	160	275	274	279	337	347	348
8	Z	.35103E+02	57	57	57	45	45	45	45	45	45	118	118	137	118	137	137
8A	X	.56878E+01	523	386	370	284	280	261	284	261	264	432	426	435	518	518	521
8A	Y	.20881E+02	319	219	215	163	162	156	163	156	157	272	271	276	333	343	344
8A	Z	.99428E+02	47	48	48	43	43	43	43	43	43	113	113	132	113	132	132
9	X	.59691E+01	522	385	370	283	280	261	283	261	263	431	426	435	518	517	520
9	Y	.38434E+02	293	197	194	144	144	141	144	141	141	247	247	251	304	316	317
9	Z	.17287E+03	34	35	35	41	41	41	41	41	41	108	108	125	108	125	125
10	X	.72585E+01	519	383	367	281	277	259	281	259	261	428	423	432	514	514	516
10	Y	.13339E+03	253	159	158	110	110	108	110	108	108	201	201	203	246	260	260
10	Z	.54088E+03	-6	-7	-2	35	35	35	35	35	35	93	93	104	93	104	104
11	X	.82597E+01	515	380	365	279	275	258	279	258	259	425	420	429	511	511	514
11	Y	.18344E+03	247	142	141	93	93	93	93	93	93	181	181	183	213	230	230
11	Z	.81747E+03	-23	-17	-17	31	31	31	31	31	31	86	86	91	86	91	91
12	X	.82825E+01	516	380	365	279	275	257	279	257	259	425	420	429	511	510	513
12	Y	.19025E+03	251	139	139	91	91	91	91	91	91	180	180	181	208	224	224
12	Z	.89247E+03	-25	-18	-18	30	30	30	30	30	30	85	85	89	85	89	89
12A	X	.83045E+01	516	380	365	279	275	257	279	257	259	425	420	429	511	510	513
12A	Y	.19692E+03	259	140	140	92	92	92	92	92	92	182	182	184	207	222	222
12A	Z	.96731E+03	-26	-19	-19	31	31	31	31	31	31	86	86	89	86	89	89

1-25

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
13	X	.88520E+01	509	375	361	274	271	254	274	254	256	419	414	423	505	504	507
13	Y	.19933E+03	295	156	156	107	107	107	107	107	107	206	206	207	226	234	234
13	Z	.11056E+04	-23	-16	-16	33	33	33	33	33	33	89	89	91	89	91	91
14	X	.80128E+02	300	210	209	127	127	127	127	127	127	220	220	222	280	286	286
14	Y	.20136E+03	334	178	178	126	126	126	126	126	126	236	236	236	255	257	257
14	Z	.11691E+04	-13	-11	-11	22	22	22	22	22	22	75	75	78	75	78	78
15	X	.13142E+03	305	213	213	130	130	130	130	130	130	223	223	225	285	289	289
15	Y	.20135E+03	334	179	178	126	126	126	126	126	126	236	236	236	256	258	258
15	Z	.11145E+04	-11	-16	-16	-2	-2	-2	-2	-2	-2	43	43	46	43	46	46
16	X	.13883E+03	303	212	212	129	129	129	129	129	129	222	222	224	284	288	288
16	Y	.20135E+03	334	179	178	126	126	126	126	126	126	236	236	236	256	258	258
16	Z	.10949E+04	-9	-15	-15	-8	-8	-8	-8	-8	-8	36	36	38	36	38	38
16A	X	.14603E+03	301	211	210	129	129	128	129	128	128	221	221	223	283	287	287
16A	Y	.20135E+03	334	179	178	126	126	126	126	126	126	236	236	236	256	258	258
16A	Z	.10753E+04	-6	-13	-13	-11	-11	-11	-11	-11	-11	33	33	36	33	36	36
17	X	.14848E+03	299	209	209	128	128	127	128	127	127	220	220	221	281	285	285
17	Y	.20134E+03	334	179	178	120	126	126	126	126	126	236	236	236	256	258	258
17	Z	.10937E+04	-5	-13	-13	-13	-13	-13	-13	-13	-13	31	31	33	31	33	33
17A	X	.14216E+03	294	205	205	125	125	125	125	125	125	216	216	218	277	281	281
17A	Y	.20132E+03	334	179	178	126	126	126	126	126	126	236	236	236	256	258	258
17A	Z	.11254E+04	-4	-13	-13	-12	-12	-12	-12	-12	-12	31	31	33	31	33	33
18	X	.12925E+03	289	201	201	122	122	122	122	122	122	213	213	214	272	277	277
18	Y	.20130E+03	334	179	178	126	126	126	126	126	126	236	236	236	256	258	258
18	Z	.11476E+04	-3	-11	-11	-9	-9	-9	-9	-9	-9	36	36	38	36	38	38
19	X	.11083E+03	283	196	196	119	119	119	119	119	119	208	208	209	266	272	272
19	Y	.20130E+03	334	179	178	126	126	126	126	126	126	236	236	236	256	258	258
19	Z	.11709E+04	0	-7	-7	-2	-2	-2	-2	-2	-2	45	45	47	45	47	47
19A	X	.92218E+02	277	190	190	115	115	115	115	115	115	203	203	204	260	267	267
19A	Y	.20130E+03	334	179	178	126	126	126	126	126	126	236	236	236	256	258	258
19A	Z	.11941E+04	2	-3	-3	6	6	6	6	6	6	57	57	59	57	59	59
20	X	.72493E+02	270	183	183	112	112	112	112	112	112	199	199	201	253	262	262
20	Y	.20126E+03	334	179	178	126	126	126	126	126	126	236	236	236	256	258	258
20	Z	.12125E+04	6	0	0	14	14	14	14	14	14	69	69	71	69	71	71
21	X	.35124E+01	371	268	265	177	176	172	177	172	172	288	286	291	360	360	361
21	Y	.17558E+03	321	172	172	121	121	121	121	121	121	228	228	228	249	255	255
21	Z	.10754E+04	12	9	9	35	35	35	35	35	35	98	98	101	98	101	101
22	X	.24349E+01	373	270	266	179	178	173	179	173	173	289	288	293	361	362	363
22	Y	.13442E+03	303	171	168	125	124	121	125	121	121	225	225	230	255	275	276
22	Z	.85294E+03	16	12	12	39	39	39	39	39	39	103	103	110	103	110	110
23	X	.17162E+01	375	271	267	180	179	174	180	174	174	291	289	295	364	364	365
23	Y	.97361E+02	328	197	191	150	149	142	150	142	143	256	254	264	294	318	319
23	Z	.72129E+03	18	14	14	39	39	39	39	39	39	103	103	113	103	113	113

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	.16880E+01	375	271	267	180	179	174	180	174	174	291	290	295	364	364	365
24	Y	.78289E+02	343	211	204	164	162	153	164	153	154	273	270	281	315	339	340
24	Z	.64788E+03	20	15	15	40	40	40	40	40	40	104	104	116	104	116	116
24A	X	.16597E+01	375	271	267	180	179	174	180	174	174	291	290	295	364	364	365
24A	Y	.59204E+02	373	238	227	188	186	174	188	174	176	304	301	312	352	375	378
24A	Z	.57431E+03	23	18	18	41	41	41	41	41	41	105	105	120	105	120	120
25	X	.48509E+00	375	272	268	180	179	174	180	174	175	291	290	295	364	364	365
25	Y	.11319E+02	446	304	285	251	247	226	251	226	228	382	376	387	446	461	464
25	Z	.30127E+03	31	26	26	45	45	45	45	45	45	112	112	130	112	130	130
26	X	.17804E+00	375	272	268	180	179	174	180	174	175	291	290	295	364	364	365
26	Y	.11431E+01	437	303	281	251	247	224	251	224	226	379	373	381	445	452	456
26	Z	.11643E+03	32	26	26	46	46	46	46	46	46	113	113	132	113	132	132
27	X	.10127E+00	375	272	268	180	179	174	180	174	175	291	290	295	364	364	365
27	Y	.25203E+00	436	304	282	254	249	225	254	225	227	381	374	381	448	451	455
27	Z	.69811E+02	32	26	26	46	46	46	46	46	46	112	112	132	112	132	132
28	X	.80039E-01	375	272	268	180	179	174	180	174	175	291	290	295	364	364	365
28	Y	.79687E-01	438	307	284	257	252	226	257	226	229	384	377	383	452	453	457
28	Z	.43744E-01	319	305	305	274	274	274	274	274	274	456	456	528	456	528	528

I-27

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*PIPE END MOMENTS(INERTIA COMPONENT)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	12	.83882E+03	360	213	212	171	171	170	171	170	170	302	302	304	320	324	324
2	12	.60090E+03	110	54	64	58	58	58	58	58	58	137	137	139	141	143	143
3	12	.11279E+04	130	75	75	67	66	66	67	66	66	149	149	150	154	156	156
4	12	.89073E+03	61	38	38	41	40	40	41	40	40	111	111	112	112	114	114
5	12	.17401E+04	67	41	41	43	43	43	43	43	43	114	114	116	116	117	117
6	12	.92791E+04	33	22	22	28	28	28	28	28	28	93	93	94	93	94	94
7	12	.16110E+05	31	19	19	24	24	24	24	24	24	86	86	87	87	87	87
8	12	.53546E+04	32	19	19	24	24	24	24	24	24	86	86	87	86	87	87
9	12	.11163E+05	32	19	19	24	24	24	24	24	24	86	86	87	86	87	87
10	12	.54201E+04	40	25	25	30	30	30	30	30	30	95	95	96	96	96	96
11	12	.11518E+05	40	25	25	30	30	30	30	30	30	95	95	96	96	96	96
12	12	.13355E+05	42	26	26	32	32	32	32	32	32	98	98	99	99	99	99
13	12	.74094E+04	32	21	21	33	33	33	33	33	33	99	99	100	99	100	100
14	12	.76743E+04	39	29	29	42	42	42	42	42	42	112	112	113	112	114	114
15	12	.87621E+04	40	29	29	41	41	41	41	41	41	110	110	111	110	112	112
16	12	.12736E+05	36	24	24	29	29	29	29	29	29	94	94	95	94	95	95
17	18	.14850E+05	35	22	22	24	24	24	24	24	24	87	87	87	87	88	88
18	12	.14697E+05	37	22	22	21	21	21	21	21	21	84	84	85	85	85	85
19	12	.14857E+05	37	22	22	21	21	21	21	21	21	84	84	84	84	85	85
20	12	.15085E+05	38	23	23	21	21	21	21	21	21	84	84	84	85	85	85
21	12	.15327E+05	39	24	24	23	23	23	23	23	23	87	87	87	88	88	88
22	12	.15382E+05	40	25	25	25	25	25	25	25	25	89	89	90	90	90	90
23	12	.15164E+05	41	26	26	28	28	28	28	28	28	93	93	93	93	94	94
24	18	.13529E+05	38	26	26	33	33	33	33	33	33	100	100	100	100	100	100
25	12	.11504E+05	44	32	32	41	41	41	41	41	41	111	111	112	112	112	112
26	12	.10543E+05	58	38	38	46	46	46	46	46	46	119	119	120	120	121	121
27	12	.99959E+04	70	43	43	51	51	51	51	51	51	124	124	126	126	127	127
28	12	.65737E+04	231	129	129	177	117	117	117	117	117	219	219	220	229	231	231
29	12	.17913E+04	377	215	215	183	183	183	183	183	183	317	317	318	335	336	336
30	12	.38151E+04	356	202	202	173	173	173	173	173	173	302	302	303	319	320	320
31	12	.17709E+04	397	228	228	192	192	192	192	192	192	331	331	332	350	351	351
32	12	.37240E+04	391	224	224	190	189	189	190	189	189	326	326	327	345	346	346
33	12	.55254E+04	422	243	243	203	203	203	203	203	203	347	347	348	367	368	368
34	12	.10089E+05	38	27	27	35	35	35	35	35	35	103	103	104	103	104	104
35	12	.15001E+05	38	23	23	21	21	21	21	21	21	84	84	84	84	85	85
36	12	.15295E+05	40	25	25	27	27	27	27	27	27	91	91	92	92	92	92
37	12	.91938E+04	90	52	52	58	58	58	58	58	58	135	135	136	136	139	139
38	12	.15188E+05	41	25	25	31	31	31	31	31	31	96	96	97	97	98	98
39	12	.15219E+05	39	23	23	22	22	22	22	22	22	86	86	86	86	87	87

1-28

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*SUPPORT FORCES(INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	FORCE (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	.56728E+02	212	131	130	74	74	74	74	74	74	148	148	150	187	200	200
2	1	.25E16E+02	382	213	212	154	153	152	154	152	152	275	275	276	298	304	304
3	1	.19685E+03	37	27	27	33	33	33	33	33	33	100	100	102	100	102	102
4	1	.70873E+03	21	14	14	29	29	29	29	29	29	91	91	92	91	92	92
5	1	.83381E+03	385	214	214	155	154	154	155	154	154	277	277	278	300	304	305
6	1	.23299E+01	213	131	131	75	75	74	75	74	74	149	149	151	188	201	201
7	1	.79894E+02	385	213	213	154	154	154	154	154	154	276	276	277	299	305	305
8	1	.74237E+03	26	17	17	22	22	22	22	22	22	84	84	84	84	84	84
9	1	.64771E+04	21	14	14	29	29	29	29	29	29	91	91	92	91	92	92
10	1	.42432E+03	29	19	19	25	25	25	25	25	25	88	88	88	88	88	88
11	1	.79531E+03	406	224	224	163	163	163	163	163	163	291	291	291	314	315	315
12	1	.65676E+02	161	104	104	49	49	49	49	49	49	109	109	110	150	151	151
13	1	.12400E+03	397	219	219	159	159	159	159	159	159	284	284	285	3.7	310	310
14	1	.32351E+03	36	24	24	26	26	26	26	26	26	91	91	93	91	93	93
15	1	.52610E+04	-2	1	1	50	50	50	50	50	50	114	114	116	114	116	116
16	1	.54314E+04	423	235	235	172	172	172	172	172	172	304	304	304	327	328	328

 * BM1 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.18028E-09	37	-3	-5	-15	-17	-18	-15	-18	-16	39	37	51	49	57	61
1	Y	.32415E-10	60	19	16	35	31	28	35	28	32	128	122	140	148	153	162
1	Z	.16521E-09	48	8	6	-12	-13	-14	-12	-14	-13	50	48	63	59	68	72
2	X	.18670E-03	71	-2	-8	-3	-6	-10	-3	-10	-6	43	38	43	62	56	65
2	Y	.60657E-03	35	-2	-	-20	-21	-21	-20	-21	-20	36	35	49	44	54	56
2	Z	.16298E-03	84	6	0	1	-2	-5	1	-5	-1	52	47	55	71	68	76
3	X	.16079E-02	47	-2	-5	-11	-13	-14	-11	-14	-12	42	40	53	55	60	65
3	Y	.20549E-02	35	-1	-2	-22	-22	-22	-22	-22	-22	33	33	47	40	51	52
3	Z	.15054E-02	56	9	8	-12	-13	-14	-12	-14	-13	48	46	62	57	67	70
4	X	.25375E-02	41	-3	-6	-14	-16	-17	-14	-17	-15	39	36	50	50	56	61
4	Y	.20553E-02	35	-1	-2	-22	-22	-22	-22	-22	-22	33	33	47	40	51	52
4	Z	.23732E-02	52	7	6	-13	-14	-15	-13	-15	-14	45	45	60	55	65	68
5	X	.40542E-02	41	-4	-6	-15	-16	-17	-15	-17	-16	36	36	50	49	56	60
5	Y	.33934E-02	34	-2	-3	-21	-22	-22	-21	-22	-22	34	34	48	42	52	53
5	Z	.37589E-02	53	7	6	-13	-14	-15	-13	-15	-14	47	45	61	56	66	69
6	X	.37214E-02	35	0	-1	-20	-21	-21	-20	-21	-21	36	35	50	43	54	55
6	Y	.29254E-09	2	-17	-18	-3	-3	-5	-3	-5	-5	62	62	74	76	81	86
6	Z	.35972E-02	35	0	-1	-20	-21	-21	-20	-21	-21	36	35	50	43	54	55
7	X	.39473E-02	43	-2	-5	-14	-15	-16	-14	-16	-15	40	38	52	51	58	62
7	Y	.34196E-02	31	-6	-7	-12	-14	-15	-12	-15	-13	51	48	63	60	68	72
7	Z	.38323E-02	49	5	4	-14	-15	-16	-14	-16	-15	45	43	59	53	63	66
8A	X	.38398E-02	39	-2	-4	-16	-17	-18	-16	-18	-17	38	36	51	48	56	59
8A	Y	.24468E-02	31	-7	-7	-3	-6	-7	-3	-7	-5	67	62	78	78	84	90
8A	Z	.38047E-02	43	3	2	-16	-17	-18	-16	-18	-17	42	41	56	50	60	63
8	X	.37404E-02	35	-2	-3	-20	-20	-21	-20	-21	-20	35	34	49	43	54	55
8	Y	.99267E-03	31	-8	-9	8	5	3	8	3	6	88	82	98	102	106	114
8	Z	.36995E-02	37	0	0	-19	-20	-20	-19	-20	-19	38	37	52	46	56	58
9	X	.38032E-02	36	0	0	-19	-20	-21	-19	-21	-20	37	36	51	45	55	57
9	Y	.63305E-03	31	-8	-10	27	23	19	27	19	24	120	112	128	138	138	149
9	Z	.35836E-02	35	-1	-2	-20	-21	-21	-20	-21	-21	35	35	49	43	54	55
10	X	.41748E-02	31	-4	-5	-12	-12	-12	-12	-12	-12	55	54	72	63	75	75
10	Y	.13443E-02	57	3	0	76	70	66	76	66	73	209	198	220	233	232	247
10	Z	.35842E-02	34	-3	-4	-9	-10	-11	-9	-11	-10	57	56	74	66	77	79
11	X	.42409E-02	47	1	0	52	51	50	52	50	51	175	173	194	192	203	205
11	Y	.13593E-02	57	3	0	76	70	66	76	66	73	208	197	219	233	231	247
11	Z	.40138E-02	48	2	2	54	52	51	54	51	53	178	176	196	196	205	209
12	X	.34609E-02	49	3	2	57	56	55	57	55	56	185	183	203	202	212	215
12	Y	.14298E-02	38	-6	-7	64	58	53	64	53	61	186	174	192	209	209	220
12	Z	.32472E-02	52	5	4	60	58	57	60	57	59	190	187	207	208	210	220
13	X	.47181E-02	46	2	0	31	29	29	31	29	30	128	126	152	144	160	162
13	Y	.28254E-02	84	21	9	18	13	10	18	10	12	72	67	90	102	110	117
13	Z	.44693E-02	45	1	0	30	29	28	30	28	29	128	126	151	144	158	162

I-30

 * BM1 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
14	X	.21591E-02	50	4	4	58	57	57	58	57	58	188	186	207	205	216	218
14	Y	.12517E-02	27	-7	-8	54	48	44	54	44	51	167	156	171	189	183	197
14	Z	.19686E-02	55	9	9	64	62	61	64	61	63	198	194	214	216	223	228
15	X	.14659E-03	99	45	37	71	66	62	71	62	67	188	180	211	213	226	236
15	Y	.75237E-10	75	6	1	10	8	5	10	5	8	58	55	74	87	95	102
15	Z	.72454E-04	100	46	37	72	67	63	72	63	67	189	181	213	215	227	237
19	X	.84708E-04	92	40	32	80	73	68	80	68	75	203	192	221	231	233	252
19	Y	.89965E-04	57	20	4	28	23	20	28	20	22	70	65	82	115	123	125
19	Z	.15289E-03	108	54	45	69	65	62	69	62	65	184	179	212	208	224	230
21	X	.87550E-04	190	123	116	113	107	104	113	104	109	258	249	286	286	305	317
21	Y	.19099E-03	139	70	52	86	79	75	86	75	79	166	158	196	220	234	243
21	Z	.21323E-03	126	69	60	75	71	69	75	69	71	193	189	223	217	236	241
23	X	.11026E-02	334	228	217	149	143	141	149	141	143	303	298	346	334	364	368
23	Y	.37661E-02	73	36	20	49	44	42	49	42	43	93	88	102	151	155	158
23	Z	.22341E-02	340	233	221	153	147	145	153	145	146	309	304	353	341	371	375
25	X	.72340E-10	109	56	55	55	52	50	55	50	53	162	157	180	182	199	206
25	Y	.53391E-10	76	37	21	49	44	42	49	42	43	96	91	110	152	159	162
25	Z	.31554E-10	309	210	195	189	179	173	189	173	180	375	362	413	418	442	458
27	X	.32805E-03	260	171	162	102	97	96	102	96	97	226	222	258	251	273	277
27	Y	.92186E-03	82	41	25	58	52	50	58	50	51	103	97	111	164	166	169
27	Z	.68112E-03	260	170	162	102	97	95	102	95	97	225	222	258	251	273	276
29	X	.28972E-05	216	136	129	76	72	70	76	70	72	184	181	210	205	223	227
29	Y	.19133E-10	84	36	23	50	45	43	50	43	45	113	108	139	159	173	177
29	Z	.17851E-05	220	139	132	77	74	72	77	72	74	187	184	213	209	227	230
33	X	.92952E-04	241	155	148	90	86	84	90	84	86	207	204	236	230	251	254
33	Y	.24619E-03	105	59	42	87	81	79	87	79	81	151	145	176	218	232	236
33	Z	.18331E-03	242	156	148	91	87	85	91	85	86	208	205	238	232	252	256
35	X	.10541E-03	241	155	147	90	86	84	90	84	85	207	203	236	230	251	254
35	Y	.31228E-03	94	51	34	73	68	66	73	66	67	128	122	146	193	202	206
35	Z	.24165E-03	241	155	148	90	86	84	90	84	86	207	204	237	231	251	254
37	X	.10816E-03	239	154	146	89	85	83	89	83	85	205	202	235	229	249	252
37	Y	.34298E-11	101	37	30	68	64	61	68	61	64	174	168	202	206	220	228
37	Z	.45811E-04	239	154	146	89	85	83	89	83	85	205	202	235	229	249	252
16	X	.17602E-01	21	-6	-10	18	14	11	18	11	15	99	92	108	118	121	129
16	Y	.26861E-09	21	3	2	28	28	26	28	26	27	120	119	132	138	143	146
16	Z	.17305E-03	21	-5	-9	18	15	12	18	12	15	99	93	108	118	121	129
20	X	.87926E-02	158	79	78	209	204	201	209	201	207	460	450	479	496	499	512
20	Y	.18828E-01	24	0	0	43	40	37	43	37	41	146	140	153	167	165	174
20	Z	.86136E-02	160	80	80	211	206	202	211	202	209	464	453	482	500	502	516
22	X	.19446E-01	185	99	99	241	235	231	241	231	239	515	504	535	555	558	572
22	Y	.47613E-01	23	0	0	43	40	37	43	37	41	145	140	153	167	165	173
22	Z	.19048E-01	186	100	100	242	236	233	242	233	240	518	506	538	558	561	575

1-31

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 * BM1 MODEL *
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EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	.29612E-01	195	108	108	251	246	243	251	243	249	532	521	553	573	577	590
24	Y	.70753E-01	23	-1	-2	44	42	39	44	39	43	148	142	155	170	168	176
24	Z	.29064E-01	195	108	108	252	246	243	252	243	250	533	522	554	575	578	592
26	X	.25738E-01	212	123	123	260	263	261	258	261	267	559	549	580	603	607	619
26	Y	.78280E-01	21	-4	-5	46	43	41	46	41	45	151	144	158	174	171	180
26	Z	.35098E-01	213	123	123	269	264	261	269	261	267	560	550	581	604	608	620
28	X	.39260E-01	222	135	134	272	269	267	272	267	271	561	555	580	605	609	618
28	Y	.67032E-01	16	-11	-11	47	43	41	47	41	45	151	144	156	174	171	180
28	Z	.38525E-01	223	135	135	273	270	268	273	268	272	563	556	582	607	611	620
30	X	.42962E-01	213	134	133	251	249	248	251	248	250	518	515	529	559	561	565
30	Y	.37586E-01	10	-19	-20	48	44	42	48	42	46	152	144	156	177	172	182
30	Z	.42203E-01	214	134	134	251	250	249	251	249	251	519	516	529	560	562	566
32	X	.42840E-01	224	146	146	253	253	253	253	253	253	520	519	522	561	561	562
32	Y	.67757E-10	98	71	70	86	86	80	86	80	81	214	213	228	237	243	248
32	Z	.42118E-01	224	146	146	254	253	253	254	253	253	520	519	522	561	561	562
36	X	.42124E-01	231	152	152	259	259	259	259	259	259	530	530	531	572	572	573
36	Y	.97756E-02	-11	-54	-54	44	41	40	44	40	43	140	135	143	169	164	171
36	Z	.41684E-01	229	150	150	257	257	257	257	257	257	526	526	528	568	568	569
38	X	.33110E-01	330	226	226	375	374	373	375	373	375	742	740	763	796	807	810
38	Y	.69912E-01	-17	-67	-68	43	42	41	43	41	43	136	133	138	166	163	167
38	Z	.37601E-01	260	176	176	290	290	290	290	290	290	586	586	591	631	634	634
39	X	.32579E-01	301	189	188	382	377	375	382	375	381	772	762	796	827	834	846
39	Y	.10619E+00	-14	-64	-64	46	44	43	46	43	45	140	137	141	170	167	172
39	Z	.31449E-01	337	201	201	337	336	336	337	336	336	671	670	685	721	728	729
40	X	.25347E-01	275	142	141	401	392	387	401	387	398	818	802	828	877	869	890
40	Y	.98054E-01	-11	-60	-61	50	48	46	50	46	49	147	143	147	177	173	178
40	Z	.25881E-01	302	202	202	349	348	348	349	348	349	695	693	711	747	754	756
41	X	.97194E-02	368	152	150	597	581	571	597	571	591	1192	1161	1169	1274	1238	1280
41	Y	.52141E-01	-8	-56	-57	55	53	51	55	51	54	156	151	156	188	183	189
41	Z	.21890E-01	261	172	172	299	299	298	299	298	299	603	602	612	649	653	654
43	X	.90192E-02	226	148	148	255	255	255	255	255	255	523	522	524	564	564	565
43	Y	.97596E-10	17	-23	-23	42	42	42	42	42	42	138	138	156	163	174	174
43	Z	.18660E-01	227	148	148	255	255	255	255	255	255	523	522	524	564	564	565
44	X	.20483E-01	172	105	105	210	208	207	210	207	209	459	456	478	493	503	507
44	Y	.20119E-01	20	-25	-25	84	80	78	84	78	82	208	201	213	242	238	246
44	Z	.19019E-01	211	137	137	243	241	240	243	240	242	507	504	519	546	551	555
45	X	.40820E-01	122	77	76	142	140	139	142	139	141	344	340	359	368	375	380
45	Y	.24693E-01	50	5	4	108	104	101	108	101	106	251	243	261	288	285	295
45	Z	.27194E-01	147	94	93	170	168	167	170	167	169	384	381	399	414	421	426
46	X	.59053E-01	106	71	71	112	111	110	112	110	111	292	290	305	312	318	321
46	Y	.18584E-01	81	35	34	126	122	118	126	118	124	287	278	300	323	323	335
46	Z	.35317E-01	124	81	81	137	136	135	137	135	137	329	327	344	354	363	366

 * BM1 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
47	X	.71596E-01	100	71	71	96	95	95	96	95	95	264	262	275	281	287	288
47	Y	.44217E-02	97	54	53	118	114	111	118	111	116	278	270	293	306	313	324
47	Z	.41985E-01	114	76	76	120	119	118	120	118	120	299	297	314	321	331	334
48	X	.65603E-01	98	70	70	94	93	92	94	92	93	260	258	271	277	282	284
48	Y	.32772E-10	119	36	34	168	158	151	168	151	164	368	348	374	408	398	423
48	Z	.36784E-01	128	82	82	140	139	139	140	139	140	333	332	353	358	371	372
49	X	.38977E-01	98	68	68	97	95	94	97	94	97	263	259	272	282	284	291
49	Y	.56958E-05	119	60	58	132	129	127	132	127	130	323	319	338	348	351	356
49	Z	.33277E-01	155	76	75	196	190	186	196	186	193	420	409	443	458	461	476
50	X	.19355E-01	112	75	74	113	110	104	113	104	109	268	261	277	294	293	304
50	Y	.11391E-04	119	60	58	132	129	127	132	127	130	323	319	338	348	351	356
50	Z	.57285E-01	109	58	58	124	120	117	124	117	122	293	286	313	322	328	338
51	X	.17760E-01	109	73	72	105	104	97	105	97	100	245	242	256	271	270	278
51	Y	.50247E-02	110	90	90	95	94	93	95	93	94	263	261	271	279	282	285
51	Z	.62796E-01	107	60	60	117	114	111	117	111	115	282	276	301	309	317	325
52	X	.12601E-01	115	82	81	105	104	98	105	98	100	247	246	260	272	276	282
52	Y	.18867E-01	105	88	88	87	85	84	87	84	86	247	244	254	261	264	268
52	Z	.55924E-01	117	65	65	126	122	120	126	120	125	304	297	322	331	337	347
53	X	.61460E-02	133	97	96	120	120	114	120	114	116	277	275	294	303	311	317
53	Y	.14784E-01	103	88	87	81	80	78	81	78	80	235	232	241	249	251	256
53	Z	.42214E-01	154	84	83	165	161	159	165	159	163	374	367	393	405	413	423
54	X	.92801E-03	116	75	74	115	112	110	115	110	113	292	287	304	314	316	323
54	Y	.18580E-02	110	92	91	83	82	80	83	80	82	234	232	243	249	255	259
54	Z	.40437E-01	139	69	68	143	141	137	143	137	140	328	325	344	356	373	378
55	X	.66450E-10	96	63	63	89	88	87	89	87	89	250	248	260	267	272	275
55	Y	.63503E-10	157	118	117	134	134	129	134	129	131	313	313	326	336	355	358
55	Z	.37069E-01	134	67	66	137	136	132	137	132	134	318	315	333	345	363	367
56	X	.45792E-02	121	96	95	99	95	91	99	91	96	257	250	261	277	275	286
56	Y	.20523E-04	134	65	64	139	138	134	139	134	136	322	319	338	350	366	371
56	Z	.18732E-01	134	65	65	138	137	133	138	133	135	320	318	336	348	364	370
57	X	.78040E-02	121	95	94	97	94	90	97	90	94	253	246	257	273	273	283
57	Y	.41043E-04	134	65	64	139	138	134	139	134	136	322	319	338	350	366	371
57	Z	.23463E-02	134	65	64	139	138	134	139	134	136	322	319	338	350	366	371
58	X	.67768E-02	121	95	94	97	93	89	97	89	94	252	245	257	272	272	282
58	Y	.15269E-02	134	65	64	139	138	134	139	134	136	322	319	338	350	366	371
58	Z	.40339E-04	137	63	63	149	146	142	149	142	146	342	336	357	372	381	390
59	X	.18753E-02	123	96	94	97	93	89	97	89	94	253	245	256	273	271	282
59	Y	.14650E-02	134	65	64	139	138	134	139	134	136	322	319	338	350	366	371
59	Z	.20171E-04	137	63	63	149	146	142	149	142	146	342	336	357	372	381	390
60	X	.13461E-10	140	93	87	105	100	95	105	95	98	259	253	271	282	283	289
60	Y	.62679E-10	134	65	64	139	138	134	139	134	136	322	319	338	350	366	371
60	Z	.59258E-10	137	63	63	149	146	142	149	142	146	342	336	357	372	381	390

I-33

 * BM1 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.21217E-05	640	382	367	339	330	321	339	321	333	594	582	614	659	659	685
1	Y	.54166E-06	412	232	217	180	171	161	180	161	168	336	325	363	381	395	411
1	Z	.17783E-05	689	449	439	328	322	316	328	316	323	601	593	636	650	669	686
2	X	.36429E+01	657	325	301	307	294	280	307	280	296	506	488	493	586	551	589
2	Y	.61604E+01	648	432	427	313	308	305	313	305	309	583	577	616	626	649	657
2	Z	.34469E+01	645	321	300	289	277	263	289	263	277	478	462	469	554	524	559
3	X	.22895E+02	625	348	330	328	318	307	328	307	321	565	550	573	635	621	653
3	Y	.18766E+02	720	489	485	352	348	346	352	346	348	650	645	691	696	726	731
3	Z	.22828E+02	564	334	325	235	229	222	235	222	229	437	428	459	480	491	508
4	X	.32898E+02	334	364	347	333	323	313	333	313	327	577	564	591	646	637	666
4	Y	.18779E+02	719	489	485	351	348	346	351	346	348	650	646	690	696	725	730
4	Z	.33128E+02	581	352	343	252	246	239	252	239	246	467	459	491	512	522	541
5	X	.52867E+02	632	361	345	330	321	311	330	311	324	573	559	586	641	632	661
5	Y	.31080E+02	706	480	476	342	338	336	342	336	338	636	631	676	679	709	715
5	Z	.53663E+02	574	346	337	247	240	233	247	233	241	458	449	481	502	512	531
6	X	.33823E+02	709	486	483	344	341	340	344	340	341	641	638	684	684	719	721
6	Y	.25620E-05	417	229	215	216	207	197	216	197	206	391	380	428	447	467	488
6	Z	.32694E+02	709	486	483	344	341	340	344	340	341	641	638	684	684	719	721
7	X	.50491E+02	642	372	356	341	332	322	341	322	335	592	579	606	661	653	682
7	Y	.36529E+02	566	373	368	258	253	250	258	250	254	496	490	528	531	554	564
7	Z	.52353E+02	568	348	339	244	238	232	244	232	239	457	449	483	499	512	529
8A	X	.45000E+02	647	392	378	344	335	328	344	328	338	604	593	625	668	669	693
8A	Y	.28147E+02	505	327	322	223	218	213	223	213	218	436	430	468	469	491	502
8A	Z	.46604E+02	591	373	365	263	257	252	263	252	258	494	486	522	535	551	567
8	X	.37425E+02	671	441	433	343	338	335	343	335	340	623	618	659	676	696	708
8	Y	.12031E+02	437	277	270	185	180	175	185	175	180	373	366	404	403	425	436
8	Z	.36952E+02	669	446	440	317	312	308	317	308	312	590	584	627	633	657	668
9	X	.35536E+02	703	476	471	337	333	330	337	330	333	626	621	667	670	699	707
9	Y	.80309E+01	353	215	207	144	139	134	144	134	137	301	295	335	331	355	363
9	Z	.34526E+02	682	457	452	341	338	336	341	336	339	628	625	667	676	704	711
10	X	.42442E+02	564	376	372	244	240	237	244	237	241	479	475	521	509	541	549
10	Y	.15699E+02	382	210	191	229	217	207	229	207	217	421	406	461	475	495	519
10	Z	.34883E+02	644	424	417	313	309	306	313	306	311	582	577	624	628	655	666
11	X	.37395E+02	402	251	246	222	218	216	222	216	219	448	444	510	484	527	534
11	Y	.15997E+02	381	209	190	227	215	205	227	205	215	417	402	457	472	491	515
11	Z	.33986E+02	431	274	270	232	229	226	232	226	230	470	466	532	504	548	556
12	X	.29292E+02	401	252	247	221	218	215	221	215	218	452	448	512	486	527	535
12	Y	.13642E+02	289	165	152	196	186	177	196	177	186	382	368	418	427	449	469
12	Z	.26060E+02	441	282	280	235	233	230	235	230	233	484	480	544	516	559	566
13	X	.58300E+02	386	225	210	252	246	241	252	241	247	452	445	508	511	547	562
13	Y	.54679E+02	617	330	304	276	264	252	276	252	260	443	429	471	531	540	562
13	Z	.54923E+02	388	225	211	252	246	242	252	242	248	453	446	510	511	548	563

I-34

 * BM1 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
14	X	.17422E+02	387	245	240	213	210	208	213	208	210	445	442	503	477	516	521
14	Y	.10356E+02	219	138	131	176	169	159	176	159	167	361	349	388	399	416	434
14	Z	.16616E+02	389	251	250	199	196	195	199	195	197	430	426	479	455	492	497
15	X	.19657E+01	481	336	303	290	275	268	290	268	274	498	484	552	568	600	617
15	Y	.14345E-05	649	331	310	318	306	292	318	292	306	510	493	527	604	600	633
15	Z	.97284E+00	484	338	305	291	276	269	291	269	275	499	486	553	570	602	618
19	X	.11242E+01	440	306	272	268	253	245	268	245	251	465	450	514	533	563	580
19	Y	.11930E+01	548	360	312	362	345	337	362	337	341	507	490	550	673	695	705
19	Z	.23507E+01	440	305	278	258	246	240	258	240	245	451	439	501	513	543	557
21	X	.17274E+01	523	380	366	256	249	246	256	246	248	471	464	530	516	559	564
21	Y	.37447E+01	680	400	359	403	385	372	403	372	384	606	585	653	747	760	792
21	Z	.34679E+01	467	332	306	260	248	243	260	243	246	456	446	509	516	547	559
23	X	.24735E+02	903	647	627	447	436	432	447	432	435	784	776	857	849	900	909
23	Y	.47036E+02	591	421	366	470	451	443	470	443	448	638	618	678	678	864	879
23	Z	.51275E+02	893	640	620	441	431	426	441	426	430	775	766	847	840	889	899
25	X	.89556E-05	768	512	505	412	406	400	412	400	407	732	724	787	794	839	855
25	Y	.72821E-06	560	390	343	415	399	392	415	392	396	570	554	617	765	779	791
25	Z	.78636E-06	669	485	461	329	317	311	329	311	314	585	574	643	643	681	689
27	X	.58308E+01	988	700	680	499	488	483	499	483	488	869	860	939	940	988	1000
27	Y	.12016E+02	623	430	375	502	483	474	502	474	482	690	670	738	911	921	942
27	Z	.12096E+02	988	700	681	499	489	484	499	484	488	870	861	940	941	988	1000
29	X	.44896E-01	1022	716	697	525	515	510	525	510	516	912	903	978	987	1030	1044
29	Y	.29199E-06	582	370	335	363	349	341	363	341	347	529	514	591	680	705	721
29	Z	.27845E-01	1024	718	699	526	516	510	526	510	516	912	903	979	988	1031	1045
33	X	.15451E+01	1011	713	694	514	504	499	514	499	504	895	885	964	968	1014	1027
33	Y	.41805E+01	488	341	297	428	414	408	428	408	413	599	585	645	789	807	819
33	Z	.30601E+01	1010	713	693	513	503	498	513	498	503	893	884	962	966	1012	1025
35	X	.17497E+01	1012	714	694	515	504	499	515	499	504	895	886	964	968	1015	1027
35	Y	.47836E+01	536	372	323	457	442	434	457	434	440	636	620	682	838	852	868
35	Z	.40217E+01	1011	713	694	514	504	499	514	499	504	894	885	963	968	1014	1027
37	X	.17878E+01	1013	715	695	516	506	500	516	500	506	897	888	966	970	1016	1029
37	Y	.57473E-07	627	360	336	327	315	304	327	304	314	524	508	577	626	647	672
37	Z	.75703E+00	1013	715	695	516	506	500	516	500	506	897	888	966	970	1016	1029
16	X	.17575E+01	349	234	211	185	173	166	185	166	171	342	330	381	393	417	429
16	Y	.26334E-05	125	93	91	97	95	90	97	90	92	238	236	253	260	271	277
16	Z	.17305E+01	352	236	214	185	174	166	185	166	171	344	332	383	394	418	431
20	X	.89224E+02	196	110	108	195	190	187	195	187	192	435	425	460	468	477	490
20	Y	.17550E+03	119	90	89	110	108	101	110	101	105	261	256	274	286	291	300
20	Z	.87562E+02	197	111	109	198	192	188	198	188	195	439	429	463	472	480	494
22	X	.20494E+03	179	105	104	189	183	180	189	180	186	424	414	445	456	463	477
22	Y	.43988E+03	116	88	87	109	106	100	109	100	104	259	255	272	284	290	298
22	Z	.20136E+03	179	105	104	189	184	180	189	180	187	425	415	446	457	464	478

I-35

 * BM1 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	.29975E+03	167	97	96	181	176	173	181	173	179	411	401	429	443	447	462
24	Y	.64019E+03	116	88	87	111	169	103	111	103	107	264	260	278	289	295	303
24	Z	.29460E+03	167	97	97	182	176	173	182	173	180	412	401	429	444	448	463
26	X	.34020E+03	146	78	78	170	164	161	170	161	168	391	380	405	422	422	438
26	Y	.67771E+03	117	88	87	116	114	109	116	109	113	274	269	288	301	306	315
26	Z	.33438E+03	146	78	78	170	164	161	170	161	168	392	380	405	423	422	438
28	X	.32255E+03	107	41	40	146	139	135	146	135	143	347	334	353	376	369	386
28	Y	.54575E+03	115	84	83	121	119	114	121	114	118	282	277	297	311	316	325
28	Z	.31648E+03	107	42	41	146	140	136	146	136	144	348	335	354	377	370	387
30	X	.28721E+03	41	-15	-16	81	75	72	81	72	79	228	217	232	251	245	259
30	Y	.29904E+03	99	66	66	116	113	109	116	109	113	273	266	287	303	306	315
30	Z	.28205E+03	41	-15	-16	81	76	72	81	72	79	228	217	232	251	246	260
32	X	.31494E+03	14	-11	-11	1	0	-1	1	-1	0	79	76	91	90	98	102
32	Y	.11277E-05	139	108	106	104	102	92	104	92	96	236	234	250	260	268	277
32	Z	.30964E+03	14	-11	-11	1	0	-1	1	-1	0	79	75	91	90	98	102
36	X	.32255E+03	23	2	1	-1	-1	-2	-1	-2	-1	75	75	88	85	96	97
36	Y	.73084E+02	40	-7	-8	98	94	92	98	92	96	232	225	243	268	268	276
36	Z	.31496E+03	19	-2	-2	-1	-2	-3	-1	-3	-2	74	73	87	84	94	96
38	X	.32246E+03	140	104	104	135	133	131	135	131	134	336	332	347	357	360	366
38	Y	.53532E+03	20	-36	-37	85	83	81	85	81	84	204	199	212	241	241	247
38	Z	.31363E+03	55	37	36	32	32	32	32	32	32	143	143	155	153	163	164
39	X	.36164E+03	172	109	109	207	202	198	207	198	205	469	459	476	501	497	511
39	Y	.85101E+03	21	-31	-32	83	81	79	83	79	81	200	196	207	237	235	240
39	Z	.27109E+03	87	60	60	87	86	85	87	85	87	249	246	257	266	268	272
40	X	.27320E+03	220	115	113	282	274	269	282	269	279	603	580	612	647	643	664
40	Y	.79996E+03	26	-23	-23	86	84	82	86	82	84	206	202	213	243	240	246
40	Z	.21051E+03	86	47	47	108	106	105	108	105	108	288	283	294	309	309	315
41	X	.94935E+02	447	241	237	558	542	532	558	532	551	1101	1070	1112	1180	1173	1214
41	Y	.43095E+03	39	-7	-9	96	93	90	96	90	94	222	217	230	260	258	265
41	Z	.16133E+03	16	-14	-15	41	40	39	41	39	40	161	159	166	176	177	180
43	X	.67199E+02	17	-6	-6	-2	-3	-3	-2	-3	-2	73	71	86	83	93	95
43	Y	.97126E-06	101	52	51	83	81	80	83	80	80	201	199	227	230	251	253
43	Z	.13903E+03	17	-6	-6	-2	-3	-3	-2	-3	-2	73	71	86	83	93	95
44	X	.21415E+03	121	85	84	120	117	115	120	115	117	304	299	313	325	325	332
44	Y	.17244E+03	118	73	70	156	150	146	156	146	151	321	311	343	366	375	386
44	Z	.17762E+03	101	71	71	88	85	83	88	83	86	244	239	255	262	267	274
45	X	.45889E+03	140	112	112	121	120	118	121	118	120	310	308	320	329	331	335
45	Y	.25397E+03	139	97	94	156	150	145	156	145	150	326	317	350	367	378	389
45	Z	.28384E+03	119	95	94	101	99	97	101	97	100	271	268	281	288	292	297
46	X	.68431E+03	143	119	119	116	115	114	116	114	115	302	301	312	319	323	325
46	Y	.22357E+03	145	105	103	145	141	136	145	136	140	316	309	339	351	363	372
46	Z	.38880E+03	122	102	102	98	97	96	98	96	98	269	267	277	285	287	291

 * BM1 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
47	X	.84784E+03	146	124	124	113	112	112	113	112	113	297	296	307	312	318	319
47	Y	.53196E+02	162	121	120	143	140	135	143	135	139	322	318	341	351	365	372
47	Z	.47400E+03	120	102	102	93	92	91	93	91	92	259	258	267	273	276	279
48	X	.77740E+03	145	123	123	112	111	111	112	111	111	295	294	305	310	316	317
48	Y	.54397E-06	351	242	220	248	233	216	248	216	223	423	401	434	490	494	512
48	Z	.40441E+03	119	95	95	97	97	96	97	96	97	266	265	277	282	287	289
49	X	.46098E+03	140	117	116	106	105	104	106	104	105	283	280	290	298	302	306
49	Y	.72295E-01	574	369	330	404	374	342	404	342	361	668	630	664	763	723	770
49	Z	.33330E+03	144	70	68	158	153	146	158	146	153	349	338	364	383	389	405
50	X	.22569E+03	198	157	155	153	152	139	153	139	144	327	324	334	354	356	369
50	Y	.14458E+00	574	369	330	404	373	342	404	342	361	668	630	664	763	723	770
50	Z	.65081E+03	143	99	98	122	120	115	122	115	119	291	286	304	315	327	334
51	X	.20634E+03	221	175	172	173	172	156	173	156	161	347	345	354	378	373	388
51	Y	.67025E+02	154	134	133	114	113	111	114	111	113	294	292	304	310	317	320
51	Z	.72632E+03	147	106	105	122	120	116	122	116	119	293	289	306	316	328	334
52	X	.15047E+03	224	180	177	169	168	154	169	154	158	346	344	355	375	377	390
52	Y	.25209E+03	183	150	146	131	127	123	131	123	126	311	306	322	332	337	344
52	Z	.62435E+03	164	116	115	146	144	142	146	142	145	344	340	357	369	376	383
53	X	.85151E+02	200	158	156	147	146	134	147	134	138	313	312	324	340	347	358
53	Y	.19898E+03	213	166	159	150	143	136	150	136	141	331	323	343	358	361	371
53	Z	.50688E+03	191	126	126	184	182	179	184	179	182	409	405	425	439	451	458
54	X	.11541E+02	456	302	275	321	299	275	321	275	290	559	533	570	632	612	647
54	Y	.25170E+02	252	188	178	177	169	159	177	159	164	365	355	381	400	403	416
54	Z	.51082E+03	197	129	127	184	183	175	184	175	178	388	387	405	421	447	453
55	X	.87485E-06	135	103	102	97	96	94	97	94	96	260	258	270	276	284	287
55	Y	.91005E-06	227	177	173	188	186	176	188	176	180	392	390	410	423	445	453
55	Z	.46808E+03	198	130	128	183	182	173	183	173	176	384	383	401	416	442	449
56	X	.56766E+02	422	303	280	289	269	247	289	247	259	515	490	522	577	566	594
56	Y	.25805E+03	192	124	122	180	179	171	180	171	174	381	380	398	413	439	445
56	Z	.23590E+03	195	126	124	181	180	172	181	172	175	382	381	399	415	440	447
57	X	.97883E+02	427	306	282	291	271	249	291	249	261	515	490	523	578	570	598
57	Y	.51608E+00	192	123	122	180	179	171	180	171	174	381	380	398	413	429	445
57	Z	.29499E+02	193	124	122	181	180	171	181	171	174	382	380	399	414	439	446
58	X	.85711E+02	446	317	292	304	282	258	304	258	271	531	504	537	598	586	617
58	Y	.19199E+02	193	124	123	181	180	171	181	171	174	382	380	399	414	439	446
58	Z	.50286E+00	183	111	110	177	175	169	177	169	172	383	380	401	415	436	443
59	X	.24219E+02	505	353	322	343	317	290	343	290	305	583	551	562	660	640	676
59	Y	.18419E+02	193	125	123	181	180	171	181	171	174	382	381	399	415	440	446
59	Z	.25144E+00	183	111	110	177	175	169	177	169	172	383	380	401	415	436	443
60	X	.19383E-06	869	582	520	596	548	497	596	497	525	925	864	886	1066	1001	1071
60	Y	.78802E-06	194	125	123	181	180	172	181	172	175	382	381	400	415	440	447
60	Z	.73868E-06	183	111	110	177	175	169	177	169	172	383	380	401	415	436	443

I-37

 * BM1 MODEL *

EARTHQUAKE NO. 1

*PIPE END MOMENTS(INERTIA COMPONENT)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	12	.26002E+04	47	4	3	-15	-16	-16	-15	-16	-16	42	41	55	51	61	63
2	18	.42579E+03	90	20	17	5	3	1	5	1	3	69	67	79	85	89	93
3	12	.71059E+03	45	3	1	-14	-15	-16	-14	-16	-15	42	40	53	52	61	65
4	18	.26489E+04	41	1	0	-17	-18	-19	-17	-19	-18	39	38	51	47	57	59
5	12	.19791E+04	65	9	6	11	8	6	11	6	9	87	82	98	102	107	115
6	12	.15845E+04	66	10	5	45	40	35	45	35	41	145	136	154	167	166	179
7	12	.27113E+04	18	-16	-18	14	10	7	14	7	12	94	87	102	111	113	122
8	12	.13887E+04	67	13	12	43	40	38	43	38	42	146	141	166	165	175	182
9	18	.12999E+04	109	41	36	74	67	63	74	63	70	192	181	203	219	222	237
10	12	.91984E+03	130	56	47	64	60	57	64	57	60	152	147	180	188	206	213
11	12	.29334E+04	82	22	15	25	22	20	25	20	22	94	91	115	118	130	135
12	12	.22961E+04	77	20	18	17	16	14	17	14	16	93	90	113	110	123	127
13	18	.22350E+04	75	18	16	16	15	14	16	14	15	92	90	112	109	122	126
14	12	.21830E+04	242	158	145	119	114	111	119	111	113	225	220	252	276	292	296
15	12	.11446E+04	239	159	144	122	116	114	122	114	115	232	226	263	283	302	306
16	12	.82842E+03	234	152	139	119	114	111	119	111	113	223	218	248	276	290	294
17	12	.27003E+03	245	144	135	144	130	135	144	135	139	306	299	344	342	362	372
18	12	.28892E+03	247	151	142	132	127	124	132	124	128	281	274	318	316	337	346
19	18	.29588E+03	244	150	141	127	121	119	127	119	122	268	262	305	304	325	333
20	12	.49025E-11	224	138	130	203	199	195	203	195	200	386	379	433	452	475	488
21	12	.16012E+04	82	25	25	108	104	102	108	102	106	275	269	291	300	304	313
22	12	.10958E+04	90	46	45	117	114	112	117	112	116	281	275	294	310	312	320
23	12	.74642E+03	113	72	71	116	113	110	116	110	113	284	278	301	308	316	324
24	12	.18234E+04	71	35	34	90	86	83	90	83	87	237	230	246	261	260	270
25	12	.22212E+04	68	28	28	98	94	91	98	91	96	252	244	260	278	275	287
26	12	.20134E+04	62	15	14	108	103	100	108	100	106	268	258	273	297	291	304
27	12	.13896E+04	69	9	8	132	127	124	132	124	130	307	297	310	342	335	348
28	12	.94015E+03	181	120	119	199	197	191	199	191	195	417	411	440	455	462	472
29	12	.28946E+04	69	32	31	93	89	86	93	86	91	240	233	251	265	266	275
30	18	.82326E+03	200	139	138	202	200	195	202	195	198	423	421	452	459	474	480
31	12	.15660E+04	69	24	24	104	102	101	104	101	103	257	254	272	286	292	296
32	12	.26025E+04	31	-18	-18	89	86	85	89	85	88	228	222	231	258	255	262
33	12	.21636E+04	33	-26	-26	103	100	98	103	98	102	254	247	253	287	280	289
34	12	.74858E+03	171	119	119	200	196	193	200	193	198	443	435	459	477	486	491
35	12	.19750E+04	109	71	71	114	113	113	114	113	114	277	276	295	304	315	317
36	12	.16340E+04	52	5	4	104	101	99	104	99	103	251	245	257	284	283	289
37	12	.12279E+04	92	32	31	160	155	151	160	151	157	351	340	360	391	387	400
38	12	.11856E+04	147	95	95	167	163	159	167	159	164	373	364	389	407	411	423
39	12	.13337E+04	127	83	82	109	107	104	109	104	107	273	269	285	295	305	312
40	18	.11609E+04	119	77	77	94	93	90	94	90	92	246	243	256	265	278	282
41	12	.83192E+03	133	100	100	119	117	115	119	115	117	299	296	309	319	324	329
42	12	.16145E+04	129	97	97	122	121	120	122	120	121	311	308	323	330	336	339

I-38

 * BM1 MODEL *

EARTHQUAKE NO. 1

*PIPE END MOMENTS(INERTIA COMPONENT)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
43	18	.17952E+04	133	101	101	125	123	122	125	122	124	315	312	327	335	340	344
44	12	.16441E+04	124	96	96	108	107	105	108	105	107	283	279	292	301	306	310
45	12	.10829E+04	142	100	100	130	128	126	130	126	129	316	311	328	340	345	353
46	12	.78098E+03	175	104	103	186	182	179	186	179	184	412	405	428	446	450	461
47	18	.71723E+03	153	90	90	163	159	156	163	156	161	370	362	386	402	406	417
48	12	.49637E+03	174	123	122	167	164	156	167	156	161	363	356	379	394	401	413
49	12	.12424E+04	146	77	76	148	147	143	148	143	145	337	334	354	366	383	388
50	18	.12328E+04	146	77	76	149	147	143	149	143	146	339	336	355	368	384	390
51	12	.52098E+03	143	107	106	124	121	116	124	116	121	297	292	306	321	326	335
52	12	.80798E+03	195	130	129	185	182	176	185	176	181	405	399	419	437	448	458
53	18	.22096E+04	70	14	12	13	12	11	13	11	13	88	86	109	104	117	121
54	12	.17185E+04	108	52	51	144	139	136	144	136	142	335	326	349	366	366	378
55	12	.20305E+04	30	-9	-13	33	28	25	33	25	30	127	118	135	147	146	158

 * BM1 MODEL *

EARTHQUAKE NO. 1

*SUPPORT FORCES(INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	FORCE (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	.18028E+03	37	-3	-5	-15	-17	-18	-15	-18	-16	39	37	51	49	57	61
2	1	.32415E+02	60	19	16	35	31	28	35	28	32	128	122	140	148	153	162
3	1	.16521E+03	48	8	6	-12	-13	-14	-12	-14	-13	50	48	63	59	68	72
4	1	.21691E+04	49	4	2	-13	-14	-15	-13	-15	-14	46	44	59	56	64	68
5	1	.13788E+04	76	0	-5	-2	-5	-9	-2	-9	-5	45	41	46	65	59	68
6	1	.21207E+04	39	-2	-4	-14	-16	-17	-14	-17	-15	42	40	55	52	61	64
7	1	.27574E+02	90	22	15	41	38	35	41	35	38	108	104	131	143	157	165
8	1	.29254E+03	2	-17	-18	-3	-4	-5	-3	-5	-5	62	62	74	76	84	86
9	1	.12550E+03	77	35	34	62	59	56	62	56	61	189	181	202	208	213	223
10	1	.26861E+03	21	3	2	28	28	26	28	26	27	120	119	132	138	143	146
11	1	.11787E+03	68	17	16	7	5	4	7	4	6	79	76	92	91	103	107
12	1	.75237E+02	75	6	1	10	8	5	10	5	8	58	55	74	87	95	102
13	1	.12972E+02	318	215	205	136	131	129	136	129	130	281	277	321	311	339	342
14	1	.19133E+02	84	36	23	50	45	43	50	43	45	113	108	139	159	173	177
15	1	.72340E+02	109	56	55	55	52	50	55	50	53	162	157	180	182	199	206
16	1	.53391E+02	76	37	21	49	44	42	49	42	43	96	91	110	152	159	162
17	1	.31554E+02	309	210	195	189	179	173	189	173	180	375	362	413	418	442	458
18	1	.12031E+03	52	20	17	42	39	37	42	37	40	150	146	164	167	175	181
19	1	.67757E+02	98	71	70	86	86	80	86	80	81	214	213	228	237	243	248
20	1	.42309E+01	216	136	129	75	72	70	75	70	71	183	180	209	205	223	226
21	1	.34298E+01	101	37	30	68	64	61	68	61	64	174	168	202	206	220	228
22	1	.81911E+02	114	89	89	88	88	87	88	87	88	248	247	260	263	271	273
23	1	.97596E+02	17	-23	-23	42	42	42	42	42	42	138	138	156	163	174	174
24	1	.32772E+02	119	36	34	168	158	151	168	151	164	368	348	374	408	398	423
25	1	.66450E+02	96	63	63	89	88	87	89	87	89	250	248	260	267	272	275
26	1	.63503E+02	157	118	117	134	134	129	134	129	131	313	313	326	336	355	358
27	1	.13461E+02	140	93	87	105	100	95	105	95	98	259	253	271	282	283	289
28	1	.62679E+02	134	65	64	139	138	134	139	134	136	322	319	338	350	366	371
29	1	.59258E+02	137	63	63	149	146	142	149	142	146	342	336	357	372	381	390
30	1	.77989E+03	134	65	64	139	138	134	139	134	136	322	319	338	350	366	371
31	1	.66465E+03	125	97	95	98	93	89	98	89	94	254	246	258	275	272	283
32	1	.14927E+03	128	99	98	103	102	98	103	98	100	257	254	270	279	287	293

I-40

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 * BM2 MODEL *
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EARTHQUAKE NO. 1

*DISPLACEMENT (INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.22436E-09	114	83	82	68	67	66	68	66	67	135	133	154	140	156	160
1	Y	.17958E-10	291	210	207	191	184	179	191	179	186	296	287	335	318	340	353
1	Z	.70537E-10	607	506	505	432	429	427	432	427	430	650	646	714	664	719	726
2	X	.52092E-03	-7	-23	-25	-21	-22	-24	-21	-24	-22	4	3	4	10	6	10
2	Y	.29335E-03	485	402	407	337	336	335	337	335	336	517	516	575	527	578	581
2	Z	.47922E-03	-3	-20	-21	-20	-21	-23	-20	-23	-21	6	4	7	11	10	14
3	X	.27601E-02	62	38	37	30	29	28	30	28	29	81	80	94	86	96	100
3	Y	.11331E-02	423	349	349	291	290	289	291	289	290	454	452	505	463	508	511
3	Z	.12454E-02	285	228	228	188	187	185	188	185	187	305	304	337	314	341	345
4	X	.38108E-02	84	57	56	45	45	43	45	43	45	103	102	119	108	121	125
4	Y	.11328E-02	423	349	349	291	290	289	291	289	290	455	453	506	463	509	511
4	Z	.13963E-02	435	357	356	301	300	298	301	298	300	466	465	512	478	517	522
5	X	.61396E-02	83	56	55	45	44	42	45	42	44	102	101	118	107	120	124
5	Y	.19112E-02	422	348	347	290	289	289	290	289	290	457	455	507	466	510	512
5	Z	.24163E-02	396	324	323	272	271	269	272	269	271	426	425	468	437	473	477
6	X	.22562E-02	388	319	318	265	264	263	265	263	264	421	419	467	429	471	473
6	Y	.16485E-09	168	111	110	102	102	100	102	100	101	195	194	231	210	233	237
6	Z	.21808E-02	388	319	318	265	264	263	265	263	264	421	419	467	429	471	473
7	X	.58275E-02	90	62	62	50	50	48	50	48	50	110	109	128	115	130	133
7	Y	.17916E-02	500	412	411	349	349	348	349	348	349	553	552	606	565	609	612
7	Z	.20840E-02	477	393	392	333	332	330	333	330	332	514	512	563	526	568	573
8A	X	.47455E-02	129	96	95	78	77	76	78	76	78	151	150	172	156	175	178
8A	Y	.13458E-02	503	412	411	352	352	351	352	351	352	564	563	614	577	617	620
8A	Z	.17240E-02	578	481	480	410	408	406	410	406	408	624	622	684	638	689	694
8	X	.30093E-02	259	208	207	172	171	170	172	170	172	287	285	321	293	324	327
8	Y	.61210E-03	467	378	378	328	327	326	328	326	327	536	535	576	550	580	583
8	Z	.18542E-02	498	413	412	349	347	346	349	346	348	540	537	595	551	599	602
9	X	.20690E-02	448	370	370	311	310	309	311	309	310	487	484	538	495	541	544
9	Y	.41853E-03	443	353	352	311	309	308	311	308	310	519	517	552	535	557	561
9	Z	.24430E-02	328	267	267	223	221	221	223	221	222	359	357	401	367	404	406
10	X	.30644E-02	432	352	352	303	302	302	303	302	303	500	500	533	511	538	539
10	Y	.17426E-02	382	304	303	271	270	269	271	269	270	469	467	484	482	491	493
10	Z	.33351E-02	325	261	261	222	222	221	222	221	222	380	379	408	389	412	414
11	X	.75260E-02	560	287	287	252	252	252	252	252	252	441	441	449	453	457	457
11	Y	.17309E-02	383	305	304	272	271	270	272	270	271	470	468	485	483	492	495
11	Z	.71880E-02	359	287	287	251	251	251	251	251	251	441	441	448	452	456	456
12	X	.65102E-02	359	287	287	251	251	251	251	251	251	441	441	447	452	455	456
12	Y	.14042E-02	379	298	297	265	264	264	265	264	265	461	460	480	475	486	488
12	Z	.61887E-02	359	287	287	250	250	250	250	250	250	440	440	446	451	454	455
13	X	.54607E-02	365	294	294	274	273	272	274	272	273	465	463	484	477	490	493
13	Y	.65605E-02	31	7	4	14	9	8	14	8	11	58	51	61	66	70	76
13	Z	.51589E-02	365	294	293	273	272	271	273	271	272	463	462	482	475	488	491

I-41

 * BM2 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	
14	X	.42517E-02	358	286	286	250	250	250	250	250	250	250	440	440	445	451	454	454
14	Y	.83711E-03	363	276	276	248	247	246	248	246	247	435	434	464	452	467	471	471
14	Z	.39688E-02	358	286	286	249	249	249	249	249	249	439	439	444	450	453	453	453
15	X	.15234E-03	389	316	313	317	310	309	317	309	314	516	507	539	531	547	557	557
15	Y	.19521E-09	11	-9	-10	-3	-4	-5	-3	-5	-4	32	31	39	39	47	50	50
15	Z	.75518E-04	390	316	313	318	310	309	318	309	314	516	507	539	532	547	558	558
19	X	.78333E-04	379	302	299	306	297	296	306	296	302	499	488	526	516	533	546	546
19	Y	.90680E-04	126	76	64	159	138	137	159	137	149	261	235	248	282	283	300	300
19	Z	.17216E-03	393	321	319	321	315	314	321	314	318	522	514	544	537	551	561	561
21	X	.10483E-03	410	341	339	342	335	335	342	335	339	536	528	566	550	572	580	580
21	Y	.28443E-03	256	194	189	218	207	205	218	205	212	361	348	374	379	406	418	418
21	Z	.24569E-03	402	329	327	331	323	323	331	323	327	533	524	555	548	563	573	573
23	X	.13154E-02	533	451	446	430	416	415	430	415	424	628	609	660	641	667	682	682
23	Y	.41028E-02	113	61	49	168	149	148	168	148	159	273	248	258	296	293	309	309
23	Z	.27278E-02	528	447	442	427	413	412	427	412	420	624	605	657	637	663	678	678
25	X	.26263E-10	814	677	676	610	608	604	610	604	608	867	864	955	889	959	968	968
25	Y	.61417E-10	132	81	71	163	147	146	163	146	155	270	249	263	291	299	314	314
25	Z	.41402E-10	452	373	367	370	354	352	370	352	362	558	537	592	574	599	617	617
27	X	.28219E-03	615	523	517	488	473	472	488	472	481	700	680	730	713	736	752	752
27	Y	.11789E-02	78	32	21	137	121	119	137	119	129	228	207	212	249	239	254	254
27	Z	.58547E-03	615	523	517	488	473	472	488	472	481	700	680	730	713	736	752	752
29	X	.21685E-05	619	526	521	485	471	470	485	470	478	692	674	718	705	724	739	739
29	Y	.25946E-10	199	146	142	170	161	160	170	160	166	293	282	303	309	336	345	345
29	Z	.13510E-05	619	526	521	485	471	470	485	470	478	692	674	719	705	724	739	739
33	X	.75418E-04	616	523	518	486	472	470	486	470	479	695	676	724	708	730	745	745
33	Y	.32485E-03	201	141	134	215	201	200	215	200	208	353	336	361	374	402	414	414
33	Z	.14930E-03	616	523	518	486	472	470	486	470	479	695	676	724	709	730	745	745
35	X	.85422E-04	616	523	518	486	472	470	486	470	479	695	676	724	708	730	745	745
35	Y	.41125E-03	134	83	75	172	157	156	172	156	165	285	266	284	306	319	332	332
35	Z	.19630E-03	616	523	518	486	472	470	486	470	479	695	676	724	708	730	745	745
37	X	.87325E-04	616	523	518	486	472	470	486	470	479	695	676	724	708	730	745	745
37	Y	.63882E-11	284	222	221	202	200	199	202	199	201	357	354	370	368	388	391	391
37	Z	.36978E-04	616	523	518	486	472	470	486	470	479	695	676	723	708	729	745	745
16	X	.62669E-04	415	315	307	331	313	310	331	310	322	522	498	563	547	571	593	593
16	Y	.11104E-09	234	138	137	128	128	126	128	126	128	248	247	297	276	301	304	304
16	Z	.59413E-04	421	318	310	336	316	314	336	314	326	526	501	569	552	577	600	600
20	X	.36209E-01	359	287	287	250	250	250	250	250	250	441	441	444	452	453	453	453
20	Y	.54235E-02	268	102	99	122	119	113	122	113	119	238	233	279	295	300	313	313
20	Z	.35547E-01	358	286	286	250	250	250	250	250	250	441	441	443	452	453	453	453
22	X	.95510E-01	361	289	289	252	252	252	252	252	252	445	445	447	456	456	457	457
22	Y	.13092E-01	259	81	78	110	107	101	110	101	107	219	214	243	281	276	290	290
22	Z	.93861E-01	361	289	289	252	252	252	252	252	252	445	445	446	456	456	456	456

I-42

 * BM2 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	.16558E+00	364	293	293	255	255	255	255	255	255	449	449	450	460	460	461
24	Y	.19728E-01	243	67	65	101	98	91	101	91	98	204	199	220	265	258	272
24	Z	.16276E+00	364	293	293	255	255	255	255	255	255	449	449	450	460	460	461
26	X	.23508E+00	368	296	296	258	258	258	258	258	258	454	454	455	465	465	465
26	Y	.21185E-01	240	63	60	102	99	92	102	92	99	206	201	219	268	258	273
26	Z	.23111E+00	369	296	296	258	258	258	258	258	258	454	454	455	465	465	465
28	X	.29807E+00	367	295	295	257	257	257	257	257	257	452	452	453	463	463	463
28	Y	.16634E-01	248	64	61	112	109	101	112	101	109	223	216	234	286	275	292
28	Z	.29304E+00	367	295	295	257	257	257	257	257	257	452	452	453	463	463	463
30	X	.34465E+00	365	294	294	256	256	256	256	256	256	450	450	450	461	461	461
30	Y	.87160E-02	244	60	56	119	115	106	119	106	115	234	226	245	298	285	304
30	Z	.33885E+00	365	294	294	256	256	256	256	256	256	450	450	450	461	461	461
32	X	.36706E+00	364	293	293	255	255	255	255	255	255	449	449	449	460	460	460
32	Y	.55877E-10	116	21	21	22	21	19	22	19	21	81	80	94	122	121	126
32	Z	.35988E+00	364	293	293	255	255	255	255	255	255	449	449	449	460	460	460
36	X	.36917E+00	364	293	293	255	255	255	255	255	255	449	449	449	460	460	460
36	Y	.17897E-02	221	56	52	150	146	137	150	137	146	277	269	283	350	337	356
36	Z	.36241E+00	364	293	293	255	255	255	255	255	255	449	449	449	460	460	460
38	X	.34757E+00	364	293	293	255	255	255	255	255	255	449	449	449	460	460	460
38	Y	.11878E-01	213	68	65	164	162	156	164	156	162	293	287	301	374	367	379
38	Z	.35269E+00	364	293	293	255	255	255	255	255	255	449	449	449	460	460	460
39	X	.26669E+00	367	295	295	257	257	257	257	257	257	452	452	453	463	464	464
39	Y	.21544E-01	176	53	50	132	130	125	132	125	130	245	240	248	317	310	321
39	Z	.31620E+00	365	294	294	256	256	256	256	256	256	450	450	450	461	461	461
40	X	.14729E+00	375	301	301	263	263	263	263	263	263	462	462	464	473	474	475
40	Y	.21811E-01	166	48	45	121	118	113	121	113	118	228	223	229	297	288	300
40	Z	.26232E+00	366	295	295	257	257	257	257	257	257	452	452	452	463	463	463
41	X	.23645E-01	388	294	293	267	267	266	267	266	267	475	474	492	489	501	503
41	Y	.11788E-01	161	53	50	128	125	119	128	119	125	239	233	241	309	298	311
41	Z	.20498E+00	367	295	295	257	257	257	257	257	257	452	452	452	463	463	463
43	X	.77873E-01	364	293	293	255	255	255	255	255	255	449	449	449	460	460	460
43	Y	.43356E-10	148	8	8	19	19	18	19	18	19	77	77	105	115	125	126
43	Z	.16112E+00	364	293	293	255	255	255	255	255	255	449	449	449	460	460	460
44	X	.11482E+00	369	297	297	258	258	258	258	258	258	454	454	455	465	466	466
44	Y	.57129E-02	182	51	48	121	118	110	121	110	117	231	225	250	293	287	302
44	Z	.14567E+00	359	289	289	251	251	251	251	251	251	443	443	443	454	454	454
45	X	.13129E+00	354	283	283	246	246	246	246	246	246	436	436	438	447	448	448
45	Y	.92195E-02	200	50	47	100	97	90	100	90	97	201	195	227	256	254	268
45	Z	.14337E+00	349	280	280	243	243	243	243	243	243	431	431	432	442	442	442
46	X	.12894E+00	339	268	268	233	233	233	233	233	233	415	415	419	426	428	428
46	Y	.84123E-02	224	53	51	88	86	80	88	80	85	185	180	217	236	239	250
46	Z	.14944E+00	342	273	273	237	237	237	237	237	237	422	422	423	433	433	433

1-43

 * BM2 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
47	X	.11368E+00	321	248	248	216	216	216	216	216	216	390	390	397	400	404	404
47	Y	.21255E-02	261	62	60	81	79	75	81	75	79	178	174	216	225	233	243
47	Z	.16014E+00	339	271	271	235	235	235	235	235	235	418	418	419	428	429	429
48	X	.10211E+00	321	248	248	216	216	216	216	216	216	389	389	397	400	404	404
48	Y	.21290E-10	439	275	271	255	252	246	255	246	251	450	445	487	477	493	503
48	Z	.16202E+00	345	276	276	240	240	240	240	240	240	426	426	427	436	437	437
49	X	.75125E-01	338	266	266	232	232	232	232	232	232	414	414	418	424	426	427
49	Y	.54347E-05	359	254	252	229	228	225	229	225	227	408	407	428	424	435	439
49	Z	.16164E+00	365	293	293	255	255	255	255	255	255	449	449	451	460	461	461
50	X	.51610E-01	368	294	294	257	257	256	257	256	257	452	451	458	463	466	467
50	Y	.10870E-04	359	254	252	229	228	225	229	225	227	408	407	428	424	435	439
50	Z	.16429E+00	374	299	299	261	261	261	261	261	261	458	458	461	469	471	471
51	X	.45330E-01	372	298	298	260	260	260	260	260	260	456	456	465	469	473	473
51	Y	.46950E-02	262	180	180	158	158	158	158	158	158	302	302	322	313	326	326
51	Z	.16024E+00	369	294	294	256	256	256	256	256	256	451	451	455	463	464	465
52	X	.30732E-01	368	294	294	256	256	256	256	256	256	450	450	459	463	467	467
52	Y	.17159E-01	255	175	175	154	154	154	154	154	154	294	294	315	306	319	320
52	Z	.11651E+00	353	276	276	241	241	241	241	241	241	427	427	433	438	441	441
53	X	.15343E-01	364	290	290	253	253	253	253	253	253	445	445	454	458	462	462
53	Y	.13532E-01	252	175	174	154	153	153	154	153	153	292	292	313	305	317	318
53	Z	.69189E-01	335	248	248	216	216	216	216	216	216	390	389	404	401	410	410
54	X	.11668E-02	270	194	193	170	170	168	170	168	169	318	317	334	330	338	340
54	Y	.18686E-02	260	182	182	159	159	158	159	158	158	299	299	321	312	324	325
54	Z	.24285E-01	412	181	180	170	169	167	170	167	169	321	320	392	361	400	404
55	X	.69134E-10	300	215	215	187	187	187	187	187	187	346	346	362	358	367	367
55	Y	.52430E-10	281	143	143	130	130	129	130	129	130	254	253	311	284	315	318
55	Z	.17832E-01	468	160	159	160	159	157	160	157	159	308	306	379	366	397	402
56	X	.58755E-02	292	219	219	191	190	189	191	189	190	349	348	351	361	367	368
56	Y	.93896E-05	490	159	158	162	161	158	162	158	161	313	311	384	372	402	408
56	Z	.87368E-02	481	159	158	161	160	157	161	157	160	311	309	382	370	399	405
57	X	.10829E-01	302	229	229	199	199	198	199	198	199	362	362	374	374	379	381
57	Y	.18778E-04	496	159	158	162	161	158	162	158	161	313	311	384	372	402	408
57	Z	.10728E-02	490	159	158	162	161	158	162	158	161	313	311	383	372	401	407
58	X	.91438E-02	299	227	226	197	197	196	197	196	197	358	358	370	371	370	378
58	Y	.69906E-03	490	159	158	162	161	158	162	158	161	313	310	383	372	401	407
58	Z	.17193E-04	518	130	129	146	144	139	146	139	144	294	290	353	351	371	379
59	X	.22275E-02	289	214	212	187	186	184	187	184	186	341	340	355	355	360	363
59	Y	.67023E-03	490	159	158	162	161	158	162	158	161	313	310	383	372	401	407
59	Z	.85968E-05	518	130	129	146	144	139	146	139	144	294	290	353	351	371	379
60	X	.14114E-10	281	195	189	179	175	168	179	168	173	318	315	332	338	339	349
60	Y	.28668E-10	490	159	158	162	161	158	162	158	161	312	310	383	372	401	407
60	Z	.25256E-10	518	130	129	146	144	139	146	139	144	294	290	353	351	371	379

I-44

 * BM2 MODEL *

*ACCELERATION(INERTIA COMPONENT)

EARTHQUAKE NO. 1

NODE NO.	COMP.	ACC(DY) (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.36375E-06	7010	5982	5939	5837	5801	5696	5837	5696	5790	7839	7777	7880	8073	7947	8144
1	Y	.10073E-06	4246	3468	3424	3178	3126	3052	3178	3052	3124	4243	4173	4301	4438	4382	4534
1	Z	.31654E-06	7495	6450	6424	5711	5676	5615	5711	5615	5677	7652	7598	7764	7807	7808	7938
2	X	.24780E+00	16865	13816	13591	13759	13637	13251	13759	13251	13579	18234	18045	18079	19227	18525	19247
2	Y	.73130E+00	10906	9432	9414	8279	8249	8198	8279	8198	8248	11097	11051	11338	11268	11382	11487
2	Z	.21379E+00	18299	14971	14733	14532	14401	14022	14532	14022	14344	19221	19027	19078	20282	19598	20314
3	X	.29838E+01	8827	7464	7392	7488	7445	7274	7488	7274	7419	10026	9947	10025	10395	10141	10450
3	Y	.31209E+01	8554	7412	7400	6462	6435	6413	6462	6413	6442	8678	8639	8888	8796	8921	8977
3	Z	.19622E+01	12715	10765	10695	9410	9367	9228	9410	9228	9343	12498	12432	12658	12889	12810	13074
4	X	.46515E+01	8331	7477	7017	7000	6959	6814	7000	6814	6940	9382	9308	9402	9698	9497	9763
4	Y	.31187E+01	8561	7419	7407	6468	6441	6418	6468	6418	6448	8686	8647	8896	8804	8929	8986
4	Z	.35331E+01	11226	9551	9496	8407	8368	8244	8407	8244	8349	11193	11129	11331	11507	11439	11677
5	X	.73947E+01	8386	7123	7061	7038	6996	6850	7038	6850	6977	9430	9355	9751	9547	9817	9817
5	Y	.51136E+01	8506	7373	7361	6404	6377	6354	6404	6354	6384	8598	8558	8810	8713	8842	8900
5	Z	.51032E+01	11742	9977	9918	8771	8732	8602	8771	8602	8710	11668	11606	11815	12006	11934	12182
6	X	.64594E+01	7371	6389	6380	5529	5502	5494	5529	5494	5513	7433	7396	7634	7523	7661	7694
6	Y	.76113E-06	2498	2006	1978	2010	1993	1932	2010	1932	1980	2704	2677	2770	2853	2832	2936
6	Z	.62438E+01	7369	6389	6380	5529	5502	5494	5529	5494	5513	7432	7396	7634	7524	7661	7694
7	X	.75394E+01	8007	6815	6760	6743	6706	6570	6743	6570	6688	9045	8978	9070	9340	9158	9404
7	Y	.34724E+01	12096	10448	10428	9004	8978	8910	9004	8910	8969	12035	11993	12346	12225	12395	12525
7	Z	.50819E+01	11472	9775	9723	8548	8512	8394	8548	8394	8493	11379	11322	11549	11685	11654	11879
8A	X	.73142E+01	7544	6461	6420	6257	6223	6122	6257	6122	6213	8406	8347	8461	8639	8528	8717
8A	Y	.25759E+01	11327	9757	9733	8365	8340	8264	8365	8264	8327	11167	11126	11481	11364	11532	11677
8A	Z	.53485E+01	10136	8692	8654	7609	7575	7481	7609	7481	7564	10156	10102	10321	10386	10390	10573
8	X	.68377E+01	7195	6221	6202	5667	5639	5598	5667	5598	5643	7624	7580	7757	7761	7795	7884
8	Y	.14197E+01	7659	6558	6531	5598	5560	5503	5598	5503	5560	7474	7419	7708	7630	7753	7879
8	Z	.58582E+01	8336	7202	7184	6281	6251	6206	6281	6206	6254	8419	8373	8594	8555	8630	8729
9	X	.62044E+01	7946	6881	6867	5975	5947	5918	5975	5918	5953	8017	7975	8205	8131	8237	8308
9	Y	.13051E+01	4512	3801	3773	3236	3186	3158	3236	3158	3200	4328	4262	4501	4453	4552	4639
9	Z	.65031E+01	7148	6191	6177	5520	5493	5469	5520	5469	5520	7427	7387	7586	7540	7618	7680
10	X	.63656E+01	7596	6577	6563	5546	5528	5494	5546	5494	5526	7410	7382	7649	7518	7684	7756
10	Y	.40344E+01	2710	2243	2204	2433	2377	2319	2433	2319	2387	3286	3206	3410	3435	3448	3584
10	Z	.71005E+01	6228	5382	5365	4767	4740	4705	4767	4705	4746	6404	6362	6545	6515	6576	6656
11	X	.14270E+02	2014	1754	1748	1679	1668	1657	1679	1657	1671	2259	2242	2436	2315	2450	2479
11	Y	.41005E+01	2705	2236	2197	2423	2367	2308	2423	2308	2377	3272	3192	3393	3422	3432	3569
11	Z	.13625E+02	2069	1798	1795	1649	1645	1635	1649	1635	1644	2216	2208	2394	2265	2406	2428
12	X	.12221E+02	1838	1595	1589	1486	1476	1467	1486	1467	1457	1999	1984	2164	2048	2176	2201
12	Y	.42017E+01	1714	1393	1371	1526	1492	1457	1526	1457	1497	2082	2034	2226	2185	2247	2330
12	Z	.11619E+02	1901	1645	1642	1456	1452	1444	1456	1444	1452	1956	1950	2121	1997	2131	2148
13	X	.11947E+02	3308	2923	2884	3717	3659	3616	3717	3616	3679	5046	4963	5288	5209	5328	5451
13	Y	.76063E+01	7728	6232	6106	6074	5910	5799	6074	5799	5955	8082	7864	7993	8555	8397	8685
13	Z	.11313E+02	3336	2946	2911	3694	3644	3602	3694	3602	3660	5013	4940	5261	5172	5300	5415

 * BM2 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
14	X	.79498E+01	1620	1400	1395	1270	1259	1252	1270	1252	1262	1709	1694	1859	1750	1869	1890
14	Y	.38574E+01	995	756	741	837	818	794	837	794	819	1173	1147	1304	1256	1322	1371
14	Z	.74258E+01	1723	1483	1481	1239	1237	1233	1239	1233	1236	1665	1663	1817	1696	1824	1833
15	X	.34806E+00	4592	4025	3912	4938	4698	4665	4938	4665	4619	6749	6429	6763	6952	6894	7176
15	Y	.27482E-06	5822	4718	4646	4802	4761	4634	4802	4634	4740	6398	6336	6400	6765	6640	6858
15	Z	.17296E+00	4602	4034	3920	4932	4692	4659	4932	4659	4813	6741	6421	6753	6943	6884	7166
19	X	.23123E+00	3668	3164	3063	3831	3614	3585	3831	3585	3723	5249	4960	5248	5420	5361	5607
19	Y	.42052E+00	2416	1847	1743	2541	2360	2344	2541	2344	2452	3506	3271	3342	3733	3659	3818
19	Z	.40607E+00	4357	3854	3756	4740	4535	4506	4740	4506	4638	6477	6203	6505	6662	6623	6869
21	X	.44876E+00	3682	3246	3213	3300	3212	3208	3300	3208	3258	4504	4388	4568	4585	4631	4725
21	Y	.12115E+01	3443	2758	2681	3211	3094	3029	3211	3029	3136	4360	4199	4304	4607	4536	4711
21	Z	.59649E+00	4738	4188	4094	4885	4673	4652	4885	4652	4782	6673	6391	6673	6846	6804	7047
23	X	.35033E+01	11900	10337	10261	9510	9298	9271	9510	9271	9405	12854	12568	13112	13053	13212	13446
23	Y	.24041E+02	1642	1213	1125	2054	1918	1902	2054	1902	1987	2864	2686	2733	3052	2971	3095
23	Z	.72141E+01	11849	10296	10219	9476	9261	9235	9476	9235	9370	12810	12520	13064	13009	13165	13401
25	X	.24988E-06	5157	4441	4431	4153	4144	4108	4153	4108	4138	5610	5593	5805	5721	5832	5899
25	Y	.33870E-06	1796	1351	1272	2063	1931	1918	2063	1918	1998	2868	2696	2750	3056	2998	3115
25	Z	.12499E-06	7916	6860	6775	6469	6224	6210	6469	6210	6352	8783	8457	8867	8943	8987	9233
27	X	.82346E+00	13034	11308	11237	10358	10168	10128	10358	10128	10260	13981	13721	14280	14203	14371	14606
27	Y	.61982E+01	1710	1279	1196	2167	2045	2021	2167	2021	2104	3015	2853	2920	3207	3137	3257
27	Z	.17083E+01	13037	11311	11240	10362	10171	10131	10362	10131	10263	13985	13726	14284	14208	14375	14610
29	X	.61476E-02	13897	12047	11977	11074	10901	10847	11074	10847	10980	14935	14695	15254	15183	15344	15584
29	Y	.11124E-06	2484	1957	1893	2383	2272	2247	2383	2247	2323	3267	3121	3211	3465	3458	3573
29	Z	.38393E-02	13818	11981	11911	11009	10834	10782	11009	10782	10915	14848	14606	15166	15093	15255	15495
33	X	.21748E+00	13371	11597	11527	10633	10450	10405	10633	10405	10537	14347	14096	14655	14579	14746	14981
33	Y	.18373E+01	1578	1169	1085	2208	2090	2076	2208	2076	2150	3084	2929	3025	3271	3211	3318
33	Z	.43084E+00	13352	11578	11508	10614	10430	10386	10614	10386	10518	14322	14070	14630	14553	14720	14956
35	X	.24626E+00	13379	11603	11533	10639	10456	10411	10639	10411	10543	14355	14104	14663	14587	14754	14990
35	Y	.22187E+01	1636	1217	1133	2220	2101	2081	2220	2081	2160	3095	2937	3023	3285	3219	3333
35	Z	.56608E+00	13367	11596	11525	10632	10448	10403	10632	10403	10535	14345	14093	14653	14577	14743	14979
37	X	.25155E+00	13403	11624	11554	10660	10476	10431	10660	10431	10563	14382	14131	14691	14615	14781	15017
37	Y	.15317E-07	4690	3328	3271	3408	3331	3267	3408	3267	3350	4585	4480	4605	4826	4814	4962
37	Z	.10652E+00	13401	11624	11554	10659	10476	10431	10659	10431	10563	14382	14131	14691	14615	14781	15017
16	X	.44486E+00	2576	2137	2079	2219	2087	2065	2219	2065	2150	3047	2873	3041	3159	3122	3269
16	Y	.97400E-06	490	275	266	279	272	258	279	258	269	431	422	522	511	542	564
16	Z	.44254E+00	2577	2138	2082	2197	2070	2048	2197	2048	2131	3016	2847	3015	3126	3094	3237
20	X	.61546E+02	439	311	309	347	344	339	347	339	344	515	511	597	544	599	608
20	Y	.63574E+02	436	192	188	207	203	194	207	194	202	355	348	406	448	447	465
20	Z	.60611E+02	434	307	304	345	342	337	345	337	342	512	507	593	541	595	606
22	X	.15275E+03	378	249	248	280	278	276	280	276	278	445	442	504	467	507	512
22	Y	.15693E+03	421	174	171	188	185	178	188	178	184	330	325	361	424	417	432
22	Z	.15027E+03	377	249	248	278	277	274	278	274	277	442	440	502	464	504	509

 * BM2 MODEL *

EARTHQUAKE NO. 1

ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	24522E+03	360	238	237	248	246	245	248	245	247	414	412	462	432	464	468
24	Y	22775E+03	411	165	162	181	178	172	181	172	178	320	315	345	413	406	419
24	Z	24117E+03	360	238	237	246	245	244	246	244	245	413	411	461	430	463	467
26	X	31738E+03	343	234	233	222	221	220	222	220	221	391	390	426	405	428	432
26	Y	24671E+03	394	152	150	172	169	164	172	164	169	307	302	335	396	391	403
26	Z	31209E+03	342	234	233	222	221	220	222	220	221	390	389	425	404	428	431
28	X	35701E+03	336	245	245	218	218	217	218	217	218	394	393	413	406	418	420
28	Y	19952E+03	376	139	136	165	162	156	165	156	162	297	291	330	380	377	391
28	Z	35104E+03	336	245	245	218	218	217	218	217	218	393	393	413	406	418	420
30	X	36177E+03	360	283	283	250	250	250	250	250	250	441	440	449	452	457	458
30	Y	10217E+03	358	125	121	161	157	149	161	149	157	291	284	329	369	366	382
30	Z	35569E+03	360	283	283	250	250	250	250	250	250	441	440	449	453	457	458
32	X	39478E+03	345	277	277	247	247	247	247	247	247	431	430	437	442	446	446
32	Y	56252E-06	385	184	180	185	179	168	185	168	178	317	311	368	405	404	423
32	Z	38814E+03	345	278	277	247	247	247	247	247	247	431	431	437	442	446	446
36	X	40448E+03	338	271	271	242	241	241	242	241	241	422	422	428	433	437	437
36	Y	21354E+02	273	87	81	158	152	138	158	138	149	281	272	318	350	343	365
36	Z	39486E+03	340	273	273	243	243	243	243	243	243	424	424	431	435	439	440
38	X	42013E+03	316	235	235	207	207	206	207	206	207	375	375	390	387	395	396
38	Y	12288E+03	341	140	135	214	208	194	214	194	205	361	352	406	450	446	468
38	Z	40186E+03	323	254	254	224	224	223	224	223	224	397	397	405	408	412	413
39	X	34502E+03	342	235	234	224	224	222	224	222	224	399	398	429	414	434	437
39	Y	23389E+03	258	95	93	144	142	136	144	136	141	261	257	283	339	336	348
39	Z	36199E+03	323	248	248	217	216	216	217	216	216	391	391	399	401	406	406
40	X	19289E+03	505	374	372	413	412	409	413	409	412	647	644	718	672	724	731
40	Y	25131E+03	225	84	81	125	123	117	125	117	122	233	229	247	306	300	311
40	Z	28571E+03	346	269	269	237	237	236	237	236	237	422	421	431	433	438	439
41	X	66959E+02	841	668	664	798	792	783	798	783	792	1157	1148	1271	1202	1292	1312
41	Y	14915E+03	247	107	104	152	147	135	152	135	145	270	262	304	342	336	356
41	Z	20794E+03	370	295	294	258	258	258	258	258	258	455	454	459	466	469	469
43	X	84112E+02	343	277	277	247	246	246	247	246	247	429	429	436	440	444	445
43	Y	31997E-06	550	228	223	228	222	208	228	208	218	374	367	450	465	484	502
43	Z	17404E+03	344	277	277	247	246	246	247	246	246	429	429	436	440	444	445
44	X	16922E+03	304	197	195	183	181	177	183	177	180	338	336	364	355	367	373
44	Y	72543E+02	411	202	196	258	247	222	258	222	242	418	405	468	505	498	533
44	Z	19608E+03	280	212	212	195	194	193	195	193	194	346	346	365	358	370	371
45	X	28335E+03	275	117	115	118	116	112	118	112	115	240	238	280	262	281	286
45	Y	10840E+03	450	214	207	260	249	227	260	227	245	420	409	481	509	510	543
45	Z	24029E+03	239	149	149	139	138	137	139	137	138	265	264	293	278	294	297
46	X	37184E+03	271	72	71	84	83	82	84	82	83	188	187	236	211	238	240
46	Y	92798E+02	459	200	196	234	226	210	234	210	223	385	376	457	471	484	509
46	Z	28728E+03	221	110	109	101	100	100	101	100	100	212	212	244	226	245	246

I-47

 * BM2 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
47	X	.42149E+03	285	F2	62	85	85	84	85	84	85	182	181	240	208	243	244
47	Y	.21686E+02	481	180	178	195	191	185	195	185	191	333	328	412	417	441	454
47	Z	.32692E+03	216	94	94	86	85	85	86	85	85	191	191	224	205	225	226
48	X	.38544E+03	285	63	63	87	86	85	87	85	86	183	182	241	209	244	245
48	Y	.15535E-06	2054	1179	1076	1163	1097	955	1163	955	1054	1625	1565	1616	1896	1767	1915
48	Z	.29371E+03	240	120	120	108	108	108	108	108	108	226	226	261	241	262	263
49	X	.25072E+03	257	61	60	71	70	69	71	69	70	163	162	211	187	213	216
49	Y	.25366E-01	2647	2071	1933	2073	2002	1853	2073	1853	1969	2950	2884	2911	3221	3021	3232
49	Z	.19156E+03	503	286	285	263	262	258	263	258	262	463	460	538	505	546	553
50	X	.13558E+03	409	206	204	189	187	183	189	183	187	334	331	396	415	430	440
50	Y	.50734E-01	2647	2070	1933	2073	2001	1853	2073	1853	1968	2949	2883	2910	3220	3021	3232
50	Z	.34637E+03	383	162	161	150	148	146	150	146	148	283	281	350	330	360	366
51	X	.11219E+03	530	291	289	272	269	264	272	264	269	453	449	527	564	578	592
51	Y	.30228E+02	338	132	124	161	157	148	161	148	155	279	275	342	322	347	359
51	Z	.38149E+03	370	139	138	129	128	126	129	126	128	252	250	316	299	327	332
52	X	.86642E+02	481	252	249	233	230	225	233	225	230	395	391	464	495	507	520
52	Y	.11515E+03	497	310	288	330	319	294	330	294	313	510	499	558	570	566	600
52	Z	.30128E+03	423	101	100	106	104	102	106	102	104	225	223	286	264	290	295
53	X	.45854E+02	470	243	239	227	223	216	227	216	222	384	379	460	476	491	505
53	Y	.91971E+02	627	431	401	448	431	397	448	397	424	672	656	709	746	724	771
53	Z	.24715E+03	496	102	101	122	121	118	122	118	121	254	251	314	309	329	335
54	X	.56565E+01	1461	1128	1052	1131	1092	1012	1131	1012	1074	1627	1591	1628	1781	1682	1797
54	Y	.12236E+02	745	524	486	533	513	472	533	472	504	790	772	828	878	846	903
54	Z	.24280E+03	577	213	211	217	214	210	217	210	214	382	378	427	484	487	498
55	X	.37559E-06	397	158	149	163	158	150	163	150	157	287	283	350	330	353	365
55	Y	.49718E-06	517	285	272	296	289	275	296	275	287	473	466	572	558	585	607
55	Z	.21880E+03	595	230	227	232	229	223	232	223	228	402	398	449	510	512	524
56	X	.31811E+02	1109	788	730	783	750	681	783	681	733	1133	1103	1138	1262	1185	1276
56	Y	.11657E+00	605	225	222	229	226	221	229	221	226	400	396	452	505	509	521
56	Z	.10811E+03	601	227	224	230	227	222	230	222	227	401	397	451	507	511	523
57	X	.54768E+02	1129	797	738	790	756	686	790	686	739	1142	1111	1151	1275	1198	1290
57	Y	.23311E+00	605	225	222	229	226	221	229	221	226	400	396	452	505	509	521
57	Z	.13360E+02	605	226	223	230	227	221	230	221	226	401	397	454	506	511	523
58	X	.47203E+02	1208	860	797	853	816	741	853	741	798	1230	1196	1234	1370	1285	1384
58	Y	.87044E+01	605	227	223	230	227	221	230	221	227	401	397	454	507	511	523
58	Z	.20304E+00	662	225	219	239	234	225	239	225	233	416	410	493	513	528	544
59	X	.12702E+02	1461	1064	987	1055	1011	920	1055	920	989	1511	1471	1500	1676	1567	1687
59	Y	.83540E+01	605	227	224	231	227	222	231	222	227	401	397	454	507	511	523
59	Z	.10153E+00	662	225	219	239	234	225	239	225	233	416	410	494	513	528	544
60	X	.72968E-07	3617	2775	2586	2750	2647	2433	2750	2433	2596	3875	3781	3793	4256	3971	4261
60	Y	.35768E-06	605	227	224	231	228	222	231	222	227	402	397	455	507	511	524
60	Z	.29827E-06	662	225	219	239	234	225	239	225	233	416	410	494	513	528	544

T-48

 * BM2 MODEL *

QUAKE NO. 1

*PIPE END MOMENTS(INERTIA COMPONENT)

64-1

NO.	SUPPORT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	12	76.72E+04	173	134	133	106	105	105	106	105	106	191	190	215	197	218	220
2	18	11830E+04	46	22	22	11	10	9	11	9	10	57	56	64	62	66	68
3	12	79466E+03	134	100	99	80	78	77	80	77	79	146	144	165	152	167	170
4	18	23753E+04	220	175	174	142	140	140	142	140	141	240	238	270	246	272	274
5	12	36764E+04	127	92	91	76	75	73	76	73	75	152	151	168	158	170	173
6	12	2511E+04	130	99	98	88	86	85	88	85	87	178	175	191	186	194	198
7	12	22067E+04	201	148	147	140	139	137	140	137	139	254	252	284	265	287	292
8	12	16460E+04	379	305	304	274	273	273	274	273	273	463	463	494	475	499	500
9	18	15137E+04	404	325	324	295	293	291	295	291	294	490	487	515	504	523	529
10	18	20272E+04	75	44	41	56	52	50	56	50	54	119	114	129	129	140	146
11	12	50897E+04	75	49	47	67	64	62	67	62	65	132	127	143	140	147	153
12	12	1511E+04	219	170	170	151	150	149	151	149	150	263	263	292	272	299	302
13	18	1111E+04	221	172	171	152	152	150	152	150	152	266	265	295	274	302	304
14	12	1111E+04	282	225	220	246	233	232	246	232	240	373	355	377	388	393	406
15	12	1111E+04	338	273	267	299	283	282	299	282	292	452	431	463	469	485	500
16	12	1111E+04	275	219	213	244	231	230	244	230	238	372	354	376	387	391	404
17	12	56379E+03	375	302	301	274	271	270	274	270	272	456	452	475	468	486	491
18	12	56374E+03	356	287	285	262	258	257	262	257	260	431	426	448	443	462	468
19	18	55880E+03	347	280	278	256	252	251	256	251	254	420	415	437	432	452	458
20	12	11317E-10	435	450	449	413	411	410	413	410	412	670	669	688	687	706	709
21	12	38299E+04	360	288	288	251	251	251	251	251	251	442	442	447	453	456	456
22	12	33319E+04	371	298	298	260	260	260	260	260	260	456	456	458	468	468	468
23	12	17509E+04	355	282	282	247	247	247	247	247	247	435	435	439	447	449	449
24	12	62061E+03	364	148	146	183	180	175	183	175	180	328	324	371	376	393	404
25	12	15396E+04	350	252	251	228	227	226	228	226	227	408	407	423	425	433	436
26	12	26293E+04	353	277	277	243	243	242	243	242	243	431	431	436	443	446	446
27	12	34113E+04	363	291	291	254	254	254	254	254	254	448	448	450	459	460	460
28	12	39945E+04	356	285	285	249	249	249	249	249	249	439	439	440	450	451	451
29	12	51825E+04	361	287	287	251	251	251	251	251	251	443	443	446	454	456	456
30	18	40274E+04	355	285	284	248	248	248	248	248	248	438	438	439	449	449	449
31	12	35126E+04	356	284	284	248	248	248	248	248	248	438	438	440	449	450	450
32	12	22936E+04	373	292	292	259	259	259	259	259	259	456	456	463	470	474	475
33	12	84638E+03	341	225	224	234	233	230	234	230	233	418	416	444	449	464	470
34	12	17553E+04	300	232	232	203	202	202	203	202	202	368	368	375	379	382	383
35	12	39307E+04	338	266	266	231	231	231	231	231	231	412	412	416	423	425	425
36	12	29782E+04	362	290	290	253	253	253	253	253	253	446	446	448	458	459	459
37	12	21651E+04	380	303	303	266	266	266	266	266	266	467	466	470	479	481	481
38	12	15352E+04	363	273	273	241	240	240	241	240	240	427	427	437	442	446	447
39	12	74489E+03	457	271	271	243	243	241	243	241	243	431	430	468	460	477	480
40	18	55398E+03	495	280	279	251	251	249	251	249	250	442	441	494	478	503	506
41	12	88689E+03	310	219	219	192	192	192	192	192	192	354	353	378	368	382	383
42	12	15844E+04	293	198	198	175	175	175	175	175	175	328	328	351	341	355	355

 * BM2 MODEL *

EARTHQUAKE NO. 1

*PIPE END MOMENTS(INERTIA COMPONENT)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
43	18	.17248E+04	290	193	193	171	170	170	171	170	170	321	321	343	334	347	348
44	12	.12294E+04	285	168	167	151	150	149	151	149	150	290	289	316	305	319	321
45	12	.62730E+03	413	225	224	208	207	204	208	204	206	376	375	417	401	421	425
46	12	.77855E+03	424	291	291	259	258	258	259	258	258	457	456	472	475	481	482
47	18	.84873E+03	397	290	290	256	256	255	256	255	256	452	451	463	467	472	473
48	12	.86135E+03	376	290	290	254	254	253	254	253	254	447	447	460	463	469	470
49	12	.13515E+03	435	276	276	247	247	246	247	246	247	439	438	466	465	477	479
50	18	.96358E+03	435	274	273	245	245	244	245	244	245	435	435	462	461	473	475
51	12	.81423E+03	321	244	244	213	212	212	213	212	212	383	383	394	396	401	402
52	12	.77289E+03	371	230	228	207	206	203	207	203	205	373	372	400	398	409	413
53	18	.27991E+04	230	180	179	159	159	157	159	157	159	277	276	306	286	313	315
54	12	.44408E+04	360	287	287	250	250	250	250	250	250	442	442	445	453	454	455
55	12	.19872E+04	200	147	145	142	139	137	142	137	140	260	257	283	272	286	292

 * 9M2 MODEL *

EARTHQUAKE NO. 1

*SUPPORT FORCES(INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	FORCE (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	.22436E+03	114	83	82	68	67	66	68	66	67	135	133	154	140	156	160
2	1	.17958E+02	291	210	207	191	184	179	191	179	186	296	287	335	318	340	353
3	1	.70537E+02	607	506	505	432	429	427	432	427	430	650	546	714	664	719	726
4	1	.95477E+03	584	485	484	413	412	408	413	408	411	619	617	680	633	685	692
5	1	.39359E+04	-6	-22	-24	-21	-22	-24	-21	-24	-22	4	3	4	10	7	11
6	1	.24106E+04	146	111	110	89	88	87	89	87	88	165	164	189	170	190	193
7	1	.71219E+02	10	-9	-10	10	8	6	10	6	8	50	47	56	57	62	66
8	1	.16485E+03	168	111	110	102	102	100	102	100	101	195	194	231	210	233	237
9	1	.20122E+03	368	295	295	258	258	258	258	258	258	450	449	461	461	468	468
10	1	.11104E+03	234	138	137	128	128	126	128	126	128	248	247	297	276	301	304
11	1	.51245E+02	648	543	542	487	486	483	487	483	486	716	714	793	731	799	805
12	1	.19521E+03	11	-9	-10	-3	-4	-5	-3	-5	-4	32	31	39	39	47	50
13	1	.13950E+02	566	480	475	455	440	439	455	439	448	658	638	688	671	595	711
14	1	.25946E+02	199	146	142	170	161	160	170	160	166	293	282	303	309	336	345
15	1	.26263E+02	814	677	676	610	608	604	610	604	608	867	864	955	889	959	968
16	1	.61417E+02	132	81	71	163	147	146	163	146	155	270	249	263	291	299	314
17	1	.41402E+02	452	373	367	370	354	352	370	352	362	558	537	592	574	599	617
18	1	.75492E+02	281	185	182	193	185	184	193	184	189	337	327	366	352	370	380
19	1	.55877E+02	116	21	21	22	21	19	22	19	21	81	80	94	122	121	126
20	1	.31616E+01	619	526	521	485	471	470	485	470	478	692	674	718	705	723	738
21	1	.63882E+01	284	222	221	202	200	199	202	199	201	357	354	370	368	388	391
22	1	.12786E+03	316	243	243	212	211	211	212	211	211	381	381	389	391	395	396
23	1	.43356E+02	148	8	8	19	19	18	19	18	19	77	77	105	115	125	126
24	1	.21290E+02	439	275	271	255	252	246	255	246	251	450	445	487	477	493	503
25	1	.69134E+02	300	215	215	187	187	187	187	187	187	346	346	362	358	367	367
26	1	.52430E+02	281	143	143	130	130	129	130	129	130	254	253	311	284	315	318
27	1	.14114E+02	281	195	189	179	175	168	179	168	173	318	315	332	338	339	349
28	1	.28668E+02	490	159	158	162	161	158	162	158	161	312	310	383	372	401	407
29	1	.25256E+02	518	130	129	146	144	139	146	139	144	294	290	353	351	371	379
30	1	.35677E+03	490	159	158	162	161	158	162	158	161	313	310	383	372	401	407
31	1	.71282E+03	282	203	201	179	178	175	179	175	177	328	327	343	343	348	352
32	1	.27484E+03	331	258	258	224	224	224	224	224	224	401	401	411	413	418	419

I-51

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 * BM3 MODEL *
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EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.14202E-09	33	30	25	27	22	22	27	22	27	37	33	40	39	41	46
1	Y	.78695E-09	8	8	8	8	8	7	8	7	8	9	8	12	9	13	13
1	Z	.21390E-09	-10	-12	-17	-14	-18	-18	-14	-18	-14	-8	-13	-9	-6	-3	1
2	X	.32964E-05	33	30	25	27	22	22	27	22	27	37	33	40	39	41	46
2	Y	.11113E-02	68	66	62	63	59	59	63	59	63	71	66	76	72	78	82
2	Z	.18800E-02	-40	-15	-16	15	15	15	15	15	15	40	40	41	41	41	42
3	X	.98453E-03	60	56	49	52	45	45	52	45	52	65	58	67	67	68	75
3	Y	.17478E-02	80	77	71	74	68	68	74	68	74	84	78	88	86	90	96
3	Z	.50401E-02	-38	-22	-23	0	0	0	0	0	0	20	19	21	21	22	23
4	X	.10920E-05	-29	-24	-29	-17	-21	-21	-17	-21	-17	-8	-12	-9	-7	-8	-4
4	Y	.18575E-02	77	74	68	71	65	65	71	65	71	80	75	85	82	87	93
4	Z	.21296E-05	-6	-9	-14	-10	-15	-15	-10	-15	-10	-4	-9	-6	-2	0	5
5	X	.35871E-01	-8	-11	-14	-14	-17	-17	-14	-17	-14	-5	-9	-4	-4	-3	0
5	Y	.18649E-02	77	74	68	71	65	65	71	65	70	80	74	85	82	87	92
5	Z	.33325E-01	-9	-11	-16	-11	-16	-16	-11	-16	-11	-6	-11	-7	-3	-1	3
6	X	.60608E-01	-21	-17	-21	-10	-13	-13	-10	-13	-10	2	0	2	3	3	6
6	Y	.63448E-02	-6	-9	-12	-13	-16	-16	-13	-16	-13	-7	-10	-5	-5	-1	1
6	Z	.40125E-01	-9	-11	-16	-11	-16	-16	-11	-16	-11	-6	-11	-7	-3	-1	3
7	X	.47708E+00	-34	4	4	50	50	50	50	50	50	84	84	84	85	85	85
7	Y	.88850E-06	35	29	23	22	16	16	22	16	22	32	26	32	35	34	40
7	Z	.40447E-01	-8	-11	-16	-11	-16	-16	-11	-16	-11	-6	-11	-7	-3	-1	3
8	X	.47844E+00	-34	5	5	51	51	51	51	51	51	87	87	87	87	87	87
8	Y	.25818E-01	35	28	21	19	11	11	19	11	19	32	24	29	35	32	40
8	Z	.46784E-01	9	7	0	6	-1	-1	6	-1	6	11	3	6	14	13	22
9	X	.47836E+00	-34	5	5	51	51	51	51	51	51	87	87	87	87	87	87
9	Y	.38587E+00	32	26	19	18	10	10	18	10	18	30	23	28	33	30	38
9	Z	.27233E+00	44	43	31	44	32	32	44	32	44	49	36	38	53	43	56
10	X	.47790E+00	-34	5	5	51	51	51	51	51	51	87	87	87	87	87	87
10	Y	.42747E+00	18	10	6	-1	-5	-5	-1	-5	-1	14	10	14	16	16	20
10	Z	.30364E+00	20	24	14	31	22	22	31	22	31	40	31	33	43	39	48
11	X	.47751E+00	-34	5	5	52	51	51	52	51	51	87	87	87	87	87	87
11	Y	.14771E-95	28	25	15	22	11	11	22	11	22	28	17	20	30	22	33
11	Z	.11757E-02	73	84	74	104	96	96	104	96	104	128	120	125	132	131	141
12	X	.47704E+00	-34	5	5	52	52	51	52	51	52	87	87	87	87	87	87
12	Y	.62234E+00	1	-8	-8	-23	-23	-23	-23	-23	-23	-4	-4	-4	-1	-1	-1
12	Z	.20588E+00	-27	3	2	42	41	41	42	41	42	73	72	73	73	73	74
13	X	.47651E+00	-34	5	5	52	52	52	52	52	52	87	87	87	87	87	87
13	Y	.11792E+01	2	-6	-7	-21	-22	-22	-21	-22	-21	-3	-3	-3	0	0	0
13	Z	.47894E-01	-29	12	12	61	61	61	61	61	61	99	99	99	99	99	99
14	X	.43905E+00	-33	6	6	52	52	52	52	52	52	87	87	87	88	88	88
14	Y	.11577E+01	2	-6	-7	-21	-22	-22	-21	-22	-21	-3	-3	-3	0	0	0
14	Z	.15191E-01	-1	43	43	100	100	100	100	100	100	146	146	147	147	148	148

I-52

 * BM3 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	X	.85216E-02	-41	-21	-21	6	6	6	6	6	6	31	31	32	32	33	33
15	Y	.59658E+00	2	-6	-7	-21	-21	-21	-21	-21	-21	-3	-3	-3	0	0	0
15	Z	.15241E-01	-1	43	43	100	100	100	100	100	100	146	146	147	147	148	148
16	X	.23569E+00	-13	35	35	93	93	93	93	93	93	137	137	138	138	138	138
16	Y	.44537E-01	3	-3	-4	-13	-14	-14	-13	-14	-13	6	6	8	9	9	9
16	Z	.15291E-01	-1	43	43	100	100	99	100	99	99	146	145	147	147	147	148
17	X	.25272E+00	-13	35	35	93	93	93	93	93	93	138	138	138	138	139	139
17	Y	.65145E-06	34	37	36	50	49	49	50	49	50	80	79	88	85	89	90
17	Z	.12006E-02	7	10	7	25	23	22	25	22	24	49	47	55	51	56	58
18	X	.25236E+00	-12	35	35	93	93	93	93	93	93	138	138	139	139	139	139
18	Y	.16162E+00	43	65	64	104	104	103	104	103	104	147	147	154	152	155	155
18	Z	.22251E+00	-6	15	15	51	50	50	51	50	50	84	84	87	87	89	89
19	X	.25172E+00	-12	35	35	93	93	93	93	93	93	138	138	139	139	139	139
19	Y	.22541E-01	137	102	96	121	114	111	121	111	114	160	154	166	179	194	199
19	Z	.10688E+00	13	0	-1	3	1	0	3	0	1	26	23	35	29	36	39
20	X	.23478E+00	-13	35	35	93	92	92	93	92	92	137	137	138	138	138	138
20	Y	.26094E-01	89	40	34	29	23	19	29	19	23	46	39	47	68	65	70
20	Z	.89067E-01	18	1	0	4	1	0	4	0	1	26	23	36	30	38	40
21	X	.25456E-01	94	115	113	176	175	173	176	173	175	243	241	250	245	256	259
21	Y	.26044E-01	89	40	34	30	23	19	30	19	23	46	39	47	69	65	70
21	Z	.66313E-02	37	0	-1	8	7	6	8	6	7	22	21	29	23	49	50
22	X	.11006E-01	93	116	114	179	178	176	179	176	178	245	244	252	248	260	262
22	Y	.11154E-01	81	33	28	23	16	13	23	13	16	39	32	41	59	56	60
22	Z	.66471E-02	37	0	-1	8	7	6	8	6	7	22	20	29	23	49	50
23	X	.16241E-02	62	94	93	157	156	155	157	155	156	218	217	224	220	227	228
23	Y	.14267E-05	57	18	13	8	3	0	8	0	4	20	20	31	42	40	45
23	Z	.66520E-02	37	0	-1	8	7	6	8	6	7	22	20	29	23	49	50
24	X	.26576E-02	122	74	70	90	86	84	90	84	84	121	118	123	131	160	161
24	Y	.30982E-02	133	115	111	150	146	144	150	144	147	202	197	208	216	234	239
24	Z	.98804E-02	38	14	13	33	32	31	33	31	32	58	57	64	61	84	85
25	X	.26622E-01	121	73	70	90	86	83	90	83	84	121	117	123	131	159	160
25	Y	.80674E-01	196	158	151	203	197	193	203	193	194	258	253	257	270	307	309
25	Z	.20282E-01	92	46	43	58	54	53	58	53	53	81	78	83	90	116	117
26	X	.26821E-02	120	72	69	89	85	82	89	82	83	119	116	121	129	158	159
26	Y	.11519E-01	973	634	618	603	581	568	603	568	570	657	640	646	731	766	769
26	Z	.55193E-01	224	121	115	110	102	97	110	97	98	125	118	119	148	152	153
27	X	.47639E-02	163	81	77	76	70	66	76	66	67	90	85	90	107	120	121
27	Y	.10350E-01	1011	658	641	622	599	586	622	586	588	676	658	664	753	780	784
27	Z	.57365E-01	225	122	116	110	102	97	110	97	98	125	118	119	148	151	152
28	X	.11840E-01	164	79	75	69	64	60	69	60	61	81	77	85	98	100	101
28	Y	.64270E-02	942	610	594	574	552	538	574	538	541	623	605	610	696	714	717
28	Z	.57357E-01	225	122	116	110	102	97	110	97	98	125	118	119	148	151	152

CS-T

 * BM3 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
29	X	.18655E-01	159	75	72	66	61	58	66	58	58	79	74	84	95	98	99
29	Y	.23026E-02	639	402	390	373	357	347	373	347	348	406	393	395	458	461	463
29	Z	.57347E-01	225	122	116	110	102	97	110	97	98	125	118	119	148	151	152
30	X	.18942E-01	154	73	69	64	59	55	64	55	56	76	72	82	91	95	96
30	Y	.42538E-04	58	25	23	40	38	36	40	36	37	63	61	65	70	93	94
30	Z	.54615E-01	211	112	106	101	93	89	101	89	90	115	109	110	137	141	142
31	X	.19904E-09	96	37	34	34	30	27	34	27	28	47	44	60	56	71	72
31	Y	.43505E-09	58	25	23	40	38	36	40	36	37	63	61	65	70	93	94
31	Z	.84979E-09	74	22	19	21	17	15	21	15	15	33	30	31	44	57	57
32	X	.25613E-01	100	117	115	176	174	173	176	173	174	244	241	251	246	257	260
32	Y	.25774E-01	101	49	43	38	31	28	38	28	31	55	48	55	80	77	82
32	Z	.66224E-02	37	0	-1	8	7	6	8	6	7	22	21	29	23	49	50
33	X	.25177E-01	106	119	117	177	175	173	177	173	175	245	242	252	247	259	262
33	Y	.25131E-01	110	57	50	46	39	35	46	35	39	64	57	64	90	88	93
33	Z	.66121E-02	37	0	-1	8	7	6	8	6	7	22	21	29	23	49	50
34	X	.21934E-01	119	125	123	179	176	174	179	174	176	248	245	257	250	263	267
34	Y	.21673E-01	132	74	67	64	56	53	64	53	57	85	77	84	114	114	119
34	Z	.65822E-02	37	0	-1	8	7	6	8	6	7	23	21	30	23	49	50
35	X	.18541E-02	157	144	141	193	190	187	193	187	190	266	261	277	268	288	294
35	Y	.34931E-02	120	129	125	189	187	185	189	185	187	251	248	254	262	280	284
35	Z	.64470E-02	38	0	0	9	8	7	9	7	8	24	22	31	25	51	52
36	X	.63604E-04	125	101	98	127	123	120	127	120	123	189	184	197	191	201	206
36	Y	.80317E-06	119	89	84	114	110	108	114	108	111	153	148	155	171	190	195
36	Z	.54670E-02	17	-23	-24	-23	-23	-23	-23	-23	-23	-21	-21	-16	-20	-8	-8
37	X	.31856E-04	125	101	98	126	122	119	126	119	122	189	184	197	191	201	206
37	Y	.10197E-01	-1	0	-2	33	31	31	33	31	32	60	58	61	61	75	79
37	Z	.71518E-02	85	27	22	31	27	27	31	27	31	43	38	47	44	71	76
38	X	.71845E-09	125	101	98	126	122	119	126	119	122	189	184	197	191	201	206
38	Y	.12401E-08	11	-3	-7	21	18	17	21	17	21	42	39	42	43	63	69
38	Z	.97173E-09	106	37	32	40	35	34	40	34	39	47	42	50	48	73	78

 * BM3 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.10087E-06	3381	3382	3379	3385	3382	3381	3385	3381	3382	3391	3388	3416	3395	3421	3425
1	Y	.18574E-06	26673	26694	26694	26725	26725	26725	26725	26725	26725	26762	26760	26781	26779	26804	26806
1	Z	.91554E-07	1342	1316	1306	1296	1286	1284	1296	1284	1294	1330	1319	1370	1336	1451	1466
2	X	.23415E-02	3382	3382	3379	3385	3382	3381	3385	3381	3382	3391	3387	3416	3395	3421	3425
2	Y	.59081E+00	13889	13896	13895	13912	13912	13911	13912	13911	13911	13931	13930	13962	13941	13979	13984
2	Z	.84776E+00	199	203	201	221	219	219	221	219	221	261	259	273	263	286	288
3	X	.76944E+00	4631	4633	4631	4638	4636	4635	4638	4635	4636	4645	4643	4673	4649	4682	4686
3	Y	.11807E+01	10212	10219	10217	10230	10229	10229	10230	10229	10229	10244	10243	10274	10252	10288	10293
3	Z	.21754E+01	420	410	406	409	405	404	409	404	408	441	437	460	444	491	497
4	X	.43254E-03	2098	2093	2082	2094	2083	2081	2094	2081	2085	2101	2090	2144	2108	2144	2151
4	Y	.11937E+01	10850	10855	10854	10868	10866	10866	10868	10866	10867	10883	10882	10913	10891	10928	10933
4	Z	.92551E-03	1194	1165	1156	1143	1134	1132	1143	1132	1141	1178	1168	1221	1185	1295	1310
5	X	.19431E+02	813	808	802	807	801	800	807	800	803	812	805	832	816	834	840
5	Y	.11955E+01	10869	10878	10877	10890	10889	10889	10890	10889	10889	10905	10904	10935	10913	10950	10955
5	Z	.14408E+02	1137	1108	1099	1087	1077	1075	1087	1075	1085	1121	1111	1159	1128	1234	1249
6	X	.28461E+02	676	673	666	674	667	666	674	666	670	682	675	709	686	709	715
6	Y	.23440E+01	5724	5722	5718	5724	5720	5720	5724	5720	5723	5739	5735	5823	5744	5883	5893
6	Z	.17389E+02	1132	1103	1094	1082	1072	1070	1082	1070	1079	1116	1106	1153	1123	1229	1243
7	X	.24978E+03	6	57	57	120	120	120	120	120	120	171	171	172	172	173	173
7	Y	.66302E-03	179	171	160	165	154	153	165	153	164	175	183	183	180	186	199
7	Z	.17528E+02	1129	1101	1091	1079	1069	1067	1079	1067	1077	1113	1103	1150	1120	1226	1240
8	X	.25262E+03	6	57	57	121	121	121	121	121	121	172	172	173	173	174	174
8	Y	.16181E+02	130	124	105	118	99	99	118	99	117	128	110	121	133	125	145
8	Z	.23813E+02	794	765	755	743	733	731	743	731	741	776	765	804	783	865	880
9	X	.25258E+03	6	57	57	121	121	121	121	121	121	172	172	173	173	174	174
9	Y	.25618E+03	98	93	77	88	72	71	88	71	88	97	81	87	101	90	107
9	Z	.17514E+03	224	211	189	203	181	181	203	181	203	222	201	213	233	236	261
10	X	.25235E+03	6	57	57	121	121	121	121	121	121	172	172	173	173	174	174
10	Y	.22437E+03	71	65	53	60	47	46	60	46	59	70	57	65	74	67	81
10	Z	.14689E+03	272	257	235	250	227	227	250	227	250	280	258	275	291	298	324
11	X	.25217E+03	5	57	57	121	121	121	121	121	121	172	172	173	173	174	174
11	Y	.95595E-03	499	489	455	477	440	439	477	439	476	496	462	475	503	481	519
11	Z	.92686E+00	895	879	856	872	847	845	872	845	869	907	884	912	912	964	990
12	X	.25194E+03	5	57	57	121	121	121	121	121	121	172	172	173	173	174	174
12	Y	.20383E+03	58	51	46	40	34	34	40	34	40	55	50	56	58	60	67
12	Z	.10045E+03	344	354	344	378	368	367	378	367	377	410	400	414	413	435	448
13	X	.25189E+03	5	57	57	121	121	121	121	121	121	172	172	173	173	174	174
13	Y	.39417E+03	34	26	21	15	9	9	15	9	15	30	25	29	33	32	38
13	Z	.26896E+02	56	96	94	153	152	152	153	152	153	203	201	207	204	209	210
14	X	.23231E+03	5	57	57	121	121	121	121	121	121	172	172	174	173	174	174
14	Y	.38610E+03	36	28	23	17	11	11	17	11	17	32	27	31	35	34	41
14	Z	.92214E+01	213	202	198	234	229	226	234	226	229	306	301	325	313	329	335

SS-1

 * BMS MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	X	.38972E+01	305	251	247	237	232	230	237	230	234	330	326	346	335	352	358
15	Y	.19994E+03	42	34	29	24	17	17	24	17	24	38	32	38	41	41	47
15	Z	.92466E+01	211	199	195	232	227	224	232	224	227	304	299	323	311	327	332
16	X	.14219E+03	115	126	125	176	175	175	176	175	176	248	247	257	251	260	263
16	Y	.15227E+02	113	96	92	90	86	85	90	85	88	120	116	141	130	141	146
16	Z	.92713E+01	208	197	193	230	225	222	230	222	225	302	297	321	309	325	330
17	X	.15256E+03	119	129	127	178	177	176	178	176	177	250	248	259	253	262	265
17	Y	.40004E-03	54	508	503	501	495	492	501	492	496	541	534	621	557	636	645
17	Z	.60217E+00	1155	1082	1057	1058	1030	1023	1058	1023	1050	1150	1120	1224	1156	1292	1329
18	X	.15240E+03	119	129	127	178	177	176	178	176	177	250	249	260	253	263	265
18	Y	.11487E+03	247	222	219	230	226	224	230	224	225	286	283	320	308	326	329
18	Z	.11024E+03	203	249	244	258	251	245	258	245	249	334	326	362	351	369	375
19	X	.15208E+03	120	129	128	179	177	177	179	177	178	251	249	260	253	263	266
19	Y	.17576E+02	1044	752	719	683	646	627	683	627	656	809	766	798	931	912	951
19	Z	.45723E+02	940	650	626	638	603	573	638	573	602	813	765	809	835	825	866
20	X	.14168E+03	124	132	131	178	177	176	178	176	177	251	249	260	253	263	265
20	Y	.16682E+02	1092	777	745	700	664	646	700	646	676	824	781	804	961	928	967
20	Z	.37755E+02	1024	706	679	700	662	630	700	630	661	889	839	882	913	898	941
21	X	.22999E+02	830	609	595	600	580	564	600	564	580	813	788	819	820	838	860
21	Y	.16667E+02	1092	777	745	700	664	646	700	646	676	824	781	804	961	928	967
21	Z	.10085E+02	1964	1222	1221	1223	1222	1221	1223	1221	1222	1230	1228	1259	1232	1301	305
22	X	.99726E+01	802	584	570	572	555	540	572	540	555	765	742	778	773	807	824
22	Y	.67709E+01	1094	776	744	701	663	644	701	644	674	829	784	811	957	927	963
22	Z	.10113E+02	1965	1223	1222	1223	1222	1222	1223	1222	1222	1231	1229	1260	1233	1301	1305
23	X	.14106E+01	1043	709	700	700	688	678	700	678	688	848	831	905	852	908	983
23	Y	.87176E-03	1040	738	706	664	626	604	664	604	637	806	758	788	905	870	914
23	Z	.10122E+02	1966	1223	1222	1224	1223	1222	1224	1222	1223	1231	1229	1260	1233	1301	1305
24	X	.15675E+01	930	631	614	613	591	575	613	575	585	736	712	758	770	823	837
24	Y	.28123E+01	995	714	686	647	614	597	647	597	626	783	742	776	879	871	910
24	Z	.11636E+02	1696	1055	1053	1056	1053	1052	1056	1052	1053	1074	1070	1114	1077	1184	1190
25	X	.15690E+01	934	633	616	615	593	577	615	577	587	737	713	760	771	825	839
25	Y	.72129E+01	810	550	534	538	518	507	538	507	512	621	604	638	673	731	738
25	Z	.14985E+02	1346	844	839	840	833	828	840	828	831	879	870	922	894	1008	1015
26	X	.15774E+01	947	640	623	622	600	584	622	584	594	742	718	768	775	833	847
26	Y	.23605E+02	1194	779	764	732	712	699	732	699	703	793	774	792	882	895	901
26	Z	.33415E+02	974	635	615	594	567	551	594	551	554	646	624	636	722	728	733
27	X	.28349E+01	1244	797	784	768	752	739	768	739	741	804	790	872	846	894	897
27	Y	.21244E+02	1219	796	781	747	726	713	747	713	717	809	789	807	899	911	917
27	Z	.35052E+02	965	629	609	588	561	545	588	545	549	642	620	629	717	723	728
28	X	.77624E+01	1764	1136	1125	1112	1099	1085	1112	1085	1088	1171	1158	1272	1194	1287	1293
28	Y	.11412E+02	1283	841	824	788	763	748	788	748	753	852	831	848	947	958	964
28	Z	.35058E+02	965	629	609	588	561	545	588	545	549	642	620	629	717	724	728

I-56

 * BM3 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(INERTIA COMPONENT)

MODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
29	X	.12403E+02	1962	1265	1255	1242	1230	1215	1242	1215	1218	1308	1295	1420	1327	1436	1443
29	Y	.24842E+01	1381	910	888	849	818	798	849	798	803	919	892	908	1020	1028	1034
29	Z	.35053E+02	965	629	609	588	561	545	588	545	549	642	620	629	717	724	728
30	X	.12622E+02	2026	1307	1296	1284	1271	1256	1284	1256	1259	1351	1338	1466	1368	1482	1489
30	Y	.43570E-01	933	597	594	571	566	564	571	564	566	615	610	627	683	71	715
30	Z	.33186E+02	931	606	587	567	541	526	567	526	530	620	598	608	693	700	704
31	X	.13005E-06	2424	1567	1556	1541	1528	1511	1541	1511	1516	1608	1595	1739	1619	1756	1763
31	Y	.44560E-06	932	597	594	571	566	564	571	564	566	615	610	627	683	711	715
31	Z	.49332E-06	734	467	457	450	437	430	450	430	433	493	482	497	553	571	575
32	X	.23360E+02	860	634	618	626	605	587	626	587	605	854	826	855	861	871	896
32	Y	.17332E+02	1093	778	746	702	666	650	702	650	679	821	780	800	965	933	971
32	Z	.19077E+02	1964	1222	1221	1223	1222	1221	1223	1221	1222	1230	1229	1259	1232	1301	1305
33	X	.23153E+02	889	657	640	653	629	610	653	610	629	894	865	890	901	903	931
33	Y	.17656E+02	1094	779	748	703	669	653	703	653	682	820	780	798	969	938	975
33	Z	.10067E+02	1965	1222	1221	1223	1222	1221	1223	1221	1222	1230	1229	1259	1232	1301	1305
34	X	.20285E+02	950	712	692	716	689	666	716	666	689	991	956	974	998	983	1015
34	Y	.16732E+02	1099	783	752	707	674	660	707	660	687	821	783	800	975	948	984
34	Z	.10032E+02	1964	1222	1221	1223	1222	1221	1223	1221	1222	1230	1229	1259	1232	1301	1305
35	X	.27113E+01	1403	913	894	923	900	888	923	888	909	1060	1031	1099	1065	1194	1222
35	Y	.31853E+01	1070	729	684	711	666	659	711	659	700	806	760	788	889	936	987
35	Z	.98466E+01	1962	1221	1220	1221	1220	1219	1221	1219	1220	1229	1227	1258	1231	1301	1305
36	X	.62755E-01	1213	861	835	901	870	847	901	847	874	1201	1163	1201	1208	1230	1266
36	Y	.86179E-03	1188	778	706	755	684	679	755	679	749	810	739	762	890	914	992
36	Z	.70526E+01	2210	1378	1378	1378	1377	1377	1378	1377	1378	1380	1379	1394	1382	1402	1404
37	X	.31441E-01	1213	861	835	902	870	848	902	848	875	1201	1163	1202	1208	1231	1267
37	Y	.93528E+01	1580	986	876	997	890	889	997	889	993	1012	907	917	1039	1012	1118
37	Z	.14957E+02	1615	1006	963	1005	963	962	1005	962	1004	1014	973	992	1030	1040	1084
38	X	.70908E-06	1214	861	835	902	870	848	902	848	875	1201	1163	1202	1208	1231	1267
38	Y	.13647E-05	1674	1045	927	1054	939	938	1054	938	1050	1066	953	959	1094	1035	1148
38	Z	.24213E-05	1553	964	925	963	924	924	963	924	963	970	931	946	975	971	1021

1-57

 * BM3 MODEL *

EARTHQUAKE NO. 1

*PIPE END MOMENTS(INERTIA COMPONENT)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	12	15088E+04	-12	2	0	26	24	24	26	24	26	49	48	50	50	51	53
2	18	15221E+04	-23	-5	-7	19	17	17	19	17	19	42	40	42	42	43	44
3	12	39393E+04	-11	-10	-14	-7	-11	-11	-7	-11	-7	2	-1	2	3	4	8
4	12	18762E+04	36	39	33	47	41	41	47	41	47	67	61	65	69	68	75
5	18	23021E+04	30	31	23	34	27	26	34	26	34	49	42	46	52	50	58
6	12	55550E+04	5	13	7	26	21	21	26	21	26	43	38	41	45	44	49
7	18	49414E+04	4	13	8	28	23	23	28	23	28	45	41	43	48	46	51
8	12	55959E+04	58	54	43	51	39	39	51	39	51	61	50	56	65	61	73
9	12	53167E+04	47	42	37	39	34	34	39	34	39	62	58	63	66	67	72
10	12	71477E+04	47	46	36	46	37	37	46	37	46	58	48	52	61	57	67
11	12	56136E+04	4	30	27	66	64	63	66	63	66	98	96	99	100	100	102
12	12	11144E+05	-25	0	7	50	49	49	50	49	50	84	84	85	84	85	85
13	18	92378E+04	-20	13	12	55	55	55	55	55	55	90	90	91	91	91	92
14	12	15264E+05	-58	-11	-20	6	6	6	6	6	6	31	30	32	32	32	33
15	12	37011E+04	54	71	70	105	104	104	105	104	104	152	151	156	155	157	159
16	18	37962E+04	50	53	52	70	69	69	70	69	70	110	109	115	113	117	118
17	12	43505E+04	69	77	76	106	104	104	106	104	104	148	147	158	154	160	161
18	12	50019E+04	-6	10	9	39	39	38	39	38	39	71	71	74	73	75	75
19	18	42058E+04	2	11	10	31	30	30	31	30	30	60	60	64	63	65	66
20	12	13425E+05	-9	20	20	66	66	65	66	65	66	105	104	107	106	107	108
21	12	34184E+04	49	39	37	71	69	68	71	68	69	105	104	108	111	123	124
22	12	26479E+04	95	95	93	146	143	142	146	142	143	198	197	202	203	220	221
23	18	26131E+04	90	89	87	138	136	134	138	134	135	189	187	193	194	209	210
24	12	23848E+04	74	73	71	116	114	113	116	113	113	163	161	167	168	178	179
25	12	74489E+03	350	214	204	198	184	176	198	176	179	222	210	226	253	263	266
26	18	88979E+03	240	141	133	133	122	115	133	115	117	154	145	159	177	189	192
27	12	16175E+04	48	10	7	13	9	7	13	7	8	28	25	29	38	49	50
28	12	24281E+04	-5	-21	-22	-9	-10	-10	-9	-10	-10	6	5	9	11	22	23
29	18	23535E+04	-1	-19	-19	-5	-6	-6	-5	-6	-6	10	9	14	14	27	28
30	12	55960E+04	144	68	64	61	55	52	61	52	52	73	69	71	90	98	99
31	12	10129E+05	84	91	89	140	137	136	140	136	137	193	191	197	200	205	207
32	12	97823E+04	102	101	98	148	145	143	148	143	145	203	200	207	211	216	219
33	12	99482E+04	103	93	90	133	130	128	133	128	130	186	182	189	194	198	202
34	12	95631E+04	-2	32	32	85	84	84	85	84	84	127	126	128	128	31	132
35	18	10034E+05	6	35	35	86	85	85	86	85	85	128	128	130	130	133	134
36	12	69445E+04	76	24	19	35	30	29	35	29	34	47	43	48	54	72	78
37	12	97476E+04	52	17	13	36	32	32	36	32	35	55	52	57	57	78	83

I-58

 * BM3 MODEL *

EARTHQUAKE NO. 1

*SUPPORT FORCES(INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	FORCE (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	.14202E+02	33	30	25	27	22	22	27	22	27	37	33	40	39	41	46
2	1	.78695E+02	8	8	8	8	8	7	8	7	8	9	8	12	9	13	13
3	1	.21390E+02	-10	-12	-17	-14	-18	-18	-14	-18	-14	-8	-13	-9	-6	-3	1
4	1	.73977E+03	9	-3	-9	-5	-11	-11	-5	-11	-5	0	-6	-2	2	4	10
5	1	.15472E+04	-40	-17	-18	11	11	11	11	11	11	35	35	36	36	36	36
6	1	.10898E+04	62	60	57	58	55	55	58	55	58	64	60	70	65	71	75
7	1	.10920E+03	-29	-24	-29	-17	-21	-21	-17	-21	-17	-8	-12	-9	-7	-8	-4
8	1	.21296E+03	-6	-9	-14	-10	-15	-15	-10	-15	-10	-4	-9	-6	-2	0	5
9	1	.88850E+02	35	29	23	22	16	16	22	16	22	32	26	32	35	34	40
10	1	.14771E+03	28	25	15	22	11	11	22	11	22	28	17	20	30	22	33
11	1	.11757E+03	73	84	74	104	96	96	104	96	104	128	120	125	132	131	141
12	1	.85216E+03	-41	-21	-21	6	6	6	6	6	6	31	31	32	32	33	33
13	1	.65145E+02	34	37	36	50	49	49	50	49	50	80	79	88	85	89	90
14	1	.12006E+03	7	10	7	25	23	22	25	22	24	49	47	55	51	56	58
15	1	.80317E+02	119	89	84	114	110	108	114	108	111	153	148	155	171	190	195
16	1	.54670E+03	17	-23	-24	-23	-23	-23	-23	-23	-23	-21	-21	-16	-20	-8	-8
17	1	.71845E+02	125	101	98	126	122	119	126	119	122	189	184	197	191	201	206
18	1	.12401E+03	11	-3	-7	21	18	17	21	17	21	42	39	42	43	63	69
19	1	.97173E+02	106	37	32	40	35	34	40	34	39	47	42	50	48	73	78
20	1	.20767E+04	51	18	14	20	16	15	20	15	17	38	34	38	55	62	65
21	1	.59678E+04	98	33	28	36	32	31	36	31	36	46	41	49	46	73	78
22	1	.80371E+04	4	-1	-5	26	23	23	26	23	26	50	47	50	51	68	73
23	1	.16241E+03	62	94	93	157	156	155	157	155	156	218	217	224	220	227	228
24	1	.14267E+03	57	18	13	8	3	0	8	0	4	26	20	31	42	40	45
25	1	.19904E+02	96	37	34	34	30	27	34	27	28	47	44	60	56	71	72
26	1	.43505E+02	58	25	23	40	38	36	40	36	37	63	61	65	70	93	94
27	1	.64579E+02	74	22	19	21	17	15	21	15	15	33	30	31	44	57	57
28	1	.53555E+04	145	88	84	61	55	52	61	52	53	74	69	70	91	99	99
29	1	.50880E+03	154	72	69	64	60	57	64	57	58	78	74	86	91	98	99
30	1	.15410E+04	135	60	57	53	48	45	53	45	46	66	62	73	79	86	87

65-1

APPENDIX II

APPENDIX II

Cross Comparison

- Table Descriptors
- RHR Model
- Displacement Responses
- Mean Values
- Standard Deviations
- Mean - 1 STD Deviation
- Acceleration Responses
- Mean Values
- Standard Deviations
- Mean - 1 STD Deviation
- Result Pipe Moment Responses
- Mean Values
- Standard Deviations
- Mean - 1 STD Deviation
- Support Force Responses
- Mean Values
- Standard Deviations
- Mean - 1 STD Deviation
- Z-Bend Model
- Displacement Responses
- Acceleration Responses
- Resultant Pipe Moment Responses
- Support Force Responses
- BM1 Model
- Displacement Responses
- Acceleration Responses
- Resultant Pipe Moment Responses
- Support Force Responses

APPENDIX II

Page

●	BM2 Model	
	●	Displacement Responses
	●	Acceleration Responses
	●	Resultant Pipe Moment Responses
	●	Support Force Responses
●	BM3 Model	
	●	Displacement Responses
	●	Acceleration Responses
	●	Resultant Pipe Moment Responses
	●	Support Force Responses

DESCRIPTION OF THE DIFFERENT COMBINATIONS
CONSIDERED IN THE DYNAMIC ANALYSIS:

CASE NUMBER	COMBINATION SEQUENCE
1	:GROUP (ALG)-DIRECTION-MODES
2	:GROUP (ALG)-MODES-DIRECTION
3	:GROUP (SRSS)-DIRECTION-MODES
4	:GROUP (SRSS)-MODES-DIRECTION
5	:MODES-GROUP (SRSS)-DIRECTION
6	:DIRECTION-GROUP (SRSS)-MODES
7	:MODES-DIRECTION-GROUP (SRSS)
8	:DIRECTION-MODES-GROUP (SRSS)
9	:GROUP (ABS)-DIRECTION-MODES
10	:GROUP (ABS)-MODES-DIRECTION
11	:MODES-GROUP (ABS)-DIRECTION
12	:DIRECTION-GROUP (ABS)-MODES
13	:MODES-DIRECTION-GROUP (ABS)
14	:DIRECTION-MODES-GROUP (ABS)

NOTES:

FOR ALL OF THE ABOVE CASES:

- 1) COMBINATION OF MODAL RESPONSES IS BY SRSS WITH A CLUSTERING FACTOR OF 0.1.
- 2) COMBINATION OF DIRECTIONAL COMPONENTS IS BY SRSS.

ABBREVIATIONS, AND SYMBOLS	DESCRIPTION
T. H.	TIME HISTORY DATA
DISP.	DISPLACEMENT (INERTIA COMPONENT)
ACC(DY)	ACCELERATION (INERTIA COMPONENT)
URS	UNIFORM RESPONSE SPECTRUM
FORCE CODES	
1	SUPPORT FORCE (INERTIA COMPONENT)
6	I-END MOMENT (INERTIA COMPONENT)
12	J-END MOMENT (INERTIA COMPONENT)
18	J-END MOMENT (INERTIA COMPONENT, ELBOW ELEMENT)

 * RHRSII MODEL *

 ** MEAN VALUES **

TOTAL NO. OF EARTHQUAKES: 33

*DISPLACEMENT (CROSS COMPARISON)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	1	72	35	34	58	57	58	58	58	58	199	196	244	260	311	313
6	2	67	30	30	39	38	37	39	37	38	153	151	198	196	244	245
6	3	56	21	21	12	12	12	12	12	12	90	89	114	111	136	137
9	1	34	3	3	42	42	42	42	42	42	175	175	215	224	261	261
9	2	33	2	2	68	67	67	68	67	67	231	230	265	294	331	331
9	3	56	22	21	13	13	13	13	13	13	93	92	117	114	139	140
12	1	38	6	6	34	34	34	34	34	34	156	156	196	200	238	238
12	2	26	-2	-3	72	71	71	72	71	71	240	240	269	305	338	339
12	3	52	18	18	21	21	21	21	21	21	118	118	155	150	188	188
16	1	57	22	22	14	14	14	14	14	14	96	95	124	119	151	151
16	2	12	-11	-11	102	102	102	102	102	102	302	302	312	371	382	382
16	3	38	6	6	35	35	35	35	35	35	157	157	196	201	238	238
19	1	8	-16	-16	69	69	69	69	69	69	239	238	256	303	326	327
19	2	12	-11	-11	102	102	102	102	102	102	302	302	312	371	382	382
19	3	7	-17	-17	68	68	68	68	68	68	236	236	255	300	323	323
22	1	9	-16	-16	69	68	68	69	68	68	238	238	256	303	326	326
22	2	12	-13	-13	90	90	90	90	90	90	278	278	290	343	358	358
22	3	7	-14	-14	111	111	111	111	111	111	322	322	331	396	403	403
23	1	9	-16	-16	68	68	68	68	68	68	237	237	255	302	325	326
23	2	12	-13	-13	90	90	90	90	90	90	277	277	289	342	358	358
23	3	7	-14	-14	108	108	108	108	108	108	316	316	327	389	398	398
35	1	-1	-20	-20	107	107	107	107	107	107	315	315	315	389	390	390
35	2	0	-19	-19	110	110	110	110	110	110	321	321	322	397	397	397
35	3	45	16	16	65	59	59	65	59	61	174	167	194	228	262	268
36	1	-2	-20	-20	105	105	105	105	105	105	313	313	313	387	387	387
36	2	0	-19	-19	110	110	110	110	110	110	321	321	321	397	397	397
36	3	0	-19	-19	108	108	108	108	108	108	317	317	318	393	393	393
39	1	-2	-21	-21	104	104	104	104	104	104	309	309	310	382	383	383
39	2	-1	-20	-20	106	106	106	106	106	106	314	314	315	389	389	389
39	3	5	-14	-15	86	85	85	86	85	85	261	260	298	326	336	337
42	1	-1	-20	-20	99	99	99	99	99	99	299	299	301	370	373	373
42	2	-2	-20	-21	102	102	102	102	102	102	304	304	307	377	378	378
42	3	9	-10	-12	84	83	83	84	83	83	252	250	260	315	328	329
45	1	0	-20	-20	98	98	98	98	98	98	297	297	300	368	372	372
45	2	5	-16	-16	90	90	90	90	90	90	279	279	297	348	358	357
45	3	7	-12	-13	93	92	92	93	92	92	274	273	282	341	350	351
50	1	6	-15	-16	107	107	107	107	107	107	315	315	321	390	395	395
50	2	19	-6	-8	60	59	59	60	59	60	212	211	250	289	295	297
50	3	16	-8	-10	79	79	78	79	78	79	252	251	282	316	336	337
57	1	7	-14	-15	79	78	78	79	78	78	254	253	265	318	333	333
57	2	52	18	15	7	3	2	7	2	7	73	68	116	104	136	143
57	3	31	7	6	-3	-5	-7	-3	-7	-6	58	53	61	90	104	107
59	1	24	1	0	1	0	-2	1	-2	-1	74	70	81	108	130	134
59	2	61	24	20	7	1	0	7	0	6	67	59	105	97	123	133
59	3	18	-3	-5	17	16	15	17	15	16	116	113	127	156	182	185
67	1	22	-9	-10	33	32	32	33	32	33	171	170	192	234	252	252
67	2	21	-7	-8	81	81	81	81	81	81	257	257	276	318	340	340
67	3	12	-12	-15	82	82	82	82	82	82	262	262	278	328	346	346
68	1	29	-5	-6	32	31	31	32	31	31	165	165	187	226	246	247
68	2	25	-5	-6	81	80	80	81	80	80	259	256	276	315	339	339
68	3	8	-16	-16	76	76	76	76	76	76	250	250	268	313	332	333

 * RHR511 MODEL *

 ** STANDARD DEVIATION **

TOTAL NO. OF EARTHQUAKES: 33

*DISPLACEMENT (CROSS COMPARISON)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
8	1	32	23	22	27	27	27	27	27	27	54	54	60	64	71	71
8	2	30	23	23	28	28	28	28	28	28	55	55	63	64	72	73
8	3	27	22	22	23	23	23	23	23	23	42	42	47	48	52	52
9	1	24	16	16	28	28	28	28	28	28	57	57	61	65	69	69
9	2	23	15	15	30	30	30	30	30	30	59	59	62	67	71	71
9	3	28	23	23	24	24	24	24	24	24	44	44	50	48	54	54
12	1	25	17	17	28	28	28	28	28	28	56	56	61	63	68	68
12	2	23	14	14	28	28	28	28	28	28	56	56	59	65	68	68
12	3	27	21	21	24	24	24	24	24	24	46	46	54	53	60	60
16	1	26	22	22	23	23	23	23	23	23	41	41	48	46	53	53
16	2	31	18	18	49	49	49	49	49	49	97	97	97	112	113	113
16	3	25	17	17	27	27	27	27	27	27	56	56	60	63	68	68
19	1	18	10	10	22	22	22	22	22	22	44	44	45	50	52	52
19	2	31	18	18	49	49	49	49	49	49	97	97	97	112	113	113
19	3	17	9	9	22	22	22	22	22	22	44	44	45	50	51	51
22	1	18	10	10	22	22	22	22	22	22	43	43	44	50	51	51
22	2	24	14	14	37	37	37	37	37	37	73	73	74	83	84	84
22	3	32	18	18	49	49	49	49	49	49	96	96	97	111	112	112
23	1	18	10	10	22	22	22	22	22	22	43	43	44	50	51	51
23	2	24	14	14	37	37	37	37	37	37	72	72	73	82	84	84
23	3	30	16	16	45	45	45	45	45	45	88	88	89	101	102	102
35	1	36	18	18	45	45	45	45	45	45	91	91	91	107	107	107
35	2	38	18	18	47	47	47	47	47	47	93	93	93	111	111	111
35	3	14	10	9	16	16	16	16	16	16	33	33	36	37	39	39
36	1	35	17	17	45	45	45	45	45	45	90	90	90	106	106	106
36	2	38	18	18	46	46	46	46	46	46	93	93	93	111	111	111
36	3	37	18	18	45	45	45	45	45	45	91	91	91	108	109	109
39	1	34	17	17	44	44	44	44	44	44	88	88	88	104	104	104
39	2	36	17	17	44	44	44	44	44	44	89	89	89	105	105	105
39	3	23	14	14	39	39	39	39	39	39	79	79	79	90	90	90
42	1	32	17	17	44	44	44	44	44	44	88	88	88	102	102	102
42	2	33	16	16	40	40	40	40	40	40	81	81	81	96	96	96
42	3	22	14	14	37	37	37	37	37	37	75	75	76	86	85	85
45	1	31	17	17	44	44	44	44	44	44	88	88	88	102	102	102
45	2	31	14	14	33	33	33	33	33	33	66	66	67	81	81	81
45	3	25	15	14	39	39	39	39	39	39	79	79	80	92	91	91
50	1	34	19	19	48	48	48	48	48	48	95	95	96	112	112	112
50	2	28	13	12	20	20	19	20	19	20	41	41	43	51	51	51
50	3	28	12	12	24	24	24	24	24	24	50	49	51	60	61	61
57	1	25	14	14	33	33	33	33	33	33	65	65	66	76	77	77
57	2	30	16	15	12	11	11	12	11	11	17	18	19	22	22	23
57	3	12	8	7	8	8	8	8	8	8	16	16	17	19	22	22
59	1	11	7	7	11	11	11	11	11	11	23	23	25	26	28	29
59	2	30	16	15	12	12	11	12	11	12	17	16	19	21	21	22
59	3	12	8	8	17	17	17	17	17	17	34	35	36	38	39	40
67	1	28	11	11	21	21	21	21	21	21	46	46	51	56	58	58
67	2	24	15	15	35	35	35	35	35	35	70	70	73	79	83	83
67	3	23	13	13	33	33	33	33	33	33	66	66	67	75	76	76
68	1	29	12	12	23	23	23	23	23	23	49	49	54	58	62	62
68	2	25	16	16	37	37	37	37	37	37	72	72	76	82	86	86
68	3	20	11	11	28	28	28	28	28	28	56	56	57	63	64	64

 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** MEAN - 1XSTD. DEVIATION **

*DISPLACEMENT(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	1	40	12	11	30	29	28	30	28	29	144	142	183	198	240	241
6	2	37	6	6	10	9	9	10	9	9	97	96	135	132	171	172
6	3	28	0	0	-10	-11	-11	-10	-11	-11	48	47	68	65	84	85
9	1	10	-12	-12	13	13	13	13	13	13	117	117	153	159	192	192
9	2	9	-13	-13	38	37	37	38	37	37	171	170	202	228	259	260
9	3	27	-1	-1	-10	-11	-11	-10	-11	-11	48	48	67	65	85	85
12	1	13	-10	-10	6	6	6	6	6	6	100	100	135	138	169	169
12	2	2	-17	-18	43	43	42	43	42	43	184	183	210	240	270	271
12	3	26	-3	-3	-2	-2	-2	-2	-2	-2	71	71	101	96	127	127
16	1	31	0	0	-8	-8	-8	-8	-8	-8	54	53	75	73	97	97
16	2	-18	-30	-30	53	53	53	53	53	53	204	204	214	258	269	269
16	3	13	-10	-10	7	7	7	7	7	7	100	100	138	137	170	170
19	1	-9	-26	-26	47	46	46	47	46	46	194	194	211	252	274	275
19	2	-18	-30	-30	53	53	53	53	53	53	204	204	214	258	269	269
19	3	-9	-26	-26	46	45	45	46	45	45	192	192	210	249	272	272
22	1	-9	-26	-26	46	46	46	46	46	46	194	194	211	252	275	275
22	2	-12	-27	-27	53	53	53	53	53	53	204	204	216	259	273	273
22	3	-24	-32	-32	62	62	62	62	62	62	225	225	234	284	291	291
23	1	9	-26	-26	46	46	46	46	46	46	194	193	211	251	274	274
23	2	-12	-27	-27	53	53	53	53	53	53	204	204	216	259	274	274
23	3	-22	-31	-31	63	63	63	63	63	63	227	227	237	288	296	296
35	1	-37	-38	-38	61	61	61	61	61	61	224	224	224	282	282	282
35	2	-38	-38	-38	63	63	63	63	63	63	227	227	228	285	285	285
35	3	31	5	0	48	43	42	48	42	45	141	133	158	191	223	228
36	1	-37	-38	-38	60	60	60	60	60	60	222	222	223	281	281	281
36	2	-38	-38	-38	63	63	63	63	63	63	227	227	228	285	285	285
36	3	-38	-38	-38	62	62	62	62	62	62	226	226	227	284	284	284
39	1	-37	-38	-38	59	59	59	59	59	59	220	220	221	278	279	279
39	2	-38	-38	-38	61	61	61	61	61	61	225	225	225	283	283	283
39	3	-18	-29	-30	46	45	45	46	45	45	182	181	188	235	245	246
42	1	-33	-38	-38	54	54	54	54	54	54	211	211	213	268	270	270
42	2	-35	-37	-37	61	61	61	61	61	61	223	223	226	280	282	282
42	3	-12	-25	-26	46	45	45	46	45	45	176	175	184	229	242	243
45	1	-31	-37	-37	53	53	53	53	53	53	208	208	211	265	269	269
45	2	-26	-31	-31	57	57	57	57	57	57	213	212	229	266	275	276
45	3	-18	-27	-28	53	52	52	53	52	52	194	193	201	249	258	259
50	1	-28	-34	-35	59	59	59	59	59	59	219	219	225	277	282	282
50	2	-9	-20	-21	40	39	39	40	39	40	171	170	207	218	244	245
50	3	-12	-21	-22	54	54	53	54	53	54	202	201	230	255	274	276
57	1	-17	-28	-29	45	45	45	45	45	45	188	188	198	242	256	256
57	2	22	2	0	-4	-7	-8	-4	-8	-4	56	51	96	81	113	119
57	3	18	0	-1	-12	-14	-16	-12	-16	-15	41	37	43	70	81	84
59	1	13	-6	-7	-10	-12	-13	-10	-13	-12	51	47	56	82	101	104
59	2	30	8	4	-5	-10	-11	-5	-11	-6	50	43	86	75	102	110
59	3	5	-12	-13	0	0	-2	0	-2	-1	81	78	90	118	142	145
67	1	-8	-21	-21	12	11	11	12	11	11	124	123	141	178	193	194
67	2	-2	-23	-23	45	45	45	45	45	45	187	187	203	238	257	257
67	3	-11	-26	-28	49	48	48	49	48	48	196	196	211	252	269	269
68	1	0	-17	-18	8	8	8	8	8	8	116	115	132	168	183	184
68	2	0	-22	-22	44	43	43	44	43	43	183	182	200	233	252	253
68	3	-11	-27	-28	47	47	47	47	47	47	194	193	210	250	268	268

 * RHRSI1 MODEL *

 ** MEAN VALUES **

TOTAL NO. OF EARTHQUAKES: 33

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	1	1567	1260	1243	1164	1131	1082	1164	1082	1106	2092	2021	2065	2665	2655	2695
6	2	990	789	779	724	703	673	724	673	687	1334	1290	1353	1704	1714	1739
6	3	392	298	292	265	258	249	265	249	254	530	516	603	662	718	727
9	1	269	198	193	182	177	170	182	170	174	395	384	455	503	562	568
9	2	924	731	721	678	658	629	678	629	643	1267	1215	1264	1609	1631	1655
9	3	464	356	352	322	313	301	322	301	307	630	611	701	793	844	854
12	1	181	105	105	97	98	94	97	94	95	244	241	304	298	363	364
12	2	858	674	665	631	612	585	631	585	598	1177	1138	1190	1506	1541	1564
12	3	174	114	114	99	98	97	99	97	98	239	238	288	280	333	334
16	1	251	179	177	159	155	152	159	152	154	340	334	406	410	472	476
16	2	126	75	72	138	136	134	138	134	135	350	346	387	428	480	483
16	3	136	84	84	77	76	76	77	76	78	209	208	260	249	305	305
19	1	76	30	26	87	83	82	87	82	84	260	255	295	330	369	372
19	2	125	74	72	138	136	134	138	134	135	349	346	386	427	479	482
19	3	77	30	26	86	81	81	86	81	83	258	250	294	322	360	364
22	1	79	33	29	87	84	83	87	83	85	261	257	298	333	376	379
22	2	72	28	25	105	105	105	105	105	105	298	298	327	363	392	392
22	3	126	61	56	153	148	144	153	144	146	397	392	490	460	540	545
23	1	80	33	30	88	84	83	88	83	85	262	257	299	333	377	380
23	2	71	27	25	105	104	104	105	104	104	298	297	325	362	391	391
23	3	144	74	65	165	157	152	165	152	156	415	406	507	483	563	572
35	1	21	-5	-5	111	111	111	111	111	111	322	321	340	397	411	412
35	2	15	-9	-10	104	104	104	104	104	104	310	310	319	385	394	394
35	3	375	276	252	311	290	281	311	281	291	568	534	657	710	871	898
36	1	18	-7	-8	106	106	106	106	106	106	313	313	325	386	397	397
36	2	17	-8	-9	105	105	105	105	105	105	312	312	323	387	397	397
36	3	167	96	79	158	152	148	158	148	150	407	399	478	498	557	584
39	1	30	0	0	103	102	102	103	102	103	304	304	320	376	394	395
39	2	59	22	17	126	123	122	126	122	126	342	338	380	422	447	458
39	3	164	115	106	183	172	171	183	171	176	321	304	347	409	464	475
42	1	69	25	24	91	91	91	91	91	91	279	278	309	350	384	384
42	2	245	167	151	191	174	170	191	170	188	395	372	505	484	589	624
42	3	191	137	126	201	189	188	201	188	193	350	330	390	445	520	532
45	1	94	45	43	101	99	99	101	99	100	290	288	332	366	417	421
45	2	560	413	393	352	334	324	352	324	344	659	633	831	798	962	1000
45	3	277	201	185	252	237	233	252	233	241	450	427	528	569	693	715
50	1	392	256	221	302	281	276	302	276	289	601	574	686	745	869	898
50	2	595	442	422	373	358	347	373	347	363	696	673	867	845	1034	1067
50	3	625	461	434	413	396	383	413	383	397	797	772	986	975	1207	1241
57	1	1369	1088	1072	922	899	871	922	871	884	1528	1476	1578	1872	2014	2045
57	2	582	439	421	332	305	299	332	299	328	531	490	558	643	663	706
57	3	2084	1678	1663	1390	1361	1317	1390	1317	1332	2261	2184	2191	2764	2745	2777
59	1	2028	1630	1615	1352	1322	1279	1352	1279	1296	2200	2124	2139	2688	2681	2720
59	2	626	470	443	363	328	320	363	320	356	598	547	653	724	779	836
59	3	1953	1569	1553	1304	1274	1233	1304	1233	1250	2123	2049	2076	2594	2605	2645
67	1	241	149	133	163	153	149	163	149	154	412	400	490	532	606	620
67	2	94	42	37	115	113	112	115	112	113	316	314	368	382	428	430
67	3	540	379	317	344	310	304	344	304	310	611	563	684	789	900	914
68	1	224	136	118	153	143	139	153	139	144	389	377	474	496	574	587
68	2	100	46	41	120	117	116	120	116	117	324	320	382	389	440	443
68	3	168	99	81	134	122	120	134	120	124	310	294	365	387	448	459

11-7

* RHRSII MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** STANDARD DEVIATION **

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	1	705	602	591	583	565	540	583	540	555	1031	997	1009	1303	1288	1311
6	2	610	527	518	511	496	475	511	475	487	910	881	906	1148	1139	1159
6	3	394	334	329	326	319	308	326	308	314	580	568	633	711	744	754
9	1	158	132	130	132	129	124	132	124	127	237	231	257	293	310	314
9	2	325	274	269	268	259	248	268	248	255	478	463	471	604	600	611
9	3	462	395	389	387	377	363	387	363	371	689	670	737	852	878	891
12	1	108	87	86	89	88	87	89	87	88	160	158	187	188	215	216
12	2	261	215	212	211	204	196	211	198	201	378	366	374	477	475	484
12	3	140	109	109	109	108	107	109	107	108	190	189	219	214	244	245
16	1	232	188	188	187	184	180	187	180	182	327	321	373	385	423	428
16	2	70	57	56	77	76	75	77	75	75	145	144	157	170	185	187
16	3	94	73	73	76	76	75	76	75	75	138	136	160	155	180	180
19	1	42	26	26	41	40	40	41	40	40	80	80	89	94	102	103
19	2	70	57	58	76	76	75	76	75	75	145	143	157	169	185	186
19	3	42	27	26	41	40	40	41	40	41	81	80	90	94	101	102
22	1	43	27	26	41	40	40	41	40	40	81	80	89	95	104	104
22	2	49	37	37	62	61	61	62	61	61	119	119	128	136	145	145
22	3	52	41	40	72	72	70	72	70	70	146	145	174	161	185	187
23	1	43	27	27	41	40	40	41	40	41	81	80	90	95	104	105
23	2	48	37	37	62	61	61	62	61	61	120	119	128	137	145	146
23	3	55	42	40	70	69	68	70	68	67	140	139	166	156	178	180
35	1	34	21	20	52	52	52	52	52	52	103	103	105	119	120	120
35	2	30	18	18	49	49	49	49	49	49	96	96	97	110	111	111
35	3	178	151	142	160	151	147	160	147	151	279	266	317	338	400	412
38	1	31	20	20	51	51	51	51	51	51	102	102	103	117	118	118
38	2	31	19	19	49	49	49	49	49	49	98	97	99	112	113	113
38	3	66	40	37	59	58	57	59	57	58	117	116	134	135	148	149
39	1	30	21	21	53	53	53	53	53	53	105	105	107	121	122	122
39	2	43	25	24	51	51	51	51	51	51	102	101	107	120	122	124
39	3	88	75	71	99	95	95	95	95	97	160	154	174	193	214	218
42	1	36	30	30	57	57	57	57	57	57	113	113	120	128	136	136
42	2	75	66	60	74	70	68	74	68	73	132	127	163	154	178	187
42	3	98	83	79	104	100	99	104	99	101	168	162	190	205	236	241
45	1	45	39	38	62	62	62	62	62	62	122	122	133	140	154	156
45	2	239	202	193	184	177	172	184	172	180	315	304	389	374	445	461
45	3	128	109	103	123	117	115	123	115	118	211	203	248	256	303	313
50	1	146	125	113	135	128	126	135	126	131	237	228	265	283	327	337
50	2	253	218	209	197	190	185	197	185	192	337	327	410	404	483	498
50	3	260	222	211	208	202	195	208	195	201	373	363	451	449	537	552
57	1	468	353	349	289	282	276	289	276	278	458	440	462	551	585	591
57	2	269	234	224	190	177	175	190	175	188	275	257	289	326	336	356
57	3	799	609	603	498	487	473	498	473	478	788	761	762	956	949	958
59	1	765	573	568	466	455	443	465	443	447	735	710	713	889	888	896
59	2	304	262	248	215	198	194	215	194	212	324	300	353	384	413	441
59	3	728	547	542	443	434	423	443	423	427	700	676	683	846	849	859
67	1	94	61	57	65	62	61	65	61	62	129	126	150	157	175	179
67	2	57	45	43	70	69	69	70	69	69	135	134	154	153	170	170
67	3	167	122	107	112	104	103	112	103	104	181	170	202	230	261	265
68	1	86	63	58	66	64	63	66	63	64	131	128	154	159	179	183
68	2	58	45	44	70	69	69	70	69	69	137	136	158	154	173	174
68	3	67	51	46	58	53	52	56	52	53	97	94	112	117	133	135

* RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** MEAN - 1XSTD. DEVIATION **

*ACCELERATION(INERTIA COMPONENT)

NODE NO.	COMP. NO.	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
8	1	861	657	651	581	568	541	581	541	551	1060	1024	1055	1361	1367	1383
8	2	380	261	260	212	207	197	212	197	200	424	408	447	556	575	579
8	3	-2	-37	-36	-61	-60	-58	-61	-58	-60	-49	-49	-29	-48	-25	-27
9	1	112	63	63	50	48	45	50	45	46	158	153	198	209	252	253
9	2	599	456	451	410	398	380	410	380	388	779	752	792	1005	1030	1043
9	3	1	-38	-37	-65	-63	-62	-65	-62	-64	-59	-59	-36	-59	-34	-37
12	1	53	18	18	7	7	7	7	7	7	83	85	117	110	147	148
12	2	595	458	453	419	407	389	419	389	397	799	771	816	1029	1065	1080
12	3	34	5	5	-9	-9	-10	-9	-10	-9	49	48	68	66	89	89
16	1	19	-9	-9	-28	-28	-28	-28	-28	-28	13	12	32	25	48	47
16	2	55	17	16	61	60	59	61	59	59	204	202	229	258	294	295
16	3	42	10	10	0	0	0	0	0	0	72	72	99	94	125	125
19	1	34	3	0	46	42	42	46	42	43	179	175	208	235	267	269
19	2	54	17	15	61	60	58	61	58	59	204	202	229	257	294	295
19	3	34	3	0	44	41	40	44	40	42	174	169	203	228	258	261
22	1	36	5	2	46	43	43	46	43	44	180	176	208	238	272	274
22	2	23	-9	-11	43	43	43	43	43	43	178	178	198	226	246	246
22	3	74	20	16	80	76	74	80	74	75	251	246	316	298	354	358
23	1	36	5	3	46	43	43	46	43	44	180	176	208	238	272	275
23	2	23	-10	-11	43	42	42	43	42	42	177	177	196	225	245	245
23	3	89	32	25	95	88	85	95	85	88	275	266	341	327	385	392
35	1	-13	-26	-26	59	59	59	59	59	59	219	218	235	278	290	291
35	2	-14	-28	-29	55	55	55	55	55	55	213	213	221	274	282	282
35	3	197	124	110	151	138	134	151	134	140	288	266	339	372	471	485
36	1	-13	-28	-28	55	55	55	55	55	55	210	210	221	269	279	279
36	2	-13	-27	-28	56	56	55	56	55	56	214	214	223	274	283	283
36	3	101	55	41	99	93	90	99	90	92	289	282	344	363	409	415
39	1	0	-21	-21	49	49	49	49	49	49	198	198	213	256	272	272
39	2	15	-2	-7	74	71	71	74	71	74	240	237	273	301	324	334
39	3	78	40	34	84	77	76	84	76	79	161	149	172	216	250	258
42	1	33	-5	-5	34	34	34	34	34	34	165	165	188	222	247	248
42	2	169	101	90	117	104	101	117	101	114	263	245	342	329	410	436
42	3	93	53	46	97	89	88	97	88	91	181	168	199	240	284	291
45	1	49	5	4	38	37	37	38	37	38	168	166	198	225	262	265
45	2	321	210	200	157	157	152	167	152	163	344	328	442	423	517	538
45	3	148	91	82	129	119	118	129	118	122	238	223	280	313	389	402
50	1	245	130	108	167	153	150	167	150	158	364	346	420	461	541	558
50	2	342	223	213	176	167	162	176	162	171	358	345	458	440	550	569
50	3	364	238	223	204	194	187	204	187	195	423	408	534	525	670	689
57	1	900	734	722	633	616	595	633	595	606	1072	1035	1116	1321	1428	1453
57	2	313	205	196	141	127	124	141	124	139	255	233	269	316	327	350
57	3	1284	1069	1060	892	873	842	892	843	854	1473	1423	1428	1808	1796	1818
59	1	1263	1056	1046	887	866	836	887	836	848	1464	1413	1425	1799	1795	1823
59	2	322	207	195	147	129	125	147	125	143	274	247	300	339	365	395
59	3	1224	1021	1011	860	839	810	860	810	823	1422	1372	1393	1746	1756	1786
67	1	146	87	76	98	91	88	98	88	91	283	274	339	374	431	440
67	2	38	-2	-5	45	43	43	45	43	44	181	179	213	228	258	259
67	3	372	257	209	231	205	200	231	200	205	429	392	482	559	638	648
68	1	137	72	60	86	78	76	86	76	79	257	248	320	336	395	404
68	2	42	0	-2	49	47	46	49	46	47	187	184	224	235	267	269
68	3	101	47	34	78	69	68	78	68	70	212	200	252	270	315	323

 * RHR511 MODEL *
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 ** MEAN VALUES **

TOTAL NO. OF EARTHQUAKES: 33

*MOMENTS AND FORCES (CROSS COMPARISON)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	6	57	23	22	15	14	14	15	14	14	96	95	121	118	145	145
2	6	61	25	24	66	66	65	66	65	65	217	216	257	272	312	312
3	12	54	9	8	54	54	54	54	54	54	199	199	238	254	293	293
6	12	-9	13	13	45	45	45	45	45	45	178	175	213	223	261	261
9	12	80	9	8	57	57	57	57	57	57	202	201	234	252	283	284
16	12	350	18	18	59	59	59	59	59	59	211	211	246	273	304	305
19	12	41	0	0	91	90	90	91	90	90	278	277	301	346	371	371
20	12	30	-1	-2	107	106	106	107	106	107	311	311	329	384	401	402
21	12	20	-8	-8	80	79	79	80	79	79	260	259	285	329	355	356
22	6	51	13	12	105	105	104	105	104	105	308	305	324	379	399	400
32	12	6	-19	-19	105	104	104	105	104	105	309	309	310	383	384	384
33	12	-2	-19	-20	101	101	101	101	101	101	302	302	365	375	377	378
36	12	50	13	12	124	124	123	124	123	124	343	342	355	424	439	440
39	12	6	-16	-16	110	110	110	110	110	110	321	321	323	397	400	400
42	12	3	-19	-19	107	107	107	107	107	107	315	315	316	389	390	390
47	12	102	-2	-2	86	86	85	86	85	86	268	267	286	336	354	355
54	12	256	23	21	91	90	89	91	89	91	268	266	301	335	365	369
59	12	84	43	39	24	18	15	24	15	22	96	86	122	132	158	168
60	6	42	5	4	65	64	64	65	64	65	226	226	252	290	320	320
61	12	26	-8	-9	87	87	87	87	87	87	274	274	293	346	366	368
62	12	-2	-12	-12	79	79	79	79	79	79	259	258	277	325	347	348
70	12	89	39	31	102	99	99	102	99	99	285	281	325	351	389	391

11-10

 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** STANDARD DEVIATION **

*MOMENTS AND FORCES (INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	6	27	22	22	24	24	24	24	24	24	43	43	49	47	54	54
2	6	26	20	20	33	33	33	33	33	33	66	66	70	74	80	80
3	12	26	16	16	29	29	29	29	29	29	59	59	63	67	72	72
6	12	19	18	18	30	30	30	30	30	30	61	61	66	69	74	74
9	12	29	15	15	26	26	26	26	26	26	53	53	55	59	61	61
16	12	69	16	16	21	21	21	21	21	21	43	43	47	49	53	53
19	12	21	12	11	29	29	29	29	29	29	57	57	59	65	67	67
20	12	27	16	16	41	41	41	41	41	41	80	80	82	92	94	94
21	12	22	13	13	29	29	29	29	29	29	58	58	59	64	67	67
22	6	22	12	12	31	31	31	31	31	31	62	62	63	68	69	69
32	12	36	17	17	43	43	43	43	43	43	86	86	88	101	101	101
33	12	32	16	16	40	40	40	40	40	40	80	80	80	94	95	95
36	12	31	19	19	41	41	41	41	41	41	83	83	84	97	99	99
39	12	38	18	18	45	45	45	45	45	45	90	90	90	108	108	108
42	12	38	18	18	45	45	45	45	45	45	90	90	90	107	107	107
47	12	61	15	14	29	29	29	29	29	29	59	59	60	70	71	71
54	12	66	15	14	22	22	22	22	22	22	44	44	46	53	55	55
59	12	27	14	14	11	11	10	11	10	11	16	15	17	21	21	23
60	6	25	11	11	24	24	24	24	24	24	48	48	52	54	57	57
61	12	22	10	10	23	23	23	23	23	23	45	45	46	53	54	54
62	12	16	10	10	24	24	24	24	24	24	48	48	49	56	57	57
70	12	39	28	26	38	37	37	38	37	37	74	73	82	86	94	94

 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** MEAN - 1XSTD. DEVIATION **

*MOMENTS AND FORCES (INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	6	30	0	0	-8	-9	-9	-8	-9	-9	52	52	71	76	90	91
2	6	35	5	4	33	32	32	33	32	32	151	150	186	187	231	232
3	12	27	-7	-7	25	24	24	25	24	24	140	139	174	187	221	221
6	12	-28	-5	-5	14	14	14	14	14	14	114	114	147	153	186	186
9	12	50	-6	-6	31	30	30	31	30	30	148	148	179	193	222	222
16	12	281	1	1	38	38	37	38	37	38	167	167	199	223	251	251
19	12	20	-12	-12	62	61	61	62	61	61	220	219	242	281	303	304
20	12	3	-18	-18	63	65	65	66	65	65	230	230	246	291	307	308
21	12	-1	-21	-21	50	50	50	50	50	50	202	201	226	264	288	238
22	6	28	1	0	74	73	73	74	73	73	243	243	260	311	329	330
32	12	-29	-36	-36	61	61	61	61	61	61	223	222	224	281	282	282
33	12	-34	-35	-36	61	61	61	61	61	61	222	222	225	280	282	283
36	12	18	-6	-6	83	82	82	83	82	82	260	259	271	327	340	341
39	12	-31	-34	-34	64	64	64	64	64	64	230	230	233	288	291	291
42	12	-34	-37	-38	61	61	61	61	61	61	224	224	228	282	283	283
47	12	41	-17	-17	57	56	56	57	56	57	209	208	226	266	282	284
54	12	189	8	6	68	67	67	68	67	68	223	221	255	282	310	313
59	12	57	29	25	12	6	4	12	4	10	79	71	104	110	136	145
60	6	17	-6	-7	41	40	40	41	40	40	177	177	199	236	262	262
61	12	4	-19	-19	64	64	64	64	64	64	229	228	246	292	312	312
62	12	-18	-22	-23	55	54	54	55	54	54	210	210	227	269	290	290
70	12	49	11	5	64	61	61	64	61	62	211	207	242	265	295	295

 * RHR511 MODEL *

 ** MEAN VALUES **

TOTAL NO. OF EARTHQUAKES: 33

*MOMENTS AND FORCES(CROSS COMPARISON)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	1	13	-11	-11	101	101	101	101	101	101	300	300	312	369	381	381
11	1	48	16	16	17	16	16	17	16	17	104	103	128	127	149	150
12	1	35	3	2	41	39	39	41	39	40	167	165	208	207	242	244
13	1	13	-11	-11	100	100	100	100	100	100	298	298	309	367	378	378
14	1	0	-22	-22	79	79	79	79	79	79	267	267	267	321	330	330
15	1	-13	-32	-32	49	48	48	49	48	48	197	197	211	251	266	266
16	1	28	0	-2	102	101	101	102	101	101	295	293	312	366	384	386
17	1	14	-13	-14	65	65	65	65	65	65	229	229	247	290	309	310
18	1	21	0	-3	75	72	72	75	72	73	214	210	228	271	292	295
19	1	23	-6	-9	73	72	71	73	71	73	244	242	276	307	330	335
20	1	48	21	19	6	3	0	6	0	2	68	62	82	103	123	128
21	1	12	-11	-12	104	104	104	104	104	104	309	308	318	382	392	393
22	1	70	30	22	16	8	6	16	6	14	93	82	137	128	162	176
23	1	20	-7	-12	72	71	71	72	71	71	237	235	253	299	318	318
24	1	17	-12	-14	51	51	50	51	50	51	197	197	222	247	272	272

 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** STANDARD DEVIATION **

*MOMENTS AND FORCES (INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	1	32	19	19	50	50	50	50	50	50	100	100	101	115	116	116
11	1	27	21	21	26	26	26	26	26	26	49	49	55	54	58	58
12	1	21	15	15	27	27	27	27	27	27	54	54	59	60	64	64
13	1	30	18	18	47	47	47	47	47	47	93	93	94	108	109	109
14	1	27	14	13	31	31	31	31	31	31	63	63	64	76	77	77
15	1	17	10	10	30	30	30	30	30	30	58	58	58	63	64	64
16	1	28	16	15	35	35	35	35	35	35	70	70	71	81	83	83
17	1	21	14	14	35	35	35	35	35	35	69	69	70	77	78	79
18	1	20	14	13	32	32	32	32	32	32	66	66	68	75	75	75
19	1	28	14	13	25	25	25	25	25	25	52	51	55	62	64	64
20	1	9	6	5	7	7	6	7	6	6	13	12	14	16	17	18
21	1	32	18	18	47	47	47	47	47	47	93	93	94	108	109	110
22	1	23	14	12	12	11	11	12	11	12	20	19	24	26	28	30
23	1	21	12	12	30	30	30	30	30	30	59	59	60	67	67	67
24	1	19	13	13	24	24	24	24	24	24	48	48	52	55	59	59

 * RHRSI1 MODEL *

TOTAL NO. OF EARTHQUAKES: 33

** MEAN - 1XSTD. DEVIATION **

*MOMENTS AND FORCES (INERTIA COMPONENT)

ELEM. NO.	FORCE CODE	URS	CASE NUMBERS (PERCENTAGE)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	1	-19	-31	-31	51	51	51	51	51	51	200	200	210	253	264	264
11	1	20	-5	-5	-9	-9	-9	-9	-9	-9	55	54	73	73	90	91
12	1	13	-12	-13	14	12	12	14	12	13	112	111	149	147	178	179
13	1	-17	-30	-30	53	53	53	53	53	53	205	205	215	259	269	269
14	1	-27	-36	-36	47	47	47	47	47	47	194	193	203	244	253	253
15	1	-30	-43	-43	18	18	18	18	18	18	139	139	152	187	201	201
16	1	0	-15	-18	67	66	65	67	65	66	224	223	240	284	301	302
17	1	-6	-28	-28	30	30	30	30	30	30	160	160	176	212	230	231
18	1	1	-14	-17	43	40	40	43	40	41	147	144	159	196	216	220
19	1	-5	-20	-23	47	46	45	47	45	47	192	190	221	244	266	270
20	1	38	15	13	-1	-3	-5	-1	-5	-4	55	49	68	87	105	109
21	1	-20	-30	-31	57	57	57	57	57	57	215	214	223	273	282	283
22	1	46	15	9	4	-2	-4	4	-4	2	72	62	113	101	134	146
23	1	0	-20	-24	42	41	40	42	40	41	177	176	193	232	250	250
24	1	-2	-26	-27	26	26	26	26	26	26	149	148	170	192	212	213

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.57644E-06	207	127	126	72	72	71	72	71	71	145	144	146	183	196	196
1	Y	.26596E-06	368	204	203	146	146	145	146	145	145	264	264	265	287	292	292
1	Z	.29555E-05	-8	-14	-14	-11	-11	-11	-11	-11	-11	33	33	34	33	34	34
2	X	.72935E-06	207	127	126	72	72	71	72	71	71	144	144	146	183	196	196
2	Y	.97898E-06	369	204	203	146	146	145	146	145	145	264	264	266	287	292	292
2	Z	.46632E-02	-11	-18	-18	-14	-14	-14	-14	-14	-14	29	29	29	29	29	29
3	X	.21806E-05	207	127	126	72	72	71	72	71	71	144	144	146	183	196	196
3	Y	.21803E-04	371	205	204	147	147	146	147	146	146	265	265	267	288	292	293
3	Z	.12819E-01	-11	-18	-18	-14	-14	-14	-14	-14	-14	29	29	29	29	29	29
4	X	.34934E-05	207	127	126	72	72	71	72	71	71	144	144	146	183	196	196
4	Y	.65133E-04	371	205	204	147	147	146	147	146	146	266	266	267	288	292	293
4	Z	.20107E-01	-11	-18	-18	-14	-14	-14	-14	-14	-14	29	29	29	29	29	29
5	X	.25280E-04	207	127	126	72	72	71	72	71	71	145	144	146	183	196	196
5	Y	.10824E-02	377	207	207	149	149	149	149	149	149	269	269	270	291	294	295
5	Z	.51495E-01	-12	-18	-18	-14	-14	-14	-14	-14	-14	28	28	28	28	28	28
6	X	.46913E-04	207	127	126	72	72	71	72	71	71	145	144	146	183	196	196
6	Y	.18414E-03	391	215	215	156	156	156	156	156	156	280	280	280	302	303	303
6	Z	.61264E-02	-12	-19	-19	-15	-15	-15	-15	-15	-15	27	27	27	27	27	27
7	X	.47457E-04	207	127	126	72	72	71	72	71	71	145	144	146	183	196	196
7	Y	.16472E-04	371	204	204	146	146	146	146	146	146	265	265	266	287	293	293
7	Z	.72897E-04	-13	-20	-20	-16	-16	-16	-16	-16	-16	25	25	25	25	25	25
8	X	.48024E-04	207	127	126	72	72	71	72	71	71	145	144	146	183	196	196
8	Y	.23095E-03	388	213	213	154	154	154	154	154	154	277	277	277	299	301	301
8	Z	.64823E-02	-12	-19	-19	-15	-15	-15	-15	-15	-15	26	26	27	26	27	27
8A	X	.50353E-04	207	127	126	72	72	71	72	71	71	145	144	146	183	196	196
8A	Y	.67772E-03	390	214	214	155	155	155	155	155	155	279	279	279	301	302	302
8A	Z	.18609E-01	-12	-19	-19	-15	-15	-15	-15	-15	-15	26	26	27	26	27	27
9	X	.52844E-04	207	127	127	72	72	71	72	71	71	145	145	146	183	196	196
9	Y	.12657E-02	392	215	215	156	156	156	156	156	156	280	280	280	302	304	304
9	Z	.32985E-01	-13	-19	-19	-15	-15	-15	-15	-15	-15	26	26	27	26	27	27
10	X	.64254E-04	207	127	127	72	72	71	72	71	71	145	145	146	183	196	196
10	Y	.49861E-02	402	222	222	162	162	162	162	162	162	288	288	288	311	312	312
10	Z	.11173E+00	-13	-19	-19	-15	-15	-15	-15	-15	-15	26	26	26	26	26	26
11	X	.73112E-04	207	127	127	72	72	71	72	71	71	145	145	146	183	196	196
11	Y	.83589E-02	414	229	229	167	167	167	167	167	167	297	297	297	320	320	320
11	Z	.17843E+00	-13	-20	-20	-16	-16	-16	-16	-16	-16	26	26	26	26	26	26
12	X	.73313E-04	207	127	127	72	72	71	72	71	71	145	145	146	183	196	196
12	Y	.93273E-02	417	231	231	169	169	169	169	169	169	299	299	299	322	323	323
12	Z	.19760E+00	-13	-20	-20	-16	-16	-16	-16	-16	-16	26	26	26	26	26	26
12A	X	.73506E-04	208	127	127	72	72	71	72	71	71	145	145	146	183	196	196
12A	Y	.10295E-01	420	233	233	170	170	170	170	170	170	302	302	302	325	325	325
12A	Z	.21676E+00	-13	-20	-20	-16	-16	-16	-16	-16	-16	26	26	26	26	26	26

91-11

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
13	X	.78346E-04	208	127	127	72	72	71	72	71	71	145	145	147	183	196	196
13	Y	.12125E-01	428	237	237	174	174	174	174	174	174	308	308	308	330	330	330
13	Z	.25314E+00	-13	-20	-20	-18	-18	-18	-18	-18	-18	25	25	26	25	26	26
14	X	.13747E-02	412	231	231	168	168	168	168	168	168	296	296	297	322	330	330
14	Y	.13483E-01	438	244	244	180	180	180	180	180	180	316	316	316	339	339	339
14	Z	.30893E+00	-12	-20	-20	-18	-18	-18	-18	-18	-18	23	23	23	23	23	23
15	X	.20606E-02	408	230	230	166	166	166	166	166	166	293	293	294	319	330	330
15	Y	.13483E-01	438	244	244	180	180	180	180	180	180	316	316	316	339	339	339
15	Z	.34843E+00	-12	-19	-19	-19	-19	-19	-19	-19	-19	21	21	21	21	21	21
16	X	.21716E-02	409	230	230	166	166	166	166	166	166	294	294	295	320	330	330
16	Y	.13483E-01	438	244	244	180	180	180	180	180	180	316	316	316	339	339	339
16	Z	.36206E+00	-11	-19	-19	-19	-19	-19	-19	-19	-19	21	21	21	21	21	21
16A	X	.22806E-02	409	230	230	166	166	166	166	166	166	294	294	295	320	330	330
16A	Y	.13483E-01	438	244	244	180	180	180	180	180	180	316	316	316	339	339	339
16A	Z	.37567E+00	-11	-19	-19	-19	-19	-19	-19	-19	-19	21	21	21	21	21	21
17	X	.23332E-02	410	231	231	167	167	167	167	167	167	295	295	296	321	331	331
17	Y	.13481E-01	438	244	244	180	180	180	180	180	180	316	316	316	339	339	339
17	Z	.38580E+00	-11	-19	-19	-19	-19	-19	-19	-19	-19	22	22	22	22	22	22
17A	X	.22995E-02	413	232	232	168	168	168	168	168	168	297	297	297	322	331	331
17A	Y	.13479E-01	438	244	244	180	180	180	180	180	180	316	316	316	339	339	339
17A	Z	.40053E+00	-11	-19	-19	-19	-19	-19	-19	-19	-19	22	22	22	22	22	22
18	X	.21786E-02	415	233	233	169	169	169	169	169	169	299	299	300	324	333	333
18	Y	.13477E-01	438	244	244	180	180	180	180	180	180	316	316	316	339	339	339
18	Z	.41154E+00	-11	-18	-18	-19	-19	-19	-19	-19	-19	22	22	22	22	22	22
19	X	.19904E-02	419	236	236	171	171	171	171	171	171	302	302	303	327	334	334
19	Y	.13477E-01	438	244	244	180	180	180	180	180	180	316	316	316	339	339	339
19	Z	.42385E+00	-10	-18	-18	-18	-18	-18	-18	-18	-18	23	23	23	23	23	23
19A	X	.18002E-02	425	238	238	174	174	174	174	174	174	308	308	307	331	337	337
19A	Y	.13476E-01	438	244	244	180	180	180	180	180	180	316	316	316	339	339	339
19A	Z	.43615E+00	-10	-18	-18	-18	-18	-18	-18	-18	-18	23	23	23	23	23	23
20	X	.15900E-02	432	242	242	177	177	177	177	177	177	311	311	312	336	340	340
20	Y	.13473E-01	438	244	244	180	180	180	180	180	180	316	316	316	339	339	339
20	Z	.44667E+00	-10	-18	-18	-18	-18	-18	-18	-18	-18	24	24	24	24	24	24
21	X	.28784E-04	161	103	103	49	49	48	49	48	48	109	109	109	149	151	151
21	Y	.11464E-01	428	238	238	175	175	175	175	175	175	308	308	308	331	331	331
21	Z	.42527E+00	-9	-17	-17	-17	-17	-17	-17	-17	-17	25	25	25	25	25	25
22	X	.19983E-04	161	103	103	49	49	48	49	48	48	109	109	109	150	151	151
22	Y	.75868E-02	421	234	234	171	171	171	171	171	171	303	303	303	328	328	328
22	Z	.34389E+00	-9	-17	-17	-17	-17	-17	-17	-17	-17	25	25	25	25	25	25
23	X	.14108E-04	161	103	103	49	49	49	49	49	49	109	109	109	150	151	151
23	Y	.51493E-02	418	232	232	170	170	170	170	170	170	300	300	300	323	323	323
23	Z	.28276E+00	-9	-17	-17	-17	-17	-17	-17	-17	-17	25	25	25	25	25	25

II-17

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT (CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	.13877E-04	161	103	103	49	49	49	49	49	49	109	109	109	150	151	151
24	Y	.40390E-02	417	231	231	169	169	169	169	169	169	299	299	300	322	323	323
24	Z	.25101E+00	-9	-17	-17	-17	-17	-17	-17	-17	-17	25	25	25	25	25	25
24A	X	.13645E-04	161	103	103	49	49	49	49	49	49	109	109	109	150	151	151
24A	Y	.29310E-02	415	230	230	168	168	168	168	168	168	298	298	298	321	321	321
24A	Z	.21924E+00	-9	-17	-17	-17	-17	-17	-17	-17	-17	25	25	25	25	25	25
25	X	.39887E-05	161	103	103	49	49	49	49	49	49	109	109	109	150	151	151
25	Y	.43653E-03	408	225	225	164	164	164	164	164	164	292	292	292	315	315	315
25	Z	.11145E+00	-9	-17	-17	-17	-17	-17	-17	-17	-17	25	25	25	25	25	25
26	X	.14640E-05	161	103	103	49	49	49	49	49	49	109	109	109	150	151	151
26	Y	.31094E-04	400	220	220	160	160	160	160	160	160	286	286	286	308	309	309
26	Z	.42937E-01	-9	-17	-17	-17	-17	-17	-17	-17	-17	25	25	25	25	25	25
27	X	.83273E-06	161	103	103	49	49	49	49	49	49	109	109	109	150	151	151
27	Y	.53284E-05	392	215	215	156	156	156	156	156	156	280	280	281	302	304	304
27	Z	.25756E-01	-9	-17	-17	-17	-17	-17	-17	-17	-17	25	25	25	25	25	25
28	X	.65815E-06	161	103	103	49	49	49	49	49	49	109	109	109	150	151	151
28	Y	.12795E-05	381	209	209	151	151	151	151	151	151	272	272	273	296	297	297
28	Z	.46620E-06	-5	-13	-13	-12	-12	-12	-12	-12	-12	32	32	34	32	34	34

11-10

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.65116E-01	529	390	374	287	284	264	287	264	266	437	431	440	524	523	526
1	Y	.28597E-01	795	617	585	445	437	397	445	397	401	661	650	651	744	737	745
1	Z	.36790E-01	437	432	432	283	283	283	283	283	283	514	514	537	514	537	537
2	X	.82392E-01	528	390	374	287	284	264	287	264	266	437	431	440	524	523	526
2	Y	.98149E-01	793	615	583	444	436	396	444	396	400	659	648	649	743	736	744
2	Z	.34985E+02	278	274	274	164	164	164	164	164	164	323	323	343	323	343	343
3	X	.24633E+00	528	390	374	287	284	264	287	264	266	437	431	440	524	523	526
3	Y	.19384E+01	789	611	579	442	434	394	442	394	399	657	645	647	740	733	742
3	Z	.96152E+02	278	274	274	164	164	164	164	164	164	323	323	343	323	343	343
4	X	.39483E+00	528	390	374	287	283	264	287	264	266	437	431	440	523	523	526
4	Y	.55870E+01	788	610	578	441	434	394	441	394	398	656	645	646	739	733	741
4	Z	.15053E+03	276	272	272	162	162	162	162	162	162	321	321	341	321	341	341
5	X	.28558E+01	527	389	373	287	283	264	287	264	266	436	430	439	523	522	525
5	Y	.67350E+02	776	592	567	436	429	389	436	389	393	648	637	639	733	727	736
5	Z	.35923E+03	215	211	211	121	121	121	121	121	121	253	253	272	253	272	272
6	X	.52999E+01	524	386	371	284	281	262	284	262	264	433	427	436	519	518	522
6	Y	.54950E+01	536	396	377	293	289	265	293	265	268	452	445	450	524	528	533
6	Z	.36058E+02	65	65	65	41	41	41	41	41	41	115	115	133	115	133	133
7	X	.53617E+01	524	386	371	284	281	262	284	262	264	433	427	436	519	518	521
7	Y	.94486E+00	603	468	460	318	317	307	318	307	308	492	489	495	562	576	578
7	Z	.30897E+00	630	634	634	610	610	610	610	610	610	980	980	997	980	997	997
8	X	.54254E+01	524	386	371	284	281	262	284	262	264	432	427	436	519	518	521
8	Y	.74119E+01	316	217	213	162	161	156	162	156	156	271	269	274	332	341	342
8	Z	.37438E+02	47	47	47	36	36	36	36	36	36	105	105	122	105	122	122
8A	X	.56886E+01	523	386	370	284	280	261	284	261	263	432	426	435	518	517	521
8A	Y	.21153E+02	314	215	210	159	158	153	159	153	153	267	266	271	327	337	338
8A	Z	.10613E+03	38	38	38	34	34	34	34	34	34	100	100	117	100	117	117
9	X	.59703E+01	522	385	370	283	280	261	283	261	263	431	426	434	518	517	520
9	Y	.38945E+02	288	193	191	141	141	138	141	138	138	243	242	247	299	311	311
9	Z	.18474E+03	26	26	26	32	32	32	32	32	32	94	94	110	94	110	110
10	X	.72597E+01	519	382	367	281	277	259	281	259	261	428	423	431	514	513	516
10	Y	.13544E+03	248	155	154	107	106	105	107	105	105	196	196	199	240	255	255
10	Z	.58103E+03	-13	-9	-9	25	25	25	25	25	25	80	80	89	80	89	89
11	X	.82612E+01	516	380	365	279	275	257	279	257	259	425	420	429	511	510	513
11	Y	.18697E+03	240	137	137	90	90	89	90	89	89	176	176	177	207	223	224
11	Z	.88153E+03	-29	-23	-23	21	21	21	21	21	21	72	72	77	72	77	77
12	X	.82836E+01	516	380	365	279	275	257	279	257	259	425	420	429	511	510	513
12	Y	.19422E+03	244	134	134	88	88	87	88	87	87	174	174	176	201	217	217
12	Z	.96337E+03	-31	-24	-24	21	21	21	21	21	21	72	72	75	72	75	75
12A	X	.83057E+01	515	380	365	279	275	257	279	257	259	425	420	429	511	510	513
12A	Y	.20132E+03	251	135	135	88	88	88	88	88	88	176	176	177	200	215	215
12A	Z	.10461E+04	-31	-25	-25	21	21	21	21	21	21	72	72	75	72	75	75

11-19

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
13	X	.88536E+01	509	375	361	274	271	254	274	254	255	419	414	423	504	504	507
13	Y	.20458E+03	285	150	149	101	101	101	101	101	101	198	198	199	218	225	225
13	Z	.11964E+04	-29	-22	-22	23	23	23	23	23	23	74	74	76	74	76	76
14	X	.80197E+02	300	209	209	127	127	127	127	127	127	219	219	221	280	285	285
14	Y	.21165E+03	313	165	165	115	115	115	115	115	115	219	219	220	238	240	240
14	Z	.12808E+04	-21	-19	-19	11	11	11	11	11	11	60	60	62	60	62	62
15	X	.13143E+03	305	213	213	130	130	130	130	130	130	223	223	225	285	289	289
15	Y	.21164E+03	313	165	165	115	115	115	115	115	115	220	220	220	238	240	240
15	Z	.12421E+04	-20	-24	-24	-12	-12	-12	-12	-12	-12	28	28	31	28	31	31
16	X	.13833E+03	304	213	213	130	130	130	130	130	130	223	223	225	285	289	289
16	Y	.21164E+03	313	165	165	115	115	115	115	115	115	220	220	220	238	240	240
16	Z	.12279E+04	-19	-24	-24	-18	-18	-18	-18	-18	-18	21	21	23	21	23	23
16A	X	.14519E+03	304	213	212	130	130	129	130	129	129	223	223	225	285	289	289
16A	Y	.21164E+03	313	165	165	115	115	115	115	115	115	220	220	220	238	240	240
16A	Z	.12137E+04	-16	-23	-23	-21	-21	-21	-21	-21	-21	18	18	20	18	20	20
17	X	.14762E+03	301	211	211	129	129	128	129	128	128	222	222	223	283	287	287
17	Y	.21162E+03	313	165	165	115	115	115	115	115	115	220	220	220	238	240	240
17	Z	.12305E+04	-16	-23	-23	-23	-23	-23	-23	-23	-23	16	16	18	16	18	18
17A	X	.14131E+03	297	207	207	126	126	126	126	126	126	218	218	220	279	284	284
17A	Y	.21160E+03	313	165	165	115	115	115	115	115	115	220	220	220	238	240	240
17A	Z	.12679E+04	-15	-22	-22	-22	-22	-22	-22	-22	-22	17	17	18	17	18	18
18	X	.12643E+03	292	203	203	124	124	123	124	123	123	215	215	216	274	279	279
18	Y	.21158E+03	313	165	165	115	115	115	115	115	115	220	220	220	238	240	240
18	Z	.12943E+04	-14	-21	-21	-19	-19	-19	-19	-19	-19	21	21	23	21	23	23
19	X	.11007E+03	286	198	198	120	120	120	120	120	120	210	210	211	269	274	274
19	Y	.21158E+03	313	165	165	115	115	115	115	115	115	220	220	220	238	240	240
19	Z	.13224E+04	-11	-18	-18	-13	-13	-13	-13	-13	-13	29	29	31	29	31	31
19A	X	.91523E+02	280	192	192	117	117	117	117	117	117	208	208	207	263	270	270
19A	Y	.21158E+03	313	165	165	115	115	115	115	115	115	220	220	220	238	240	240
19A	Z	.13548E+04	-9	-14	-14	-6	-6	-6	-6	-6	-6	39	39	40	39	40	40
20	X	.71870E+02	273	186	186	114	114	114	114	114	114	202	202	204	256	265	265
20	Y	.21155E+03	313	165	165	115	115	115	115	115	115	220	219	220	238	240	240
20	Z	.13902E+04	-7	-12	-12	0	0	0	0	0	0	48	48	49	48	49	49
21	X	.35132E+01	371	268	264	177	176	172	177	172	172	287	286	291	360	360	361
21	Y	.18055E+03	309	164	164	115	115	115	115	115	115	219	219	219	239	245	245
21	Z	.13717E+04	-11	-14	-14	6	6	6	6	6	6	55	55	57	55	57	57
22	X	.24355E+01	373	270	266	179	178	173	179	173	173	289	288	293	361	362	363
22	Y	.13767E+03	293	165	162	119	119	116	119	116	116	218	217	223	246	266	267
22	Z	.11505E+04	-13	-16	-16	3	3	3	3	3	3	50	50	55	50	55	55
23	X	.17166E+01	375	271	267	180	179	174	180	174	174	291	289	295	363	364	365
23	Y	.99556E+02	318	190	184	145	143	137	145	137	137	248	246	255	285	308	310
23	Z	.96608E+03	-11	-14	-14	4	4	4	4	4	4	51	51	59	51	59	59

11-20

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	.16884E+01	375	271	267	180	179	174	180	174	174	291	289	295	364	364	365
24	Y	.80008E+02	334	205	197	158	157	148	158	148	149	265	263	273	306	329	331
24	Z	.86523E+03	-9	-13	-13	4	4	4	4	4	4	52	52	62	52	62	62
24A	X	.16601E+01	375	271	267	180	179	174	180	174	174	291	290	295	364	364	365
24A	Y	.60445E+02	363	231	220	182	180	169	182	169	170	290	292	304	343	360	368
24A	Z	.76414E+03	-7	-11	-11	6	6	6	6	6	6	54	54	65	54	65	65
25	X	.48520E+00	375	272	267	180	179	174	180	174	175	291	290	295	364	364	365
25	Y	.11485E+02	438	298	280	240	242	221	240	221	224	375	369	380	438	452	456
25	Z	.39784E+03	0	-4	-4	10	10	10	10	10	10	60	60	74	60	74	74
26	X	.17808E+00	375	272	267	180	179	174	180	174	175	291	290	295	364	364	365
26	Y	.11547E+01	431	299	277	248	244	221	248	221	223	375	368	376	439	447	450
26	Z	.15364E+03	0	-3	-3	10	10	10	10	10	10	61	61	75	61	75	75
27	X	.10129E+00	375	272	267	180	179	174	180	174	175	291	290	295	364	364	365
27	Y	.25398E+00	432	301	279	251	246	222	251	222	225	378	370	377	443	447	451
27	Z	.92129E+02	0	-3	-3	10	10	10	10	10	10	61	61	75	61	75	75
28	X	.80058E-01	375	272	267	180	179	174	180	174	175	291	290	295	364	364	365
28	Y	.80147E-01	435	305	282	255	250	225	255	225	227	382	374	380	448	449	454
28	Z	.46797E-01	291	279	279	249	249	249	249	249	249	420	420	487	420	487	487

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*PIPE END MOMENTS (CROSS COMPARISON)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	12	.14969E+04	158	75	75	52	52	51	52	51	51	125	125	126	135	137	138
2	12	.92753E+03	36	6	6	2	2	2	2	2	2	53	53	54	53	57	57
3	12	.17573E+04	47	12	12	7	7	7	7	7	7	60	60	61	63	64	64
4	12	.13478E+04	6	-8	-8	-6	-6	-6	-6	-6	-6	39	39	40	40	41	41
5	12	.26391E+04	10	-2	-6	-5	-5	-5	-5	-5	-5	41	41	42	42	43	43
6	12	.13836E+05	-10	-17	-17	-13	-13	-13	-13	-13	-13	29	29	30	29	30	30
7	12	.23809E+05	-10	-19	-19	-15	-15	-15	-15	-15	-15	26	26	26	26	27	27
8	12	.79110E+04	-10	-19	-19	-16	-16	-16	-16	-16	-16	26	26	26	26	26	26
9	12	.16493E+05	-10	-19	-19	-16	-16	-16	-16	-16	-16	26	26	26	26	26	26
10	12	.80823E+04	-5	-16	-16	-12	-12	-12	-12	-12	-12	31	31	31	31	32	32
11	12	.17172E+05	-5	-16	-16	-12	-12	-12	-12	-12	-12	31	31	31	31	32	32
12	12	.19989E+05	-4	-15	-15	-11	-11	-11	-11	-11	-11	32	32	33	33	33	33
13	12	.10139E+05	-3	-11	-11	-2	-2	-2	-2	-2	-2	45	45	45	45	46	46
14	12	.11466E+05	-6	-13	-13	-4	-4	-4	-4	-4	-4	42	42	43	42	43	43
15	12	.13378E+05	-7	-14	-14	-7	-7	-7	-7	-7	-7	37	37	38	38	38	38
16	12	.19233E+05	-9	-17	-17	-14	-14	-14	-14	-14	-14	28	28	29	28	29	29
17	18	.22440E+05	-10	-18	-18	-17	-17	-17	-17	-17	-17	24	24	24	24	24	24
18	12	.21994E+05	-8	-17	-17	-18	-18	-18	-18	-18	-18	23	23	23	23	24	24
19	12	.22231E+05	-7	-17	-17	-18	-18	-18	-18	-18	-18	23	23	23	23	23	23
20	12	.22599E+05	-7	-17	-17	-18	-18	-18	-18	-18	-18	23	23	23	23	24	24
21	12	.22989E+05	-6	-17	-17	-17	-17	-17	-17	-17	-17	25	25	25	25	25	25
22	12	.23130E+05	-6	-16	-16	-16	-16	-16	-16	-16	-16	26	26	26	26	26	26
23	12	.23081E+05	-7	-17	-17	-15	-15	-15	-15	-15	-15	27	27	27	27	27	27
24	18	.20977E+05	-10	-18	-18	-14	-14	-14	-14	-14	-14	29	29	29	29	29	29
25	12	.18177E+05	-8	-16	-16	-10	-10	-10	-10	-10	-10	34	34	34	34	34	34
26	12	.16239E+05	2	-10	-10	-4	-4	-4	-4	-4	-4	42	42	43	42	43	43
27	12	.15106E+05	12	-5	-5	0	0	0	0	0	0	48	48	49	49	50	50
28	12	.96388E+04	126	56	56	48	48	48	48	48	48	117	117	118	125	125	125
29	12	.27103E+04	215	108	108	87	87	87	87	87	87	175	175	176	187	188	188
30	12	.57239E+04	204	101	101	82	82	82	82	82	82	168	168	169	179	180	180
31	12	.27062E+04	225	114	114	91	91	91	91	91	91	182	182	182	194	195	195
32	12	.56719E+04	222	112	112	90	90	90	90	90	90	180	180	180	192	193	193
33	12	.85082E+04	239	123	123	97	97	97	97	97	97	190	190	191	203	204	204
34	12	.15314E+05	-8	-16	-16	-10	-10	-10	-10	-10	-10	34	34	34	34	34	34
35	12	.22452E+05	-7	-17	-17	-18	-18	-18	-18	-18	-18	23	23	23	23	23	23
36	12	.23160E+05	-6	-16	-16	-16	-16	-16	-16	-16	-16	26	26	26	27	27	27
37	12	.13729E+05	27	2	2	6	6	6	6	6	6	57	57	58	59	60	60
38	12	.22680E+05	-5	-15	-15	-12	-12	-12	-12	-12	-12	31	31	32	32	32	32
39	12	.22810E+05	-7	-17	-17	-18	-18	-18	-18	-18	-18	24	24	24	24	24	24

11-22

 * ZBEND MODEL *

EARTHQUAKE NO. 1

*SUPPORT FORCES (CROSS COMPARISON)

ELEM. NO.	FORCE CODE	FORCE (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	.57644E+02	207	127	126	72	72	71	72	71	71	145	144	146	183	196	196
2	1	.26596E+02	368	204	203	146	146	145	146	145	145	264	264	265	287	292	292
3	1	.29555E+03	-8	-14	-14	-11	-11	-11	-11	-11	-11	33	33	34	33	34	34
4	1	.92015E+03	-6	-11	-11	0	0	0	0	0	0	47	47	48	47	48	48
5	1	.85941E+03	371	205	204	147	147	146	147	146	146	266	265	267	288	292	293
6	1	.23729E+01	207	127	126	72	72	71	72	71	71	145	144	146	183	196	196
7	1	.82358E+02	371	204	204	146	146	146	146	146	146	265	265	266	287	293	293
8	1	.10934E+04	-13	-20	-20	-16	-16	-16	-16	-16	-16	25	25	25	25	25	25
9	1	.84093E+04	-6	-11	-11	0	0	0	0	0	0	47	47	48	47	48	48
10	1	.62915E+03	-12	-19	-19	-15	-15	-15	-15	-15	-15	27	27	27	27	27	27
11	1	.82118E+03	390	214	214	155	155	155	155	155	155	279	279	279	301	302	302
12	1	.65315E+02	161	103	103	49	49	49	49	49	49	109	109	109	150	151	151
13	1	.12795E+03	381	209	209	151	151	151	151	151	151	272	272	273	296	297	297
14	1	.46620E+03	-5	-13	-13	-12	-12	-12	-12	-12	-12	32	32	34	32	34	34
15	1	.63926E+04	-19	-16	-16	23	23	23	23	23	23	76	76	78	76	78	78
16	1	.56146E+04	406	224	224	163	163	163	163	163	163	291	291	291	313	314	314

11-23

 * BM1 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.17473E-09	42	0	-2	-13	-14	-15	-13	-15	-14	43	41	55	54	62	67
1	Y	.38344E-10	35	0	-1	14	11	8	14	8	11	93	88	103	109	114	121
1	Z	.15615E-09	57	14	13	-6	-8	-9	-6	-9	-7	58	58	72	68	78	82
2	X	.19530E-03	63	-6	-12	-7	-11	-14	-7	-14	-10	38	32	38	55	49	58
2	Y	.58820E-03	39	0	0	-17	-18	-19	-17	-19	-18	41	39	54	49	58	61
2	Z	.17253E-03	74	0	-4	-4	-7	-10	-4	-10	-7	43	39	46	62	59	67
3	X	.15688E-02	51	0	-2	-9	-10	-12	-9	-12	-10	46	44	57	59	64	69
3	Y	.19578E-02	41	3	2	-18	-18	-19	-18	-19	-18	48	39	54	47	59	59
3	Z	.14438E-02	63	14	12	-8	-9	-10	-8	-10	-9	54	52	69	63	74	77
4	X	.24739E-02	45	-1	-3	-12	-14	-15	-12	-15	-13	42	40	54	53	60	65
4	Y	.19581E-02	41	3	2	-18	-18	-19	-18	-19	-18	40	39	54	47	59	59
4	Z	.22670E-02	59	12	11	-9	-10	-11	-9	-11	-10	53	52	68	62	73	76
5	X	.39548E-02	45	-1	-4	-12	-14	-15	-12	-15	-14	41	40	54	53	60	64
5	Y	.32322E-02	40	2	1	-17	-18	-18	-17	-18	-18	41	40	58	49	60	61
5	Z	.35977E-02	60	12	11	-9	-10	-11	-9	-11	-10	53	52	68	63	73	76
6	X	.36149E-02	39	2	1	-18	-19	-19	-18	-19	-19	40	39	54	47	59	59
6	Y	.29147E-09	2	-17	-18	-3	-3	-5	-3	-5	-4	63	62	75	77	84	86
6	Z	.34942E-02	39	2	1	-18	-19	-19	-18	-19	-19	40	39	54	47	59	59
7	X	.38503E-02	46	0	-2	-11	-13	-14	-11	-14	-12	43	42	58	55	62	66
7	Y	.33380E-02	34	-4	-4	-10	-12	-13	-10	-13	-11	54	51	67	64	72	76
7	Z	.36510E-02	56	10	9	-10	-11	-12	-10	-12	-11	52	51	67	61	72	74
8A	X	.37423E-02	43	0	-2	-14	-15	-16	-14	-16	-15	41	40	55	52	60	63
8A	Y	.25210E-02	27	-9	-10	-8	-8	-10	-6	-10	-7	62	58	73	72	79	84
8A	Z	.36075E-02	51	8	7	-12	-13	-14	-12	-14	-13	50	49	65	58	69	72
8	X	.36389E-02	39	0	0	-17	-18	-19	-17	-19	-18	39	38	53	47	58	59
8	Y	.10650E-02	22	-14	-15	1	-1	-3	1	-3	0	76	70	85	88	92	99
8	Z	.34878E-02	46	6	5	-14	-15	-15	-14	-15	-15	47	46	61	55	66	67
9	X	.36268E-02	43	4	3	-16	-16	-17	-16	-17	-16	44	43	59	52	63	64
9	Y	.69859E-03	18	-17	-19	15	11	8	15	8	13	100	92	107	116	116	126
9	Z	.34846E-02	39	1	0	-18	-18	-19	-18	-19	-18	39	38	53	47	58	59
10	X	.38872E-02	41	2	1	-5	-6	-6	-5	-6	-6	66	66	84	75	88	88
10	Y	.14689E-02	44	-5	-7	61	58	52	61	52	58	183	172	193	205	204	217
10	Z	.34662E-02	39	0	0	-6	-7	-7	-6	-7	-7	62	61	80	72	83	85
11	X	.40335E-02	55	6	6	60	58	58	60	58	59	189	187	209	207	218	221
11	Y	.14896E-02	43	-5	-8	61	55	51	61	51	58	181	171	191	204	202	216
11	Z	.38399E-02	55	7	6	60	59	58	60	58	60	191	188	209	209	219	223
12	X	.32876E-02	57	8	8	65	64	63	65	63	64	200	198	219	218	229	232
12	Y	.16017E-02	23	-16	-17	46	41	37	46	37	43	155	145	161	176	171	185
12	Z	.31086E-02	58	9	9	67	65	64	67	64	66	203	199	220	221	230	234
13	X	.45279E-02	52	6	4	36	35	34	36	34	35	138	136	163	155	171	173
13	Y	.29321E-02	78	16	5	14	9	6	14	6	8	68	61	83	95	103	109
13	Z	.43214E-02	50	5	2	35	33	32	35	32	34	136	133	160	152	167	171

 * BM1 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
14	X	.2555E-02	57	10	9	68	65	65	68	65	66	202	201	222	220	232	234
14	Y	.14213E-02	12	-18	-19	35	31	27	35	27	33	135	125	138	155	149	162
14	Z	.18985E-02	60	13	13	70	68	67	70	67	69	209	205	225	227	235	240
15	X	.16168E-03	80	32	24	65	50	47	55	47	51	161	154	182	184	195	205
15	Y	.76673E-10	71	4	0	8	6	3	8	3	6	58	52	71	84	91	98
15	Z	.79988E-04	81	32	24	66	51	48	56	48	52	162	155	183	185	198	206
19	X	.97228E-04	67	22	16	57	51	47	57	47	52	164	154	180	188	195	207
19	Y	.97612E-04	46	11	-3	18	13	11	18	11	12	57	52	68	99	105	108
19	Z	.16195E-03	96	45	37	69	55	53	59	53	55	168	153	194	190	208	212
21	X	.92794E-04	174	110	104	101	95	92	101	92	97	238	229	264	265	282	293
21	Y	.19564E-03	134	66	48	82	75	71	82	71	74	160	151	189	213	226	235
21	Z	.21593E-03	124	67	58	73	69	67	73	67	69	189	185	219	213	232	237
23	X	.12464E-02	284	100	180	120	115	113	120	113	115	256	252	294	284	310	314
23	Y	.39689E-02	64	29	13	41	36	34	41	34	36	83	78	92	138	142	145
23	Z	.25058E-02	293	197	187	125	120	118	125	118	119	264	260	304	293	320	323
25	X	.83477E-10	81	35	34	34	32	30	34	30	33	127	122	143	144	159	166
25	Y	.56525E-10	68	29	15	41	36	34	41	34	36	85	80	99	138	145	147
25	Z	.39682E-10	225	146	134	130	122	117	130	117	123	278	267	308	312	331	344
27	X	.36869E-03	221	141	133	79	76	74	79	74	75	190	187	218	212	232	235
27	Y	.92423E-03	81	41	24	67	62	60	67	60	61	102	97	110	164	165	169
27	Z	.76538E-03	220	141	133	79	75	74	79	74	75	190	186	218	212	232	235
29	X	.31666E-05	190	116	110	61	57	58	61	56	57	160	157	183	179	198	199
29	Y	.20041E-10	75	30	18	43	39	36	43	36	38	103	99	128	148	161	165
29	Z	.19552E-05	192	118	111	32	69	67	62	67	58	182	159	188	182	199	201
33	X	.10321E-03	207	130	123	71	67	66	71	66	67	176	173	203	198	216	219
33	Y	.24666E-03	105	59	41	87	81	78	87	78	80	151	144	176	217	231	236
33	Z	.20369E-03	208	131	124	72	68	66	72	66	68	177	174	204	198	217	220
35	X	.11701E-03	207	130	123	71	67	66	71	66	67	176	173	203	197	216	219
35	Y	.31096E-03	95	51	34	74	69	66	74	66	63	129	123	147	194	203	207
35	Z	.26855E-03	207	130	123	71	68	66	71	66	67	176	174	203	198	216	219
37	X	.11999E-03	206	129	122	70	67	65	70	65	66	175	172	202	196	215	218
37	Y	.37553E-11	84	25	19	53	49	47	53	47	50	150	145	176	180	192	199
37	Z	.50912E-04	206	129	122	70	67	65	70	65	66	175	172	202	196	215	218
16	X	.17826E-03	19	-7	-11	16	13	10	16	10	14	96	90	105	115	118	126
16	Y	.29370E-09	10	-5	-5	17	17	15	17	15	16	102	100	112	118	122	125
16	Z	.17508E-03	20	-6	-10	17	13	10	17	10	14	97	91	106	115	119	127
20	X	.12102E-01	87	30	29	124	121	118	124	118	123	307	299	320	333	335	345
20	Y	.22053E-01	6	-14	-14	22	19	17	22	17	20	110	106	116	128	126	134
20	Z	.11875E-01	88	30	30	125	122	119	125	119	124	309	301	322	335	337	347
22	X	.20811E-01	93	35	35	131	127	125	131	125	130	318	310	332	345	347	357
22	Y	.56558E-01	4	-16	-16	20	18	15	20	15	19	106	102	113	124	123	130
22	Z	.28110E-01	94	35	35	132	128	125	132	125	130	319	311	332	346	348	357

 * BM1 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	.42601E-01	105	44	44	144	140	138	144	138	143	339	332	353	368	370	360
24	Y	.85937E-01	1	-19	-19	19	17	14	19	14	17	104	99	110	122	121	128
24	Z	.41868E-01	105	44	44	144	140	138	144	138	143	339	332	354	368	370	380
28	X	.49097E-01	127	62	62	168	164	162	168	162	167	380	373	395	411	414	423
28	Y	.97166E-01	-2	-23	-23	18	15	13	18	13	16	102	97	107	120	119	125
28	Z	.48257E-01	127	62	62	168	165	162	168	162	167	380	373	395	412	414	423
28	X	.46494E-01	172	98	98	214	211	210	214	210	213	458	453	474	498	499	508
28	Y	.83980E-01	-7	-29	-29	17	14	12	17	12	16	100	95	105	119	116	123
28	Z	.45711E-01	172	98	98	214	211	210	214	210	213	458	453	474	498	499	508
30	X	.41285E-01	228	143	143	265	264	263	265	263	265	543	540	554	588	588	592
30	Y	.47638E-01	-12	-36	-37	16	14	12	16	12	15	99	53	102	118	115	122
30	Z	.40551E-01	228	143	143	265	264	263	265	263	265	544	541	555	587	589	593
32	X	.42648E-01	230	151	151	260	260	260	260	260	260	532	531	533	573	574	575
32	Y	.84045E-10	59	38	37	50	49	45	50	45	46	153	152	164	172	178	181
32	Z	.41339E-01	230	151	151	260	260	260	260	260	260	532	531	533	573	574	575
36	X	.41648E-01	235	156	156	264	264	264	264	264	264	538	538	539	580	581	581
36	Y	.12648E-01	-31	-64	-64	11	9	8	11	8	10	88	81	87	107	104	109
36	Z	.41079E-01	234	154	154	263	262	262	263	262	263	536	535	537	578	578	579
38	X	.37499E-01	279	188	188	319	318	318	319	318	319	644	641	662	691	701	703
38	Y	.90952E-01	-37	-75	-75	8	7	6	8	6	8	79	78	80	101	99	102
38	Z	.38045E-01	258	172	172	288	288	288	288	288	288	578	578	583	622	626	626
39	X	.43742E-01	199	115	115	259	255	253	259	253	258	549	542	588	590	595	605
39	Y	.14073E+00	-35	-73	-73	10	9	8	10	8	9	81	78	82	104	101	105
39	Z	.34658E-01	280	173	173	298	296	295	298	295	298	599	598	612	645	651	652
40	X	.34676E-01	174	77	76	268	266	268	268	268	264	571	559	578	614	608	624
40	Y	.13061E+00	-33	-70	-70	12	11	10	12	10	12	85	82	88	108	105	109
40	Z	.29443E-01	254	165	166	295	294	294	295	294	295	599	597	613	644	651	653
41	X	.15070E-01	201	62	61	349	339	332	349	332	345	733	713	718	786	763	789
41	Y	.69958E-01	-31	-67	-67	15	14	13	15	13	15	91	87	91	114	111	115
41	Z	.23287E-01	240	156	156	275	275	275	275	275	275	560	560	569	604	608	608
43	X	.88857E-02	231	152	152	260	260	260	260	260	260	532	532	533	574	574	575
43	Y	.12719E-09	-10	-41	-41	9	9	9	9	9	9	82	82	96	102	110	110
43	Z	.18383E-01	231	152	152	260	260	260	260	260	260	532	532	533	574	574	575
44	X	.20906E-01	166	101	101	204	202	201	204	201	203	448	444	468	481	483	495
44	Y	.27883E-01	-13	-45	-46	32	30	28	32	28	31	122	117	125	147	144	150
44	Z	.19747E-01	199	128	128	230	229	228	230	228	229	484	482	496	522	527	531
45	X	.41977E-01	115	72	72	135	134	133	135	133	135	332	328	346	355	352	366
45	Y	.36931E-01	0	-29	-30	39	36	34	39	34	37	135	129	141	159	157	164
45	Z	.28026E-01	140	88	88	162	160	159	162	159	161	370	367	384	398	406	410
46	X	.62255E-01	95	62	62	101	100	99	101	99	100	272	270	284	291	296	299
46	Y	.30041E-01	12	-16	-16	40	37	35	40	35	38	139	133	147	162	162	169
46	Z	.36882E-01	119	77	77	132	131	130	132	130	132	320	318	335	344	353	357

 * BM1 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
47	X	.76313E-01	87	81	80	83	83	82	83	82	83	241	240	252	257	263	264
47	Y	.06742E-02	30	2	1	44	42	39	44	39	43	150	145	160	171	174	181
47	Z	.42709E-01	110	73	73	116	115	115	116	115	116	293	291	307	314	324	326
48	X	.05000E-01	80	80	80	82	81	81	82	81	82	239	237	249	254	260	262
48	Y	.05000E-01	22	-23	-25	49	43	40	49	40	46	180	149	163	183	177	191
48	Z	.30000E-01	114	71	70	126	124	124	125	124	124	306	305	324	329	341	343
49	X	.41810E-01	85	80	80	84	82	80	84	80	83	239	234	247	256	258	264
49	Y	.76059E-05	84	20	18	74	72	70	74	70	72	217	214	228	236	238	242
49	Z	.47580E-01	78	23	22	107	103	100	107	100	105	264	256	280	290	293	303
50	X	.22379E-01	84	51	50	84	81	78	84	78	80	218	213	226	241	239	249
50	Y	.15212E-04	64	20	18	74	72	70	74	70	72	217	214	228	236	238	242
50	Z	.80443E-01	49	13	12	59	57	55	59	55	58	180	175	194	200	205	211
51	X	.20926E-01	78	47	46	74	73	67	74	67	69	192	190	202	214	214	221
51	Y	.55110E-02	91	73	73	78	77	76	78	76	77	231	229	239	245	248	251
51	Z	.88479E-01	47	14	14	54	52	50	54	50	53	171	167	185	190	196	201
52	X	.15744E-01	73	45	45	64	63	59	64	59	60	178	177	188	198	201	206
52	Y	.21295E-01	82	67	66	65	64	63	65	63	65	207	205	213	220	222	226
52	Z	.83293E-01	46	11	10	52	49	48	52	48	51	171	166	183	189	194	200
53	X	.86251E-02	66	40	39	57	56	52	57	52	54	168	167	180	187	192	197
53	Y	.17273E-01	74	61	60	55	54	52	55	52	54	187	184	192	199	201	204
53	Z	.71455E-01	50	8	8	56	54	53	56	53	55	180	176	191	198	203	209
54	X	.11078E-02	81	47	46	80	78	76	80	76	78	228	224	239	246	249	254
54	Y	.23878E-02	63	49	49	42	41	40	42	40	41	160	158	166	172	176	179
54	Z	.66112E-01	46	3	3	48	47	45	48	45	46	162	160	172	179	189	192
55	X	.79734E-10	83	36	36	58	57	56	58	56	57	192	190	200	206	210	212
55	Y	.91383E-10	79	51	51	62	62	59	62	59	60	187	187	196	203	216	218
55	Z	.59271E-01	46	4	3	48	48	45	48	45	46	161	160	171	178	189	192
56	X	.50012E-02	102	79	78	82	78	75	82	75	79	227	220	230	245	243	253
56	Y	.33503E-04	43	1	0	46	45	43	46	43	45	158	157	168	175	185	188
56	Z	.30328E-01	44	2	1	47	46	44	47	44	45	159	158	169	176	187	190
57	X	.86587E-02	99	78	75	78	74	71	78	71	75	218	212	222	236	238	245
57	Y	.67002E-04	43	1	0	46	45	43	46	43	45	158	157	168	175	185	188
57	Z	.38277E-02	43	1	0	46	46	43	46	43	45	158	157	168	176	185	189
58	X	.74903E-02	100	77	76	78	75	71	78	71	75	219	212	223	237	236	245
58	Y	.24895E-02	43	1	0	46	46	43	46	43	45	159	157	168	176	185	189
58	Z	.70114E-04	36	-5	-6	43	41	39	43	39	42	154	151	163	171	177	182
59	X	.20347E-02	105	81	79	82	78	74	82	74	78	225	218	228	244	242	252
59	Y	.23886E-02	43	1	0	46	46	43	46	43	45	159	157	168	176	185	189
59	Z	.35059E-04	36	-5	-6	43	41	39	43	39	42	154	151	163	171	177	182
60	X	.14732E-10	119	78	71	87	83	79	87	79	81	228	223	239	249	250	255
60	Y	.10218E-09	44	1	1	47	46	43	47	43	45	159	157	168	176	185	189
60	Z	.10300E-09	36	-5	-6	43	41	39	43	39	41	154	151	163	171	177	182

II-27

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*  BM1  MODEL  *
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EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.27528E-05	470	271	260	238	231	225	238	225	234	435	425	450	485	485	505
1	Y	.72570E-08	292	147	137	109	102	95	109	95	100	228	217	245	259	269	281
1	Z	.21929E-05	540	345	337	247	242	237	247	237	243	468	462	497	508	523	537
2	X	.53435E+01	416	189	173	178	169	159	178	159	170	313	300	304	368	344	370
2	Y	.71244E+01	547	360	358	257	253	250	257	250	253	491	488	519	528	547	555
2	Z	.51480E+01	399	182	168	160	162	143	160	143	162	287	276	281	338	318	341
3	X	.30587E+02	443	235	221	221	213	205	221	205	215	397	388	403	450	439	463
3	Y	.20999E+02	632	427	423	304	300	298	304	298	300	571	567	606	611	638	642
3	Z	.29720E+02	410	233	226	157	153	147	157	147	153	312	306	329	346	354	367
4	X	.43230E+02	458	253	240	229	222	214	229	214	225	415	405	425	467	461	483
4	Y	.21017E+02	632	426	422	303	300	298	303	298	300	570	567	600	611	637	642
4	Z	.42237E+02	434	255	247	176	171	165	176	165	172	340	338	364	380	388	402
5	X	.69587E+02	458	250	238	227	219	212	227	212	222	411	401	421	463	456	478
5	Y	.34845E+02	619	417	414	294	291	289	294	289	291	556	552	592	595	622	627
5	Z	.68694E+02	427	248	241	171	166	158	171	166	166	336	329	354	370	378	393
6	X	.35057E+02	681	468	462	328	326	325	328	325	328	614	612	657	658	690	692
6	Y	.39506E-05	235	113	104	105	99	92	105	92	98	219	211	242	254	268	281
6	Z	.33887E+02	681	468	462	328	326	325	328	325	328	614	612	657	658	690	692
7	X	.65441E+02	473	264	252	240	233	226	240	226	236	434	424	445	487	481	503
7	Y	.43010E+02	465	301	297	204	200	197	204	197	200	406	401	434	438	456	464
7	Z	.68024E+02	430	255	248	173	168	163	173	163	169	342	335	362	375	385	399
8A	X	.54436E+02	517	306	295	267	260	253	267	253	262	482	473	492	535	535	555
8A	Y	.33819E+02	403	255	251	168	164	161	168	161	165	346	341	372	373	392	401
8A	Z	.57261E+02	462	285	279	196	191	186	196	186	192	383	377	406	417	429	443
8	X	.39432E+02	632	413	406	320	316	313	320	313	318	586	582	620	636	656	667
8	Y	.14778E+02	337	206	201	132	128	124	132	124	128	285	279	310	309	327	336
8	Z	.42805E+02	564	372	368	260	255	252	260	252	256	495	490	527	532	554	563
9	X	.40224E+02	610	409	404	286	282	280	286	280	283	541	537	578	580	606	613
9	Y	.10169E+02	258	149	143	93	89	84	93	84	87	217	212	243	240	259	266
9	Z	.35470E+02	662	442	437	330	327	324	330	324	328	609	605	647	656	682	689
10	X	.49413E+02	470	309	305	195	192	190	195	190	192	397	394	434	423	451	458
10	Y	.21617E+02	250	125	111	139	130	123	139	123	130	278	267	307	318	332	349
10	Z	.37888E+02	585	383	376	281	277	273	281	273	278	528	523	566	570	595	605
11	X	.49023E+02	283	168	164	145	143	141	145	141	143	318	315	365	345	378	384
11	Y	.21946E+02	250	125	111	138	130	122	138	122	129	277	266	306	317	330	348
11	Z	.44579E+02	304	184	182	152	150	148	152	148	151	334	331	381	360	393	399
12	X	.38534E+02	281	167	164	144	141	139	144	139	142	320	317	365	345	377	382
12	Y	.18480E+02	187	95	86	118	111	104	118	104	111	256	246	282	289	305	320
12	Z	.34403E+02	310	190	188	154	152	150	154	150	152	342	339	388	367	399	405
13	X	.77288E+02	267	145	133	166	161	157	166	157	162	316	311	359	361	378	399
13	Y	.83578E+02	369	181	184	146	138	130	146	138	136	255	246	273	313	319	333
13	Z	.72744E+02	268	145	135	166	161	158	166	158	162	318	312	360	361	389	400

11-28

 * BM1 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
14	X	.22212E+02	282	170	167	145	143	141	145	141	143	328	325	373	352	383	387
14	Y	.14012E+02	130	78	71	104	99	92	104	92	97	241	232	260	269	281	294
14	Z	.18634E+02	338	215	214	168	168	164	168	164	166	375	372	419	397	430	435
16	X	.23961E+01	377	257	231	220	208	202	220	202	207	390	379	424	448	474	488
16	Y	.21088E+05	409	193	178	184	178	167	184	167	173	315	303	327	379	378	398
16	Z	.11864E+01	379	259	232	220	208	202	220	202	207	391	380	436	449	475	489
19	X	.13643E+01	345	234	207	203	191	184	203	184	189	365	353	406	421	446	460
19	Y	.16413E+01	371	234	199	236	223	217	236	217	220	341	329	372	462	477	485
19	Z	.26178E+01	385	264	239	222	211	205	222	205	210	394	384	440	450	478	490
21	X	.18551E+01	480	347	334	232	225	222	232	222	224	432	426	487	474	513	519
21	Y	.67465E+01	408	226	199	228	216	207	228	207	215	360	346	391	452	460	481
21	Z	.38149E+01	415	293	269	227	216	211	227	211	215	408	396	453	460	488	499
23	X	.33171E+02	648	457	442	308	300	298	308	298	299	559	553	613	608	645	652
23	Y	.67856E+02	461	324	279	363	348	341	363	341	346	500	484	532	677	684	696
23	Z	.68725E+02	641	452	437	304	298	292	304	292	295	553	546	606	601	638	645
25	X	.12081E+05	543	354	348	279	275	271	279	271	276	516	510	558	562	596	608
25	Y	.88304E+06	444	304	265	325	312	305	325	305	309	453	439	491	613	625	634
25	Z	.10437E+05	479	340	322	223	214	210	223	210	212	416	408	460	460	488	494
27	X	.79556E+01	697	488	472	339	331	327	339	327	331	610	604	662	662	697	706
27	Y	.15779E+02	450	304	262	358	344	337	358	337	343	502	486	538	670	678	694
27	Z	.16505E+02	697	486	472	339	331	327	339	327	331	611	604	662	663	697	706
29	X	.61724E+01	716	493	480	355	347	343	355	343	348	636	629	684	691	722	732
29	Y	.36338E+06	448	276	248	271	269	253	271	253	258	404	392	454	525	545	558
29	Z	.38143E+01	720	497	483	357	349	345	357	345	349	639	632	687	694	725	736
33	X	.21179E+01	710	493	479	348	341	337	348	337	341	625	619	676	679	713	722
33	Y	.49108E+01	401	276	238	349	338	333	349	333	336	495	483	534	657	672	682
33	Z	.41932E+01	710	493	479	347	340	336	347	336	340	624	618	675	678	712	721
35	X	.23987E+01	711	493	479	348	341	337	348	337	341	626	619	676	679	713	722
35	Y	.58186E+01	442	302	260	374	361	355	374	355	360	527	513	568	698	710	724
35	Z	.55124E+01	711	493	479	348	341	337	348	337	341	625	619	676	679	712	722
37	X	.24516E+01	712	494	480	349	341	338	349	338	341	627	620	677	680	714	723
37	Y	.90842E+07	361	192	178	171	163	156	171	156	162	295	285	329	362	374	389
37	Z	.10381E+01	712	494	480	349	341	338	349	338	341	627	620	677	680	714	723
18	X	.20850E+01	278	181	162	140	130	124	140	124	128	272	263	305	315	335	346
18	Y	.27422E+05	116	85	83	89	88	82	89	82	84	224	222	239	248	257	262
18	Z	.20567E+01	280	183	164	140	130	124	140	124	128	273	264	306	316	336	347
20	X	.13386E+03	97	40	38	97	93	91	97	91	95	258	250	273	278	284	293
20	Y	.19382E+03	99	72	71	90	88	82	90	82	86	227	223	238	249	254	262
20	Z	.13201E+03	97	40	38	97	94	91	97	91	95	257	251	273	279	285	294
22	X	.31562E+03	81	33	32	87	84	82	87	82	86	240	233	253	261	265	275
22	Y	.49965E+03	90	66	65	84	82	78	84	78	80	216	213	228	238	243	250
22	Z	.31038E+03	81	33	32	87	84	82	87	82	86	241	234	254	261	266	275

 * BM1 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	.46881E+03	71	26	26	81	77	75	81	75	79	228	221	240	249	261	261
24	Y	.75808E+03	82	59	58	78	76	71	78	71	75	207	204	219	229	233	240
24	Z	.45897E+03	71	26	26	81	77	75	81	75	79	228	221	240	249	261	261
26	X	.53099E+03	57	14	14	73	69	67	73	67	72	215	207	223	235	234	245
26	Y	.85267E+03	73	49	49	72	70	68	72	68	69	197	193	209	219	223	229
26	Z	.52207E+03	57	14	14	73	69	67	73	67	72	215	207	223	235	234	245
28	X	.48570E+03	37	-5	-6	63	59	58	63	58	61	197	188	201	216	212	223
28	Y	.73084E+03	60	37	37	65	63	59	65	59	63	185	181	197	207	210	217
28	Z	.47747E+03	37	-5	-6	63	59	58	63	58	61	197	188	201	216	212	223
30	X	.34519E+03	17	-30	-30	51	48	43	51	43	49	173	164	176	192	187	199
30	Y	.40982E+03	45	21	21	58	55	52	58	52	58	172	167	182	194	198	203
30	Z	.33930E+03	17	-29	-30	51	48	43	51	43	49	173	164	176	192	187	199
32	X	.32969E+03	9	-15	-15	-3	-4	-5	-3	-5	-4	71	68	82	82	89	93
32	Y	.13794E+05	98	70	68	67	65	57	67	57	60	175	173	186	194	201	208
32	Z	.32414E+03	9	-15	-15	-3	-4	-5	-3	-5	-4	71	68	82	82	89	93
36	X	.33205E+03	19	0	-1	-4	-4	-5	-4	-5	-4	70	70	83	79	90	91
36	Y	.10636E+03	-3	-36	-36	36	33	32	36	32	35	128	123	135	153	153	158
36	Z	.32589E+03	15	-5	-5	-5	-5	-6	-5	-6	-5	68	67	81	78	87	89
38	X	.38047E+03	103	73	73	99	97	98	99	98	98	269	266	279	283	290	295
38	Y	.74822E+03	-13	-54	-55	32	31	30	32	30	31	117	114	123	144	144	148
38	Z	.30692E+03	59	40	39	35	35	34	35	34	35	148	148	160	159	169	169
39	X	.47280E+03	108	60	60	135	131	128	135	128	133	335	327	341	359	357	367
39	Y	.11801E+04	-12	-50	-51	32	30	29	32	29	31	116	114	122	143	141	145
39	Z	.25084E+03	102	73	73	103	101	100	103	100	102	277	274	285	295	298	302
40	X	.36526E+03	139	60	60	186	180	176	186	176	183	426	414	432	458	456	472
40	Y	.11050E+04	-8	-44	-44	35	33	31	35	31	33	122	119	127	148	146	150
40	Z	.19664E+03	99	57	57	123	121	119	123	119	122	315	310	322	337	338	344
41	X	.18237E+03	220	99	97	284	275	269	284	269	280	602	584	609	648	644	668
41	Y	.59602E+03	0	-33	-34	42	40	38	42	38	40	133	129	139	160	159	164
41	Z	.15405E+03	22	-10	-11	48	47	45	48	45	47	174	171	178	189	190	194
43	X	.69830E+02	12	-9	-10	-5	-6	-7	-5	-7	-6	67	65	79	76	86	88
43	Y	.15034E-05	30	-1	-2	18	17	16	18	16	18	95	93	111	113	126	128
43	Z	.14447E+03	12	-9	-10	-5	-6	-7	-5	-7	-6	67	65	79	76	86	88
44	X	.23878E+03	98	66	65	97	94	92	97	92	95	262	258	271	281	282	287
44	Y	.24836E+03	51	20	18	78	73	70	78	70	74	192	185	207	224	230	237
44	Z	.18695E+03	91	63	62	78	76	74	78	74	77	227	222	237	244	248	255
45	X	.54382E+03	102	79	78	87	85	84	87	84	86	246	244	254	262	264	267
45	Y	.36710E+03	65	36	34	77	73	69	77	69	73	194	188	211	223	230	238
45	Z	.29644E+03	110	86	86	92	90	89	92	89	91	256	252	264	272	275	280
46	X	.81840E+03	103	83	83	81	80	79	81	79	80	236	235	244	250	254	256
46	Y	.31550E+03	73	45	43	74	71	67	74	67	70	195	189	211	219	228	235
46	Z	.41716E+03	107	88	88	85	84	83	85	83	84	244	242	251	258	261	264

11-30

 * BM1 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
47	X	.10065E+04	107	88	88	79	79	79	79	79	79	234	234	243	247	252	253
47	Y	.78921E+02	81	53	52	68	66	62	68	62	65	192	189	205	212	221	227
47	Z	.50016E+03	109	92	91	83	82	81	83	81	82	241	239	248	254	257	259
48	X	.92303E+03	108	88	88	78	78	77	78	77	78	232	232	241	245	250	251
48	Y	.71727E-08	242	160	142	164	152	139	164	139	145	296	280	305	347	350	364
48	Z	.43234E+03	105	83	83	85	84	84	85	84	84	242	241	252	257	262	264
49	X	.55077E+03	100	81	81	72	71	70	72	70	72	220	218	228	233	236	239
49	Y	.10062E+00	384	237	209	262	240	217	262	217	231	452	425	449	520	491	525
49	Z	.56132E+03	45	0	0	53	50	48	53	48	50	166	160	175	186	190	199
50	X	.32705E+03	105	78	76	75	74	65	75	65	69	195	192	200	213	215	224
50	Y	.20124E+00	384	237	209	262	240	217	262	217	231	452	424	449	520	491	525
50	Z	.88625E+03	78	46	45	63	61	58	63	58	61	187	183	196	205	213	219
51	X	.30500E+03	117	86	84	85	84	73	85	73	77	202	201	207	223	220	230
51	Y	.75634E+02	125	108	107	90	89	87	90	87	88	249	248	258	263	269	272
51	Z	.98822E+03	81	51	51	63	61	59	63	59	61	189	186	198	206	214	219
52	X	.21344E+03	128	97	95	90	89	79	90	79	82	214	213	221	235	238	245
52	Y	.29167E+03	144	116	113	100	96	93	100	93	95	255	251	265	274	278	283
52	Z	.96055E+03	72	40	40	60	58	57	60	57	59	189	186	197	205	210	214
53	X	.11446E+03	123	92	90	83	83	74	84	74	77	207	206	216	227	233	240
53	Y	.23618E+03	162	123	118	109	104	98	109	98	102	261	255	272	284	286	295
53	Z	.92523E+03	59	24	23	55	54	53	56	53	54	178	178	187	195	202	205
54	X	.15561E+02	312	198	178	212	196	178	212	178	189	389	369	397	442	428	454
54	Y	.32627E+02	171	122	115	114	107	99	114	99	104	259	251	271	286	288	298
54	Z	.88540E+03	71	32	31	64	63	58	64	58	60	182	181	191	200	215	219
55	X	.10881E-05	89	63	62	59	58	56	59	56	57	189	188	198	203	208	211
55	Y	.13194E-05	126	91	88	98	97	90	98	90	93	240	238	252	261	276	281
55	Z	.79525E+03	75	35	34	66	66	61	66	61	62	185	184	194	204	219	223
56	X	.09282E+02	328	230	211	218	202	184	218	184	194	404	384	409	454	446	469
56	Y	.44606E+00	69	29	28	62	61	58	62	58	58	178	177	188	197	211	215
56	Z	.40506E+03	71	32	30	64	63	58	64	58	60	181	180	191	200	214	218
57	X	.12072E+03	327	229	210	217	201	183	217	183	192	338	379	405	450	443	466
57	Y	.89204E+00	69	29	28	62	61	56	62	56	58	178	177	188	197	211	215
57	Z	.50993E+02	69	30	28	62	62	57	62	57	58	179	178	188	197	212	216
58	X	.10608E+03	341	237	216	226	209	190	226	190	200	410	388	414	464	455	479
58	Y	.33172E+02	69	30	29	62	62	57	62	57	59	179	178	189	197	212	216
58	Z	.91426E+00	56	18	15	52	51	48	52	48	50	165	164	175	183	195	198
59	X	.30180E+02	385	263	238	256	235	213	256	213	225	448	422	447	510	494	523
59	Y	.31830E+02	70	30	29	62	62	57	62	57	59	179	178	189	198	212	216
59	Z	.46715E+00	56	18	15	52	51	48	52	48	50	165	164	175	183	195	198
60	X	.30200E-08	522	337	298	346	315	283	346	283	301	558	519	532	648	606	651
60	Y	.13619E-05	70	30	29	62	62	57	62	57	59	179	178	189	198	212	216
60	Z	.13431E-05	56	18	15	52	51	48	52	48	50	165	164	175	183	195	198

11-31

 * BM1 MODEL *

EARTHQUAKE NO. 1

*PIPE END MOMENTS(CROSS COMPARISON)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	12	.25792E+04	50	7	8	-12	-12	-13	-12	-13	-12	48	45	59	55	65	66
2	18	.43787E+03	84	18	14	2	1	0	2	0	1	63	61	74	79	83	88
3	12	.09014E+03	50	5	4	-11	-12	-13	-11	-13	-12	45	44	58	57	65	69
4	18	.25721E+04	44	4	3	-15	-16	-16	-15	-16	-15	43	41	55	51	62	63
5	12	.21157E+04	53	2	0	4	2	0	4	0	2	74	70	84	88	93	100
6	12	.17781E+04	48	0	-4	29	23	20	29	20	20	117	110	126	138	137	148
7	12	.28130E+04	13	-18	-21	9	6	3	9	3	7	86	80	94	103	105	114
8	12	.14892E+04	58	8	5	33	30	28	33	28	32	129	124	147	148	156	163
9	18	.15312E+04	77	19	15	47	41	38	47	38	43	148	138	158	170	173	185
10	12	.83821E+03	152	70	60	79	74	71	79	71	74	175	171	207	214	235	243
11	12	.25954E+04	105	37	30	41	37	34	41	34	37	119	116	143	146	159	165
12	12	.19480E+04	108	41	39	38	36	34	38	34	37	127	124	150	147	163	168
13	18	.21127E+04	84	25	23	23	21	19	23	19	21	102	100	124	120	134	139
14	12	.22384E+04	232	152	139	114	107	105	114	105	107	216	211	243	266	281	286
15	12	.12012E+04	223	145	132	111	106	103	111	103	105	216	210	245	264	283	286
16	12	.82099E+03	237	154	140	120	115	112	120	112	114	225	219	250	278	293	297
17	12	.30301E+03	208	117	109	117	111	109	117	109	113	261	254	295	293	310	320
18	12	.31997E+03	213	126	118	109	104	101	109	101	105	242	237	276	275	294	302
19	18	.32529E+03	212	128	119	106	101	98	106	98	101	234	229	267	267	286	293
20	12	.48778E-11	225	139	130	205	199	196	205	196	201	387	381	435	454	477	491
21	12	.53683E+04	-45	-62	-62	-38	-39	-39	-38	-39	-38	11	10	16	19	20	23
22	12	.12625E+04	85	25	25	88	85	83	88	83	87	231	225	241	255	256	264
23	12	.80305E+03	98	59	58	100	98	94	100	94	98	258	251	272	278	286	294
24	12	.19848E+04	56	23	22	74	70	67	74	67	71	200	202	218	230	230	240
25	12	.26380E+04	41	9	8	66	63	61	66	61	65	196	188	202	218	215	225
26	12	.24900E+04	30	-6	-6	68	63	61	68	61	65	198	188	231	220	216	226
27	12	.17861E+04	30	-14	-14	80	76	74	80	74	78	218	208	218	243	238	248
28	12	.12534E+04	104	60	59	116	115	111	116	111	114	274	271	291	303	307	316
29	12	.32854E+04	48	16	14	69	66	63	69	63	68	199	193	209	220	221	229
30	18	.10011E+04	146	97	95	147	146	142	147	142	145	330	327	354	359	372	377
31	12	.19836E+04	32	0	-1	60	59	58	60	58	59	181	179	192	205	209	212
32	12	.34212E+04	0	-37	-38	44	41	39	44	39	42	149	145	151	172	169	175
33	12	.28926E+04	0	-43	-44	51	49	47	51	47	50	163	158	163	188	183	191
34	12	.89074E+03	127	84	82	152	148	145	152	145	150	355	349	369	384	388	396
35	12	.27409E+04	50	23	23	53	53	52	53	52	53	171	170	184	190	198	199
36	12	.21863E+04	13	-20	-20	51	50	48	51	48	51	162	158	166	166	186	190
37	12	.18248E+04	28	-9	-10	74	70	68	74	68	72	202	196	208	229	227	236
38	12	.17324E+04	69	33	32	82	79	76	82	76	80	223	217	234	247	249	257
39	12	.18406E+04	63	32	32	50	49	47	50	47	49	170	167	179	185	193	198
40	18	.15562E+04	62	31	31	44	43	41	44	41	42	158	155	165	172	181	184
41	12	.95300E+03	102	73	73	90	89	87	90	87	89	248	246	257	265	270	274
42	12	.17859E+04	106	77	77	100	99	98	100	98	99	271	269	282	289	294	296

II-32

 * BM1 MODEL *

EARTHQUAKE NO. 1

*PIPE END MOMENTS(CROSS COMPARISON)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
43	18	.20068E+04	108	79	79	100	99	98	100	98	100	270	268	281	289	293	297
44	12	.20129E+04	82	60	60	69	68	67	69	67	69	212	209	220	227	230	235
45	12	.15113E+04	73	43	43	65	62	61	65	61	64	198	195	208	214	219	223
46	12	.14059E+04	52	13	13	59	56	54	59	54	56	183	179	193	203	205	211
47	18	.11385E+04	59	19	19	65	63	61	65	61	64	198	190	205	216	218	220
48	12	.68288E+03	99	62	61	92	91	85	92	85	89	235	231	247	258	263	272
49	12	.20181E+04	51	9	8	52	51	49	52	49	70	168	167	179	186	196	200
50	18	.20215E+04	49	7	7	51	50	48	51	48	49	168	165	177	185	194	198
51	12	.58817E+03	114	83	82	98	95	91	98	91	94	251	246	259	272	277	284
52	12	.12882E+04	84	43	43	79	78	73	79	73	75	217	212	224	236	243	250
53	18	.20969E+04	78	19	18	19	18	16	19	16	18	97	96	119	115	128	132
54	12	.19270E+04	84	35	35	116	112	110	116	110	115	287	280	299	315	315	326
55	12	.21404E+04	22	-14	-17	26	21	17	26	17	22	114	106	122	134	133	144

 * BM1 MODEL *

EARTHQUAKE NO. 1

*SUPPORT FORCES (CROSS COMPARISON)

ELEM. NO.	FORCE CODE	FORCE (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	.17473E+03	42	0	-2	-13	-14	-15	-13	-15	-14	43	41	55	54	62	67
2	1	.38344E+02	35	0	-1	14	11	8	14	8	11	93	80	103	109	114	121
3	1	.15615E+03	57	14	13	-6	-8	-9	-6	-9	-7	58	56	72	68	78	82
4	1	.21659E+04	50	4	2	-13	-14	-15	-13	-15	-14	48	44	59	56	64	68
5	1	.14498E+04	67	-4	-10	-7	-10	-13	-7	-13	-9	38	34	39	56	51	60
6	1	.20902E+04	41	-1	-2	-13	-14	-15	-13	-15	-14	44	42	57	54	63	67
7	1	.32529E+02	61	3	-1	19	17	14	19	14	17	76	73	96	106	118	125
8	1	.29147E+03	2	-17	-18	-3	-3	-5	-3	-5	-4	63	62	75	77	84	86
9	1	.14823E+03	50	14	14	37	34	32	37	32	36	145	138	155	161	165	174
10	1	.29370E+03	10	-5	-5	17	17	15	17	15	16	102	100	112	118	122	126
11	1	.10884E+03	82	27	26	15	14	13	15	13	15	93	91	108	107	120	125
12	1	.76673E+02	71	4	0	8	8	3	8	3	6	56	52	71	84	91	98
13	1	.15086E+02	259	171	162	103	99	97	103	97	98	228	224	262	254	277	280
14	1	.20041E+02	75	30	18	43	39	36	43	36	38	103	99	128	148	161	165
15	1	.83477E+02	81	35	34	34	32	30	34	30	33	127	122	143	144	159	166
16	1	.56525E+02	66	29	15	41	36	34	41	34	35	85	80	99	138	145	147
17	1	.39662E+02	225	146	134	130	122	117	130	117	123	278	267	308	312	331	344
18	1	.13820E+03	32	5	2	23	21	20	23	20	22	118	114	130	132	140	145
19	1	.84045E+02	59	38	37	50	49	45	50	45	46	153	152	164	172	176	181
20	1	.46229E+01	189	118	109	60	57	56	60	56	57	159	157	183	179	195	198
21	1	.37553E+01	84	25	19	53	49	47	53	47	50	150	145	176	180	192	199
22	1	.97130E+02	81	59	59	59	58	58	59	58	59	193	192	204	206	213	214
23	1	.12719E+03	-10	-41	-41	9	9	9	9	9	9	82	82	96	102	110	110
24	1	.58804E+02	22	-23	-25	49	43	40	49	40	46	160	149	163	183	177	191
25	1	.79734E+02	63	38	36	58	57	56	58	56	57	192	190	200	206	210	212
26	1	.91363E+02	79	51	51	62	62	59	62	59	60	187	187	196	203	216	218
27	1	.14732E+02	119	76	71	87	83	79	87	79	81	228	223	239	249	250	255
28	1	.10218E+03	44	1	1	47	46	43	47	43	45	159	157	168	176	185	189
29	1	.10300E+03	36	-5	-6	43	41	39	43	39	42	154	151	163	171	177	182
30	1	.12716E+04	44	1	1	46	46	43	46	43	45	159	157	168	176	185	189
31	1	.71158E+03	110	84	82	85	80	77	85	77	81	231	224	234	250	247	258
32	1	.18715E+03	82	59	58	62	61	58	62	58	60	185	182	195	202	209	213

 * BM2 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.21009E-09	129	98	95	79	78	77	79	77	79	151	149	172	166	174	178
1	Y	.20274E-10	247	175	172	158	152	147	158	147	153	251	243	285	273	290	302
1	Z	.12479E-09	299	242	242	201	199	198	201	198	199	324	321	360	331	363	366
2	X	.52312E-03	-7	-23	-25	-21	-22	-24	-21	-24	-22	4	2	3	9	6	10
2	Y	.39966E-03	329	289	268	221	220	219	221	219	220	353	352	395	360	398	400
2	Z	.48485E-03	-4	-21	-22	-21	-22	-24	-21	-24	-22	5	3	6	10	8	12
3	X	.26255E-02	71	45	44	37	36	34	37	34	36	90	89	104	95	107	110
3	Y	.14623E-02	305	248	248	203	202	201	203	201	202	329	328	369	336	371	373
3	Z	.14622E-02	227	180	179	145	144	143	145	143	144	245	244	273	252	276	279
4	X	.35881E-02	95	66	66	54	54	52	54	52	54	116	114	133	121	135	139
4	Y	.14622E-02	305	248	248	203	202	202	203	202	202	330	328	369	336	371	373
4	Z	.20378E-02	268	213	212	175	174	172	175	172	174	288	287	319	298	322	326
5	X	.57759E-02	94	66	65	54	53	51	54	51	53	115	114	132	120	134	138
5	Y	.25481E-02	291	236	235	193	192	191	193	191	192	317	316	355	324	357	359
5	Z	.33684E-02	258	204	203	166	166	164	166	164	166	277	276	308	285	311	314
6	X	.28829E-02	282	228	227	188	184	184	188	184	185	307	306	344	314	346	348
6	Y	.17729E-09	149	96	95	88	87	85	88	85	87	174	173	208	188	210	214
6	Z	.27867E-02	282	228	227	188	184	184	188	184	185	307	306	344	314	346	348
7	X	.54678E-02	103	73	72	60	60	58	60	58	60	124	123	143	130	145	148
7	Y	.30098E-02	257	204	204	167	167	166	167	166	167	289	288	320	296	322	324
7	Z	.33195E-02	262	210	209	171	171	170	171	170	171	285	284	316	293	319	322
8A	X	.44098E-02	148	111	110	92	91	90	92	90	91	170	169	193	176	195	199
8A	Y	.24363E-02	233	182	182	150	149	149	150	149	149	267	266	294	274	296	297
8A	Z	.30983E-02	277	223	222	183	183	181	183	181	183	303	302	336	310	339	342
8	X	.31182E-02	246	197	197	163	162	161	163	161	162	273	271	307	280	309	312
8	Y	.11788E-02	194	148	148	122	121	121	122	121	121	230	229	251	237	253	255
8	Z	.27409E-02	304	247	246	204	202	202	204	202	203	333	331	370	340	372	375
9	X	.28610E-02	296	240	240	197	196	196	197	196	197	324	322	361	331	364	366
9	Y	.86759E-03	161	118	118	98	97	97	98	97	97	198	197	214	200	217	218
9	Z	.28693E-02	262	211	210	173	172	171	173	171	172	288	287	323	295	326	328
10	X	.53544E-02	204	159	158	130	130	130	130	130	130	243	243	262	250	265	265
10	Y	.35147E-02	139	100	100	84	83	83	84	83	83	182	181	189	188	193	194
10	Z	.47887E-02	196	151	151	124	124	124	124	124	124	234	233	254	240	257	258
11	X	.13394E-01	158	118	117	97	97	97	97	97	97	204	204	208	210	213	213
11	Y	.35040E-02	139	100	99	83	83	83	83	83	83	181	181	189	188	192	194
11	Z	.12761E-01	158	118	118	98	98	98	98	98	98	204	204	208	211	213	213
12	X	.11566E-01	158	118	118	97	97	97	97	97	97	204	204	208	210	212	212
12	Y	.27572E-02	144	102	102	86	85	85	86	85	85	186	185	195	193	198	199
12	Z	.10961E-01	159	118	118	98	98	98	98	98	98	205	205	208	211	213	213
13	X	.98831E-02	157	118	117	107	106	106	107	106	106	212	211	222	219	226	227
13	Y	.68562E-02	25	2	0	9	4	3	9	3	6	51	45	54	58	63	69
13	Z	.93196E-02	157	118	118	106	106	105	106	105	106	211	211	222	218	225	227

 * BM2 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT (CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
14	X	.75412E-02	158	118	118	97	97	97	97	97	97	204	204	207	210	212	212
14	Y	.15453E-02	150	104	103	88	88	87	88	87	88	190	189	205	199	207	209
14	Z	.70030E-02	159	119	119	98	98	98	98	98	98	205	205	208	211	213	213
15	X	.27290E-03	173	132	130	133	128	128	133	128	131	244	238	257	252	261	267
15	Y	.20121E-09	8	-11	-12	-6	-6	-8	-8	-8	-7	28	27	35	35	42	45
15	Z	.13520E-03	173	132	130	133	129	128	133	128	131	244	239	257	252	261	267
19	X	.13497E-03	178	133	131	130	130	130	130	130	133	248	241	263	257	267	275
19	Y	.97770E-04	109	83	82	140	121	120	140	120	131	235	211	223	254	255	271
19	Z	.31287E-03	171	131	130	132	128	128	132	128	130	242	238	254	250	258	263
21	X	.18003E-03	197	157	155	157	153	153	157	153	155	270	268	287	278	291	296
21	Y	.33233E-03	205	152	147	172	163	161	172	161	167	295	284	305	310	333	343
21	Z	.41088E-03	170	130	134	137	133	132	137	132	135	248	243	260	258	264	270
23	X	.15445E-02	439	309	305	361	340	339	351	339	346	520	504	548	531	553	560
23	Y	.40615E-02	115	63	51	171	151	150	171	150	162	277	252	262	300	297	313
23	Z	.32300E-02	430	302	358	345	333	332	345	332	339	511	495	539	522	544	557
25	X	.38540E-10	522	429	428	383	382	380	383	380	382	559	557	619	574	621	628
25	Y	.60464E-10	130	83	74	168	151	149	168	149	159	276	254	269	297	300	320
25	Z	.57200E-10	299	242	237	239	228	227	239	227	234	370	360	400	387	405	418
27	X	.29343E-03	588	499	494	466	451	450	466	450	459	669	650	698	682	704	720
27	Y	.11035E-03	78	32	20	130	120	118	130	118	128	227	205	211	247	238	252
27	Z	.60849E-03	588	499	494	466	452	450	466	450	459	669	650	698	682	705	720
29	X	.21394E-05	629	535	530	493	479	478	493	478	486	702	684	729	716	735	750
29	Y	.30205E-10	157	111	107	132	124	123	132	123	128	237	227	245	250	274	282
29	Z	.13322E-05	629	534	529	493	479	478	493	478	486	703	685	730	716	736	751
33	X	.75205E-04	618	525	520	488	473	472	488	472	481	697	678	726	711	732	740
33	Y	.46220E-03	111	69	65	121	111	111	121	111	118	218	208	224	233	252	261
33	Z	.14920E-03	618	523	518	488	472	470	488	470	479	695	676	724	709	730	746
35	X	.85107E-04	618	520	520	488	474	472	488	472	481	698	679	727	711	733	748
35	Y	.45777E-03	111	64	57	145	131	130	145	130	138	246	229	245	264	276	298
35	Z	.19579E-03	618	525	520	488	473	472	488	472	481	697	678	726	710	732	748
37	X	.88749E-04	621	528	522	490	475	474	490	474	483	700	681	729	713	735	750
37	Y	.98459E-11	149	109	108	98	94	94	98	94	95	198	194	205	204	216	219
37	Z	.36734E-04	621	528	522	490	475	474	490	474	483	700	681	729	713	735	750
10	X	.10202E-03	210	155	150	105	153	152	165	152	159	282	267	307	297	312	326
10	Y	.15806E-03	135	67	60	60	60	59	60	59	60	144	144	179	164	182	184
10	Z	.94794E-04	220	162	157	173	161	159	173	159	167	292	277	319	309	324	338
20	X	.64072E-01	150	110	110	95	95	95	95	95	95	202	202	203	208	209	209
20	Y	.60517E-02	200	64	62	81	79	74	81	74	79	175	172	209	222	226	236
20	Z	.63629E-01	150	110	110	95	95	95	95	95	95	202	202	203	208	209	209
22	X	.17258E+00	155	115	115	95	95	95	95	95	95	201	201	202	207	208	208
22	Y	.16235E-01	189	46	44	69	67	62	69	62	67	157	153	177	207	203	214
22	Z	.16958E+00	155	115	115	95	95	95	95	95	95	201	201	202	207	208	208

11-36

 * BM2 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	.30240E+00	154	115	115	94	94	94	94	94	94	200	200	201	206	207	207
24	Y	.23518E-01	188	40	38	68	68	68	68	68	68	155	151	169	200	200	212
24	Z	.29729E+00	154	115	115	94	94	94	94	94	94	200	200	201	206	207	207
26	X	.43486E+00	153	114	114	93	93	93	93	93	93	199	199	200	205	205	205
26	Y	.25037E-01	188	38	35	71	68	62	71	62	68	159	154	170	211	203	216
26	Z	.42749E+00	153	114	114	93	93	93	93	93	93	199	199	200	205	205	205
26	X	.55205E+00	152	113	113	93	93	93	93	93	93	198	198	198	204	204	204
28	Y	.19904E-01	191	37	34	77	74	68	77	68	74	169	164	179	222	213	227
28	Z	.54274E+00	152	113	113	93	93	93	93	93	93	198	198	198	204	204	204
30	X	.63904E+00	151	112	112	92	92	92	92	92	92	197	197	197	202	202	202
30	Y	.99757E-02	200	40	36	91	88	80	91	80	88	192	185	201	247	236	253
30	Z	.62829E+00	150	112	112	92	92	92	92	92	92	197	197	197	202	202	202
32	X	.68250E+00	149	111	111	91	91	91	91	91	91	195	195	195	201	201	201
32	Y	.58388E-10	108	16	15	17	16	14	17	14	16	73	72	86	113	111	116
32	Z	.67102E+00	149	111	111	91	91	91	91	91	91	195	195	195	201	201	201
36	X	.68720E+00	149	111	111	90	90	90	90	90	90	195	195	195	200	200	200
36	Y	.19046E-02	202	47	43	135	132	123	135	123	132	254	247	260	323	311	328
36	Z	.67438E+00	149	111	111	90	90	90	90	90	90	195	195	195	201	201	201
38	X	.65423E+00	146	108	108	88	88	88	88	88	88	191	191	192	197	197	197
38	Y	.16524E-01	125	20	18	90	88	84	90	84	88	182	178	188	241	235	245
38	Z	.65955E+00	148	110	110	90	90	90	90	90	90	193	193	193	199	199	199
39	X	.51199E+00	143	105	105	86	86	86	86	86	86	187	187	188	193	193	193
39	Y	.28242E-01	110	16	14	77	76	71	77	71	76	163	159	166	218	212	221
39	Z	.59539E+00	147	109	109	89	89	89	89	89	89	192	192	192	198	198	198
40	X	.29333E+00	138	101	101	82	82	82	82	82	82	182	182	183	187	168	188
40	Y	.26506E-01	114	22	19	82	80	75	82	75	80	170	166	171	226	219	229
40	Z	.49670E+00	146	108	108	88	88	88	88	88	88	191	191	191	197	197	197
41	X	.51736E-01	123	80	80	68	67	67	68	67	67	163	162	170	169	174	175
41	Y	.13199E-01	133	36	34	103	101	95	103	95	101	202	197	204	265	255	267
41	Z	.38764E+00	147	109	109	89	89	89	89	89	89	192	192	192	198	198	198
43	X	.14489E+00	149	111	111	91	91	91	91	91	91	195	195	195	201	201	201
43	Y	.50237E-10	114	-6	-6	3	2	2	3	2	2	53	53	76	85	94	95
43	Z	.29977E+00	149	111	111	91	91	91	91	91	91	195	195	195	201	201	201
44	X	.22177E+00	142	105	105	85	85	85	85	85	85	187	187	187	192	193	193
44	Y	.67074E-02	140	28	26	88	85	79	88	79	85	182	176	198	235	229	242
44	Z	.26514E+00	152	113	113	93	93	93	93	93	93	198	198	198	204	204	204
45	X	.24909E+00	139	102	102	82	82	82	82	82	82	182	182	183	188	188	189
45	Y	.10708E-01	158	28	25	70	68	62	70	62	68	157	152	180	204	203	214
45	Z	.25285E+00	154	115	115	94	94	94	94	94	94	201	201	201	207	207	207
46	X	.23872E+00	137	98	98	79	79	79	79	79	79	178	178	180	184	185	185
46	Y	.98348E-02	177	31	29	61	59	54	61	54	59	144	140	171	187	190	200
46	Z	.25762E+00	156	117	117	96	96	96	96	96	96	203	203	203	209	209	209

II-37

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 * BM2 MODEL *
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EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
47	X	.20411E+00	134	94	94	76	76	76	76	76	76	173	172	176	178	180	181
47	Y	.24880E-02	208	38	37	55	53	49	55	49	53	137	134	170	177	185	193
47	Z	.27313E+00	157	117	117	96	96	96	96	96	96	204	204	204	210	210	210
48	X	.18277E+00	135	94	94	76	76	76	76	76	76	173	173	177	179	181	181
48	Y	.41253E-10	178	93	91	83	82	78	83	78	81	183	181	203	198	206	211
48	Z	.28138E+00	156	118	116	95	95	95	95	95	95	203	203	203	209	209	209
49	X	.13533E+00	143	103	103	84	84	84	84	84	84	185	185	187	191	192	192
49	Y	.92495E-05	169	108	107	93	92	91	93	91	92	198	198	210	208	214	217
49	Z	.29667E+00	153	114	114	93	93	93	93	93	93	199	199	200	205	205	205
50	X	.92357E-01	161	120	120	99	99	99	99	99	99	208	208	211	215	216	216
50	Y	.18500E-04	169	108	107	93	92	91	93	91	92	198	198	210	208	214	217
50	Z	.30932E+00	151	112	112	91	91	91	91	91	91	198	198	198	202	203	203
51	X	.81273E-01	163	122	122	100	100	100	100	100	100	210	210	215	217	219	219
51	Y	.78290E-02	117	68	68	55	55	55	55	55	55	141	141	153	148	155	155
51	Z	.29981E+00	151	111	111	90	90	90	90	90	90	195	195	197	201	202	202
52	X	.54833E-01	162	120	120	99	99	99	99	99	99	208	208	213	215	218	218
52	Y	.28541E-01	113	65	65	53	53	52	53	52	53	137	137	150	144	152	152
52	Z	.21560E+00	144	103	103	84	84	84	84	84	84	185	185	188	191	192	192
53	X	.27139E-01	162	120	120	99	99	99	99	99	99	208	208	213	215	217	218
53	Y	.22801E-01	111	64	64	52	51	51	52	51	51	135	134	147	142	149	150
53	Z	.12735E+00	136	89	89	71	71	71	71	71	71	166	166	174	172	177	177
54	X	.16429E-02	182	109	108	92	91	90	92	90	91	198	198	208	205	211	213
54	Y	.31923E-02	110	65	65	51	51	51	51	51	51	134	133	146	141	148	149
54	Z	.43553E-01	185	58	58	50	50	49	50	49	50	135	134	174	157	179	181
55	X	.10819E-09	155	101	101	83	83	83	83	83	83	185	185	195	192	198	198
55	Y	.89628E-10	123	42	42	35	34	34	35	34	34	107	106	140	124	143	144
55	Z	.28740E-01	252	61	60	61	60	59	61	59	60	153	152	197	189	208	211
56	X	.90631E-02	154	107	106	88	88	87	88	87	88	191	190	199	199	202	204
56	Y	.15088E-04	267	61	60	63	62	60	63	60	62	157	155	201	194	212	216
56	Z	.14046E-01	261	61	60	62	62	60	62	60	62	155	154	199	192	210	214
57	X	.17030E-01	155	109	109	90	90	89	90	89	90	194	193	201	202	205	206
57	Y	.30174E-04	267	61	60	63	62	60	63	60	62	157	155	201	194	212	216
57	Z	.17211E-02	268	61	60	63	62	61	63	61	62	157	156	201	194	212	216
58	X	.14273E-01	156	109	109	90	90	89	90	89	90	194	193	201	202	205	206
58	Y	.11214E-02	287	61	60	63	62	61	63	61	62	157	156	201	194	212	216
58	Z	.23877E-04	345	66	64	77	75	72	77	72	75	183	181	226	225	239	245
59	X	.33530E-02	158	108	107	90	90	89	90	89	90	193	192	202	202	206	207
59	Y	.10746E-02	268	61	61	63	62	61	63	61	62	157	156	201	194	212	216
59	Z	.11939E-04	345	66	64	77	75	72	77	72	75	183	181	226	225	239	245
60	X	.19047E-10	182	119	114	106	104	98	106	98	102	209	207	220	224	225	232
60	Y	.45942E-10	268	61	61	63	62	61	63	61	62	157	156	201	195	213	216
60	Z	.35075E-10	345	66	64	77	75	72	77	72	75	183	181	226	225	239	245

 * BM2 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.42728E+00	5953	5077	5041	4954	4924	4834	4954	4834	4915	6658	6608	6694	6858	6751	6918
1	Y	.12368E+00	3439	2805	2770	2569	2527	2467	2569	2467	2525	3437	3379	3484	3595	3550	3673
1	Z	.38659E+00	6118	5263	5242	4658	4630	4580	4658	4580	4630	6248	6203	6339	6374	6375	6482
2	X	.26267E+00	15904	13028	12815	12975	12859	12495	12975	12495	12803	17196	17018	17050	18133	17471	18152
2	Y	.96515E+00	8239	7122	7109	6249	6226	6187	6249	6187	6225	8384	8349	8567	8513	8600	8679
2	Z	.23002E+00	17001	13908	13687	13499	13378	13028	13499	13028	13325	17857	17678	17725	18844	18209	18874
3	X	.35337E+01	7438	6287	6226	6307	6271	6126	6307	6126	6249	8450	8384	8449	8762	8547	8808
3	Y	.39579E+01	6724	5823	5814	5074	5052	5035	5074	5035	5058	6821	6790	6987	6914	7013	7057
3	Z	.26100E+01	9534	8068	8010	7049	7017	6912	7049	6912	6999	9371	9372	9491	9665	9605	9804
4	X	.55588E+01	6957	5908	5858	5843	5809	5688	5843	5688	5793	7837	7854	8101	7934	8156	
4	Y	.39558E+01	6729	5828	5818	5079	5057	5039	5079	5039	5062	6027	6796	6993	6920	7019	7063
4	Z	.43590E+01	8560	7280	7237	6405	6375	6280	6405	6280	6360	8535	8486	8641	8775	8723	9005
5	X	.88582E+01	6983	5929	5878	5858	5823	5701	5858	5701	5807	7855	7793	7871	8122	7953	8178
5	Y	.65584E+01	6610	5727	5717	4971	4950	4932	4971	4932	4955	6681	6651	6847	6772	6872	6917
5	Z	.67539E+01	8847	7514	7489	6602	6573	6475	6602	6475	6557	8792	8745	8903	9047	8993	9180
6	X	.80734E+01	5877	5092	5084	4403	4382	4376	4403	4376	4391	5927	5897	6087	5999	6109	6136
6	Y	.93057E+00	2025	1622	1600	1626	1612	1562	1626	1562	1601	2193	2172	2247	2315	2298	2383
6	Z	.78041E+01	5876	5092	5084	4403	4382	4376	4403	4376	4391	5926	5897	6087	5999	6109	6136
7	X	.89850E+01	6703	5702	5656	4842	4811	4797	4842	4797	4898	6710	6686	6884	6816	6911	6985
7	Y	.61878E+01	6744	5819	5808	5008	4994	4958	5008	4958	4989	6710	6686	6884	6816	6911	6985
7	Z	.67755E+01	8579	7300	7268	6386	6359	6271	6386	6271	6345	8510	8467	8637	8739	8716	8884
8A	X	.87860E+01	6263	5362	5328	5192	5164	5079	5192	5079	5156	6981	6932	7027	7175	7082	7240
8A	Y	.51878E+01	6574	4794	4782	4103	4091	4053	4103	4053	4084	5494	5474	5650	5592	5675	5747
8A	Z	.70282E+01	7690	6590	6562	5786	5741	5669	5786	5669	5732	7705	7664	7830	7880	7883	8022
8	X	.83818E+01	5851	5057	5041	4604	4582	4548	4604	4548	4585	6201	6165	6309	6313	6340	6413
8	Y	.24694E+01	4361	3727	3712	3176	3154	3121	3176	3121	3154	4254	4223	4389	4344	4414	4487
8	Z	.74795E+01	6507	5619	5605	4898	4874	4839	4898	4839	4876	6572	6536	6709	6678	6738	6815
9	X	.78717E+01	6242	5402	5391	4688	4666	4643	4688	4643	4671	6297	6255	6446	6388	6471	6527
9	Y	.18321E+01	3185	2679	2659	2276	2241	2221	2276	2221	2250	3054	3007	3177	3144	3214	3276
9	Z	.80151E+01	5781	5004	4993	4460	4438	4419	4460	4419	4445	6007	5975	6136	6099	6162	6212
10	X	.91758E+01	5239	4532	4522	3816	3804	3780	3816	3780	3803	5109	5090	5275	5184	5300	5349
10	Y	.60294E+01	1780	1468	1441	1595	1558	1519	1595	1519	1564	2165	2112	2248	2265	2274	2365
10	Z	.93876E+01	4697	4055	4042	3589	3569	3542	3589	3542	3573	4830	4798	4937	4914	4960	5021
11	X	.20270E+02	1388	1205	1201	1152	1144	1137	1152	1137	1146	1580	1549	1685	1600	1695	1718
11	Y	.60537E+01	1800	1482	1456	1609	1571	1531	1609	1531	1578	2184	2130	2268	2285	2292	2385
11	Z	.19455E+02	1419	1229	1227	1125	1122	1115	1125	1115	1121	1522	1516	1647	1556	1655	1670
12	X	.17436E+02	1258	1088	1084	1012	1005	998	1012	998	1006	1371	1361	1487	1405	1495	1513
12	Y	.56005E+01	1261	1020	1003	1120	1095	1068	1120	1068	1098	1537	1501	1645	1614	1661	1723
12	Z	.16888E+02	1293	1115	1113	983	981	975	983	975	980	1331	1327	1446	1360	1453	1465
13	X	.16461E+02	2374	2094	2085	2670	2628	2597	2670	2597	2643	3635	3574	3810	3753	3839	3929
13	Y	.99417E+01	5889	4745	4648	4624	4498	4413	4624	4413	4532	6160	5993	6092	6522	6401	6621
13	Z	.15657E+02	2382	2101	2075	2641	2605	2575	2641	2575	2617	3594	3541	3773	3709	3801	3884

11-39

 * BM2 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
14	X	.11410E+02	1098	945	941	854	847	842	854	842	849	1160	1150	1265	1189	1272	1287
14	Y	.48010E+01	780	587	576	653	638	618	653	618	638	923	902	1028	539	1043	1082
14	Z	.10771E+02	1167	991	990	823	822	819	823	819	821	1117	1115	1221	1138	1226	1233
15	X	.55584E+00	2838	2483	2412	3054	2904	2883	3054	2883	2980	4189	3988	4197	4316	4279	4456
15	Y	.27674E-06	5781	4685	4613	4768	4727	4601	4768	4601	4706	6353	6291	6355	6717	6593	6810
15	Z	.27593E+00	2847	2491	2420	3054	2903	2883	3054	2883	2979	4188	3987	4195	4315	4278	4454
19	X	.33637E+00	2490	2143	2074	2602	2453	2433	2602	2433	2528	3577	3378	3576	3694	3654	3823
19	Y	.46105E+00	2195	1676	1581	2309	2144	2129	2309	2129	2228	3189	2974	3039	3396	3329	3473
19	Z	.56055E+00	3128	2764	2693	3406	3257	3237	3406	3237	3332	4664	4466	4684	4798	4770	4949
21	X	.53640E+00	3064	2699	2672	2744	2671	2667	2744	2667	2710	3752	3655	3805	3819	3858	3937
21	Y	.13687E+01	3036	2430	2362	2831	2727	2669	2831	2669	2764	3848	3705	3798	4066	4003	4159
21	Z	.78231E+00	3589	3169	3097	3701	3539	3523	3701	3523	3622	5064	4849	5064	5196	5164	5349
23	X	.40962E+01	10163	8826	8761	8119	7937	7915	8119	7915	8029	10979	10734	11199	11149	11285	11485
23	Y	.24025E+02	1643	1214	1125	2055	1919	1903	2055	1903	1988	2866	2688	2734	3054	2973	3097
23	Z	.82268E+01	10378	9018	8949	8297	8109	8086	8297	8086	8204	11220	10967	11443	11395	11532	11739
25	X	.26531E-06	4851	4176	4187	3905	3897	3863	3905	3863	3891	5278	5261	5461	5382	5487	5550
25	Y	.33807E-06	1799	1354	1275	2067	1935	1922	2067	1922	2002	2874	2702	2756	3062	3004	3121
25	Z	.16836E-06	5851	5087	5004	4778	4595	4584	4778	4584	4690	6494	6253	6557	6613	6646	6828
27	X	.89077E+00	12041	10446	10380	9568	9392	9355	9568	9355	9477	12917	12677	13193	13123	13278	13494
27	Y	.62411E+01	1698	1270	1187	2151	2030	2007	2151	2007	2089	2994	2833	2899	3185	3114	3234
27	Z	.18478E+01	12045	10449	10384	9571	9395	9358	9571	9358	9480	12922	12682	13198	13127	13282	13499
29	X	.66589E-02	12826	11117	11053	10219	10059	10009	10219	10009	10132	13784	13563	14079	14014	14162	14384
29	Y	.12314E-06	2234	1758	1701	2143	2043	2020	2143	2020	2089	2942	2809	2891	3121	3114	3218
29	Z	.41569E-02	12755	11058	10994	10161	9999	9951	10161	9951	10073	13708	13483	14000	13933	14082	14304
33	X	.23535E+00	12348	10709	10644	9818	9649	9607	9818	9607	9729	13250	13018	13535	13464	13618	13836
33	Y	.20405E+01	1411	1043	987	1978	1872	1860	1978	1860	1926	2767	2627	2714	2935	2882	2978
33	Z	.46623E+00	12331	10691	10626	9801	9631	9590	9801	9590	9712	13227	12994	13511	13441	13595	13813
35	X	.26650E+00	12355	10715	10650	9824	9654	9612	9824	9612	9735	13257	13025	13542	13472	13626	13844
35	Y	.23874E+01	1513	1124	1045	2053	1945	1927	2053	1927	2000	2869	2722	2802	3046	2985	3091
35	Z	.61260E+00	12344	10707	10643	9817	9647	9606	9817	9606	9727	13248	13015	13533	13462	13616	13834
37	X	.27223E+00	12377	10733	10668	9842	9673	9631	9842	9631	9753	13282	13050	13567	13497	13650	13869
37	Y	.21440E-07	2893	2349	2308	2408	2351	2305	2408	2305	2364	3247	3172	3261	3419	3410	3516
37	Z	.11627E+00	12376	10733	10668	9842	9673	9631	9842	9631	9753	13282	13050	13567	13497	13651	13869
10	X	.59708E+00	1892	1585	1522	1626	1528	1511	1626	1511	1576	2242	2113	2237	2326	2298	2407
10	Y	.11194E-05	413	226	219	230	223	211	230	211	221	362	355	442	431	458	477
10	Z	.59386E+00	1894	1587	1526	1612	1517	1500	1612	1500	1562	2222	2096	2221	2304	2280	2386
20	X	.90197E+02	268	181	179	205	203	200	205	200	203	319	317	375	339	377	383
20	Y	.79455E+02	329	134	130	146	142	135	146	135	141	264	259	304	339	338	352
20	Z	.88915E+02	264	177	175	203	201	198	203	198	201	317	314	372	337	374	381
22	X	.22574E+03	223	136	135	157	156	154	157	154	156	268	267	309	283	311	314
22	Y	.19808E+03	311	110	114	127	125	120	127	120	124	239	235	264	314	308	320
22	Z	.22215E+03	223	136	135	155	155	153	155	153	155	266	265	307	281	309	312

07-II

 * BM2 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
24	X	.36533E+03	209	127	126	133	132	131	133	131	132	245	244	277	257	279	281
24	Y	.29075E+03	300	107	105	120	118	113	120	113	118	229	225	248	301	296	306
24	Z	.35934E+03	208	127	126	132	132	131	132	131	132	244	243	276	256	278	280
26	X	.47709E+03	194	122	121	114	114	113	114	113	114	226	225	249	236	251	253
26	Y	.31138E+03	291	100	98	116	113	109	116	109	113	222	219	244	293	289	299
26	Z	.46921E+03	194	122	121	114	113	112	114	112	113	226	225	249	235	251	253
28	X	.55580E+03	180	121	121	104	104	103	104	103	104	217	216	229	225	233	234
28	Y	.24870E+03	282	92	90	113	110	105	113	105	110	218	214	245	285	282	294
28	Z	.54633E+03	180	121	121	104	104	103	104	103	104	217	216	229	225	233	234
30	X	.62759E+03	165	121	121	102	102	101	102	101	102	211	211	216	218	221	222
30	Y	.12600E+03	271	82	79	112	108	102	112	102	108	217	212	248	280	278	291
30	Z	.61708E+03	185	121	121	102	102	101	102	101	102	211	211	216	218	221	222
32	X	.69680E+03	152	114	114	96	96	96	96	96	96	200	200	204	207	209	209
32	Y	.60456E-06	351	165	161	165	160	150	165	150	158	288	282	336	370	369	387
32	Z	.68505E+03	152	114	114	96	96	96	96	96	96	200	200	204	207	209	209
36	X	.70823E+03	150	112	112	95	95	95	95	95	95	198	198	202	204	206	207
36	Y	.22039E+02	261	81	75	150	144	130	150	130	142	269	261	305	336	330	351
36	Z	.69305E+03	150	112	112	95	95	95	95	95	95	199	199	202	205	207	207
38	X	.71144E+03	145	98	98	81	81	81	81	81	81	181	180	189	187	192	193
38	Y	.15401E+03	251	92	88	151	145	134	151	134	144	267	261	304	338	336	353
38	Z	.69452E+03	145	105	105	87	87	87	87	87	87	188	188	192	194	196	196
39	X	.57717E+03	184	100	100	94	93	92	94	92	93	198	198	216	207	219	221
39	Y	.25988E+03	222	75	73	120	117	112	120	112	117	225	221	244	295	293	303
39	Z	.63358E+03	141	99	99	81	81	81	81	81	81	180	180	185	186	189	189
40	X	.37882E+03	208	141	140	161	160	159	161	159	161	280	279	317	293	320	323
40	Y	.27339E+03	199	69	67	107	105	100	107	100	104	206	202	219	273	268	278
40	Z	.52423E+03	143	101	101	83	83	83	83	83	83	184	184	189	190	193	193
41	X	.11720E+03	437	339	336	413	409	404	413	404	409	618	613	683	644	695	706
41	Y	.16259E+03	218	90	87	131	126	115	131	115	125	239	232	271	306	300	318
41	Z	.40518E+03	141	102	102	84	83	83	84	83	83	184	184	187	190	192	192
43	X	.14840E+03	151	113	113	96	96	96	96	96	96	200	200	203	206	208	209
43	Y	.33190E-06	527	216	212	216	210	197	216	197	207	357	350	431	445	463	480
43	Z	.30704E+03	151	113	113	96	96	96	96	96	96	200	200	203	206	208	209
44	X	.27630E+03	147	82	81	73	72	70	73	70	72	168	167	184	178	186	189
44	Y	.83945E+02	341	161	155	209	200	178	209	178	195	348	336	391	422	416	447
44	Z	.28769E+03	159	112	112	101	100	100	101	100	100	204	204	217	212	220	221
45	X	.39115E+03	172	57	58	58	57	54	58	54	58	146	145	175	162	176	179
45	Y	.12582E+03	374	170	165	210	201	182	210	182	198	349	339	401	426	426	454
45	Z	.34917E+03	133	71	71	64	64	63	64	63	63	151	151	170	160	171	173
46	X	.50630E+03	172	27	26	35	34	33	35	33	34	111	111	147	129	148	149
46	Y	.10783E+03	382	159	155	188	181	167	188	167	179	318	310	380	393	403	425
46	Z	.41851E+03	120	44	44	37	37	37	37	37	37	114	114	136	124	137	137

 * BM2 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
47	X	.56863E+03	185	20	20	37	37	38	37	36	37	109	109	152	128	154	155
47	Y	.25242E+02	399	141	139	153	150	145	153	145	150	272	268	339	344	365	378
47	Z	.48203E+03	114	31	31	28	28	25	26	25	26	97	97	120	107	120	121
48	X	.52017E+03	185	21	21	38	38	37	38	37	38	110	109	153	129	155	156
48	Y	.17900E-06	1769	1010	921	998	939	816	998	816	902	1397	1345	1389	1632	1520	1648
48	Z	.44509E+03	124	45	45	37	37	37	37	37	37	115	115	138	125	139	139
49	X	.34242E+03	161	17	17	25	25	24	25	24	25	93	92	127	110	129	131
49	Y	.33326E-01	1991	1552	1447	1554	1500	1387	1554	1387	1475	2221	2171	2192	2427	2276	2436
49	Z	.37391E+03	209	97	97	86	85	83	86	83	85	188	187	226	210	230	234
50	X	.20493E+03	236	102	101	91	90	87	91	87	90	187	185	228	241	250	257
50	Y	.66650E-01	1991	1552	1447	1554	1499	1386	1554	1386	1474	2221	2170	2191	2427	2275	2436
50	Z	.50282E+03	232	80	79	72	71	69	72	69	71	164	162	210	196	217	221
51	X	.19942E+03	254	120	119	139	107	105	109	105	107	211	209	253	273	281	289
51	Y	.41936E+02	215	67	61	88	85	78	88	78	84	173	170	219	204	222	231
51	Z	.54707E+03	228	66	66	60	59	57	60	57	59	146	144	190	178	197	201
52	X	.13854E+03	263	120	118	108	106	103	108	103	106	209	207	252	272	279	287
52	Y	.15964E+03	331	195	180	210	202	184	210	184	198	340	332	374	383	381	405
52	Z	.43261E+03	264	40	39	43	42	40	43	40	42	127	125	168	153	172	175
53	X	.68850E+02	280	128	125	118	115	110	118	110	114	222	219	272	283	293	303
53	Y	.12750E+03	424	283	261	295	283	259	295	259	278	467	446	484	510	494	528
53	Z	.35847E+03	311	39	39	53	52	50	53	50	52	144	142	185	182	196	200
54	X	.82087E+01	978	746	694	748	721	668	748	668	709	1090	1065	1091	1196	1128	1207
54	Y	.16985E+02	509	349	322	356	341	312	356	312	335	541	528	568	605	581	622
54	Z	.33538E+03	390	127	125	129	127	124	129	124	127	249	246	281	323	325	333
55	X	.50468E-06	270	92	85	96	92	86	96	86	91	188	185	235	220	237	246
55	Y	.68630E-06	348	179	169	186	182	172	186	172	180	315	310	386	376	396	412
55	Z	.29558E+03	414	144	142	145	143	139	145	139	143	271	268	306	351	353	362
56	X	.43439E+02	785	550	508	546	522	472	546	472	510	803	781	807	897	841	908
56	Y	.15783E+00	421	140	138	143	141	137	143	137	140	269	266	307	347	350	359
56	Z	.14624E+03	418	142	140	144	142	138	144	138	142	270	267	307	349	351	360
57	X	.75101E+02	796	554	511	549	524	473	549	473	512	806	783	812	903	846	914
57	Y	.31563E+00	421	140	138	143	141	137	143	137	140	269	266	307	347	350	359
57	Z	.18039E+02	421	141	139	144	141	137	144	137	141	270	267	309	348	351	360
58	X	.84068E+02	854	601	555	595	559	514	595	514	555	870	846	873	973	911	983
58	Y	.11784E+02	421	141	139	144	141	137	144	137	141	270	267	309	348	351	360
58	Z	.27653E+00	460	138	134	149	145	139	149	139	144	278	274	336	350	361	373
59	X	.17318E+02	1045	753	697	747	715	648	747	648	699	1081	1052	1073	1203	1123	1211
59	Y	.11311E+02	421	141	139	144	142	137	144	137	141	270	267	309	348	351	360
59	Z	.13828E+00	459	138	134	149	145	139	149	139	144	278	274	336	350	361	373
60	X	.10483E-08	2487	1901	1769	1883	1812	1663	1883	1663	1777	2666	2601	2609	2932	2733	2935
60	Y	.48428E-08	421	141	139	144	142	137	144	137	141	270	267	310	348	351	361
60	Z	.40622E-08	460	138	134	149	145	139	149	139	144	278	274	336	350	361	373

11-42

 * BM2 MODEL *

EARTHQUAKE NO. 1

*PIPE END MOMENTS(CROSS COMPARISON)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	12	.27785E+04	183	141	141	114	112	111	114	111	112	202	199	226	207	228	230
2	18	.11802E+04	46	22	21	11	10	8	11	8	10	56	56	64	61	66	68
3	12	.77147E+03	140	106	105	84	83	82	84	82	83	154	151	172	159	174	178
4	18	.22409E+04	239	191	191	155	154	154	155	154	155	260	258	291	266	294	296
5	12	.31235E+04	123	88	87	71	70	69	71	69	70	147	146	162	153	164	168
6	12	.27216E+04	123	85	84	76	74	72	76	72	74	159	158	171	167	173	178
7	12	.29428E+04	126	85	85	80	79	77	80	77	79	165	163	188	174	189	193
8	12	.32294E+04	143	106	106	90	90	89	90	89	90	186	186	201	192	205	205
9	18	.26183E+04	190	145	144	128	127	126	128	126	127	240	238	265	248	260	263
10	12	.18350E+04	93	58	58	72	67	66	72	66	69	142	135	152	152	165	171
11	12	.46382E+04	91	63	61	83	80	77	83	77	81	153	148	166	163	171	177
12	12	.30018E+04	219	170	170	152	150	149	152	149	150	264	263	294	272	300	303
13	18	.32968E+04	184	141	140	123	123	122	123	122	122	224	224	250	231	256	258
14	12	.31181E+04	284	228	221	249	236	234	249	234	242	378	358	380	392	397	410
15	12	.15202E+04	328	266	259	291	275	274	291	274	283	440	421	451	456	473	487
16	12	.11546E+04	275	219	214	244	231	229	244	229	238	372	355	376	388	391	405
17	12	.96195E+03	177	135	134	118	116	116	118	116	117	225	222	236	232	242	241
18	12	.88340E+03	190	146	145	130	127	127	130	127	129	239	235	250	246	258	262
19	18	.84304E+03	196	151	150	136	133	132	136	132	134	244	240	255	252	265	269
20	12	.12894E-10	370	383	381	349	347	347	349	347	349	575	574	590	590	606	609
21	12	.23660E+05	-25	-37	-37	-43	-43	-43	-43	-43	-43	-12	-12	-11	-10	-10	-10
22	12	.61738E+04	153	114	114	93	93	93	93	93	93	199	199	200	205	206	206
23	12	.31832E+04	149	109	109	90	90	90	90	90	90	193	193	195	200	201	201
24	12	.66678E+03	331	130	128	163	160	155	163	155	160	298	294	338	343	359	369
25	12	.23819E+04	191	126	126	112	110	109	112	109	110	227	226	238	239	244	246
26	12	.44671E+04	166	121	121	101	101	101	101	101	101	212	212	215	219	220	221
27	12	.61058E+04	158	118	118	98	98	97	98	97	98	206	206	207	212	212	213
28	12	.71377E+04	154	115	115	94	94	94	94	94	94	201	201	201	207	207	207
29	12	.92288E+04	158	117	117	97	97	97	97	97	97	204	204	205	210	211	211
30	18	.72082E+04	153	114	114	94	94	94	94	94	94	199	199	200	205	206	206
31	12	.64857E+04	146	108	108	88	88	88	88	88	88	191	191	192	197	197	197
32	12	.45402E+04	139	97	97	81	80	80	81	80	80	180	180	184	188	190	190
33	12	.15280E+04	143	80	79	84	84	82	84	82	84	197	185	201	204	211	215
34	12	.26818E+04	184	118	118	99	99	99	99	99	99	208	208	212	215	217	217
35	12	.68459E+04	150	100	109	90	90	90	90	90	90	194	194	196	200	201	201
36	12	.56377E+04	144	105	105	86	86	86	86	86	86	188	188	189	194	194	194
37	12	.43165E+04	140	102	102	83	83	83	83	83	83	183	183	185	190	190	191
38	12	.28197E+04	151	102	102	85	85	85	85	85	85	187	186	192	194	196	197
39	12	.12859E+04	222	114	114	98	98	97	98	97	98	207	207	228	224	234	235
40	18	.99429E+03	237	111	111	95	95	93	95	93	95	202	201	230	221	235	237
41	12	.14037E+04	108	101	101	84	84	84	84	84	84	186	186	202	195	204	205
42	12	.26159E+04	137	80	80	82	82	80	80	80	80	158	158	173	166	175	178

34-II

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 * BM2 MODEL *
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EARTHQUAKE NO. 1

*PIPE END MOMENTS(CROSS COMPARISON)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	
43	18	.28420E+04	136	77	77	64	64	64	64	64	64	64	155	154	169	163	171	171
44	12	.19869E+04	137	65	65	54	54	53	54	53	54	54	140	140	157	150	159	160
45	12	.10553E+04	203	92	92	82	81	80	82	80	81	81	183	181	206	197	210	212
46	12	.13690E+04	197	121	121	104	104	103	104	103	104	104	218	215	225	226	230	231
47	18	.14570E+04	182	121	121	101	101	101	101	101	101	101	213	212	220	222	224	225
48	12	.16536E+04	163	115	115	96	95	95	96	95	95	95	202	202	210	211	214	215
49	12	.18102E+04	191	105	104	89	89	88	89	88	89	89	193	193	208	207	214	215
50	18	.17615E+04	191	103	103	87	87	87	87	87	87	87	192	191	206	206	212	213
51	12	.13298E+04	158	111	110	91	91	91	91	91	91	91	198	195	202	203	207	207
52	12	.12700E+04	187	101	100	87	86	84	87	84	86	86	188	187	204	203	209	212
53	18	.32570E+04	183	143	140	122	122	121	122	121	121	121	224	222	248	231	254	256
54	12	.79008E+04	157	117	117	96	96	96	96	96	96	96	203	203	205	210	211	211
55	12	.27456E+04	117	78	77	74	72	71	74	71	73	73	160	158	177	169	179	183

 * BM2 MODEL *
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EARTHQUAKE NO. 1

*SUPPORT FORCES (CROSS COMPARISON)

ELEM. NO.	FORCE CODE	FORCE (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	.21009E+03	129	96	95	79	78	77	79	77	79	151	149	172	156	174	178
2	1	.20274E+02	247	175	172	158	152	147	158	147	153	251	243	285	270	290	302
3	1	.12479E+03	299	242	242	201	199	198	201	198	199	324	321	360	331	363	366
4	1	.16288E+04	301	243	242	200	200	198	200	198	199	321	320	357	330	360	364
5	1	.39658E+04	-6	-23	-24	-21	-22	-25	-21	-25	-23	3	2	3	9	6	10
6	1	.22677E+04	162	125	124	101	101	99	101	99	101	182	181	208	188	209	212
7	1	.70195E+02	12	-7	-9	11	10	7	11	7	10	52	50	58	59	64	68
8	1	.17729E+03	149	96	95	88	87	85	88	85	87	174	173	208	188	210	214
9	1	.35232E+03	167	125	125	105	104	104	105	104	104	214	214	220	220	224	224
10	1	.15806E+03	135	67	66	60	60	59	60	59	60	144	144	179	164	182	184
11	1	.82942E+02	362	297	297	262	262	260	262	260	262	404	403	452	413	455	459
12	1	.20121E+03	8	-11	-12	-6	-6	-8	-6	-8	-7	28	27	35	35	42	45
13	1	.15139E+02	514	435	430	411	398	397	411	397	405	598	580	626	610	633	647
14	1	.30269E+02	157	111	107	132	124	123	132	123	128	237	227	245	250	274	282
15	1	.38548E+02	522	429	428	383	382	380	383	380	362	559	557	619	574	621	628
16	1	.60464E+02	136	83	74	168	151	149	168	149	159	276	254	269	297	306	320
17	1	.57286E+02	299	242	237	239	228	227	239	227	234	376	360	400	387	405	418
18	1	.10532E+03	173	104	102	110	104	103	110	103	107	213	206	234	224	237	244
19	1	.50380E+02	106	16	15	17	16	14	17	14	16	73	72	86	113	111	116
20	1	.31195E+01	629	534	530	493	479	477	493	477	486	782	684	729	715	735	750
21	1	.98459E+01	149	109	108	96	94	94	96	94	95	196	194	205	204	216	219
22	1	.21530E+03	147	103	103	85	85	85	85	85	85	185	185	190	192	194	194
23	1	.50237E+02	114	-6	-6	3	2	2	3	2	2	53	53	76	85	94	95
24	1	.41253E+02	178	93	91	83	82	78	83	78	81	183	181	203	198	206	211
25	1	.10819E+03	155	101	101	83	83	83	83	83	83	185	185	195	192	198	198
26	1	.89628E+02	123	42	42	35	34	34	35	34	34	107	105	140	124	143	144
27	1	.19047E+02	182	119	114	106	104	98	106	98	102	209	207	220	224	225	232
28	1	.45942E+02	268	61	61	63	62	61	63	61	62	157	156	201	195	213	216
29	1	.35075E+02	345	66	64	77	75	72	77	72	75	183	181	226	225	239	245
30	1	.57192E+03	268	61	61	63	62	61	63	61	62	157	156	201	194	212	216
31	1	.10373E+04	163	108	107	92	91	89	92	89	90	194	193	204	204	208	211
32	1	.45816E+03	158	115	115	94	94	94	94	94	94	201	200	206	208	211	211

54-II

 * BM3 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.20539E-09	-7	-10	-13	-11	-15	-15	-11	-15	-11	-4	-7	-2	-3	-2	1
1	Y	.04625E-09	1	0	0	0	0	0	0	0	1	1	5	1	5	5	5
1	Z	.22982E-09	-10	-18	-22	-20	-24	-24	-20	-24	-20	-15	-19	-15	-13	-10	-5
2	X	.47674E-05	-7	-10	-13	-11	-15	-15	-11	-15	-11	-4	-7	-2	-3	-2	1
2	Y	.15477E-02	21	19	10	17	14	14	17	14	17	22	19	20	24	27	31
2	Z	.20679E-02	-40	-23	-23	5	4	4	5	4	5	28	27	28	28	29	29
3	X	.10511E-02	-4	-6	-10	-9	-13	-13	-9	-13	-9	-1	-5	0	0	0	4
3	Y	.20070E-02	21	19	15	10	12	12	10	12	10	23	19	20	24	27	31
3	Z	.54119E-02	-42	-27	-28	-6	-6	-6	-6	-6	-6	12	11	13	13	13	14
4	X	.11420E-05	-32	-20	-32	-20	-25	-25	-20	-25	-21	-12	-10	-13	-11	-12	-8
4	Y	.27039E-02	22	19	10	17	13	13	17	13	17	24	20	27	25	28	32
4	Z	.22200E-05	-11	-13	-18	-14	-19	-19	-14	-19	-14	-8	-13	-10	-6	-4	0
5	X	.40035E-01	-19	-22	-25	-24	-27	-27	-24	-27	-24	-17	-20	-10	-15	-15	-12
5	Y	.27121E-02	22	19	10	17	13	13	17	13	17	24	20	27	25	28	32
5	Z	.30357E-01	-10	-18	-23	-19	-23	-23	-19	-23	-19	-14	-18	-15	-11	-10	-5
6	X	.02092E-01	-23	-19	-23	-12	-15	-15	-12	-15	-12	0	-2	0	1	0	4
6	Y	.75540E-02	-21	-24	-20	-27	-29	-29	-27	-29	-27	-22	-24	-20	-20	-17	-14
6	Z	.43930E-01	-10	-18	-23	-19	-24	-24	-19	-24	-19	-14	-18	-15	-12	-10	-5
7	X	.53001E+00	-42	-7	-7	33	33	33	33	33	33	63	63	63	64	64	64
7	Y	.14320E-05	-10	-19	-23	-23	-27	-27	-23	-27	-24	-17	-21	-17	-15	-10	-12
7	Z	.44200E-01	-10	-18	-23	-19	-23	-24	-19	-24	-19	-14	-18	-15	-12	-10	-5
8	X	.53919E+00	-41	-6	-6	34	34	34	34	34	34	65	65	66	66	66	66
8	Y	.40049E-01	-14	-18	-23	-24	-29	-29	-24	-29	-24	-10	-21	-18	-14	-10	-10
8	Z	.50032E-01	1	0	-8	-1	-9	-9	-1	-9	-1	2	-4	-1	5	4	12
9	X	.53910E+00	-41	-6	-6	34	34	34	34	34	34	66	65	66	66	66	66
9	Y	.00419E+00	-15	-19	-23	-24	-29	-29	-24	-29	-24	-10	-21	-18	-14	-10	-11
9	Z	.32520E+00	20	20	10	21	11	11	21	11	21	24	14	15	20	20	31
10	X	.53057E+00	-41	-6	-6	34	34	34	34	34	34	66	66	66	66	66	66
10	Y	.03007E+00	-20	-20	-20	-34	-30	-30	-34	-30	-34	-23	-25	-23	-21	-21	-19
10	Z	.33344E+00	10	13	4	19	11	11	19	11	19	27	19	21	30	20	35
11	X	.53013E+00	-41	-6	-6	34	34	34	34	34	34	66	66	66	66	66	66
11	Y	.19739E-05	-3	-6	-13	-8	-10	-10	-8	-10	-8	-4	-12	-9	-2	-8	0
11	Z	.13570E-02	49	59	51	77	69	69	77	69	77	98	90	94	101	100	100
12	X	.53750E+00	-41	-6	-6	34	34	34	34	34	34	66	66	66	66	66	66
12	Y	.90320E+00	-30	-30	-30	-47	-47	-47	-47	-47	-47	-34	-34	-33	-32	-32	-32
12	Z	.22522E+00	-33	-5	-6	30	29	29	30	29	30	58	57	58	58	50	59
13	X	.53090E+00	-41	-6	-6	34	34	34	34	34	34	66	66	66	66	66	66
13	Y	.17281E+01	-30	-30	-30	-46	-46	-46	-46	-46	-46	-34	-34	-34	-32	-32	-31
13	Z	.53021E-01	-37	0	0	44	44	44	44	44	44	78	78	78	78	78	78
14	X	.49400E+00	-41	-5	-5	35	35	35	35	35	35	66	66	66	67	67	67
14	Y	.16909E+01	-30	-30	-30	-46	-46	-46	-46	-46	-46	-34	-34	-34	-32	-32	-31
14	Z	.16044E-01	-11	29	29	01	00	00	01	00	00	122	122	123	123	124	124

 * BM3 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NO.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	X	.94078E-02	-47	-28	-29	-2	-3	-3	-3	-3	-3	19	19	20	19	20	20
15	Y	.87083E+00	-29	-30	-30	-40	-40	-40	-40	-40	-40	-33	-34	-33	-31	-31	-31
15	Z	.10884E-01	-11	29	29	80	80	86	80	80	80	122	122	123	123	124	124
16	X	.25992E+00	-21	22	22	75	75	75	75	75	75	115	115	116	116	116	118
16	Y	.63288E-01	-27	-32	-32	-39	-39	-39	-39	-39	-39	-25	-25	-23	-23	-23	-22
16	Z	.16923E-01	-11	29	29	80	80	80	80	80	80	122	122	123	123	124	124
17	X	.27863E+00	-21	23	23	75	75	75	75	75	75	116	116	116	116	116	117
17	Y	.96778E-00	-9	-7	-8	1	0	0	1	0	1	21	20	27	24	27	28
17	Z	.13580E-02	-5	-2	-4	11	9	8	11	8	10	31	29	37	33	38	40
18	X	.27822E+00	-21	23	23	75	75	75	75	75	75	116	116	116	116	117	117
18	Y	.24836E+00	-6	7	7	33	32	32	33	32	32	61	60	65	64	66	66
18	Z	.25093E+00	-10	2	2	34	33	33	33	34	33	63	63	66	65	67	68
19	X	.27749E+00	-20	23	23	75	75	75	75	75	75	116	116	117	117	117	117
19	Y	.34937E-01	53	30	26	42	38	36	42	38	38	68	64	71	80	89	93
19	Z	.12905E+00	-8	-17	-18	-14	-16	-17	-14	-17	-15	4	2	11	7	13	15
20	X	.25892E+00	-21	22	22	75	74	74	75	74	74	115	115	116	116	116	116
20	Y	.30250E-01	63	21	10	12	0	3	12	3	0	28	20	27	45	43	47
20	Z	.10891E+00	-3	-10	-10	-14	-16	-18	-14	-18	-16	3	1	11	6	12	15
21	X	.37580E-01	32	46	44	87	86	85	87	85	86	132	131	137	133	141	143
21	Y	.30192E-01	63	21	10	12	0	3	12	3	0	28	20	27	45	43	47
21	Z	.70319E-02	29	-8	-8	2	1	0	2	0	1	15	14	22	16	40	41
22	X	.18224E-01	31	48	45	89	88	87	89	87	88	134	133	139	136	144	146
22	Y	.13130E-01	54	13	8	4	0	-3	4	-3	0	18	12	20	35	32	36
22	Z	.70469E-02	29	-8	-7	2	1	0	2	0	1	15	14	22	16	40	41
23	X	.23760E-02	11	33	32	75	75	75	75	74	75	118	117	121	118	123	124
23	Y	.18383E-05	37	3	0	-5	-9	-12	-5	-12	-9	10	4	14	24	22	26
23	Z	.70515E-02	29	-8	-7	2	1	0	2	0	1	15	13	22	16	40	41
24	X	.30140E-02	95	53	50	68	64	62	68	62	62	95	92	96	104	129	130
24	Y	.50382E-02	43	32	29	54	51	50	54	50	52	85	83	89	94	105	109
24	Z	.11016E-01	23	2	1	19	18	18	19	18	18	42	41	47	44	65	66
25	X	.30191E-02	95	53	50	67	64	62	67	62	62	94	92	96	103	129	130
25	Y	.11015E-01	108	79	74	111	108	103	111	103	104	148	145	148	157	183	184
25	Z	.22608E-01	72	31	28	41	38	36	41	36	37	62	60	64	70	93	94
26	X	.30387E-02	94	52	49	66	63	61	66	61	61	93	90	95	102	127	128
26	Y	.19612E-01	530	331	322	312	300	292	312	292	293	345	334	338	388	408	410
26	Z	.05490E-01	173	86	82	77	70	66	77	66	67	89	84	84	109	112	113
27	X	.54928E-02	128	57	53	52	47	44	52	44	45	65	61	64	80	91	91
27	Y	.17624E-01	552	345	335	324	310	302	324	302	304	356	345	348	401	417	419
27	Z	.07919E-01	175	87	82	77	71	67	77	67	67	90	84	85	109	112	113
28	X	.12944E-01	141	64	60	55	50	46	55	46	47	66	62	69	81	83	84
28	Y	.10270E-01	552	344	334	321	308	299	321	299	301	352	341	344	398	409	411
28	Z	.07910E-01	175	87	82	77	71	67	77	67	67	90	84	85	109	112	113

II-47

 * BM3 MODEL *

EARTHQUAKE NO. 1

*DISPLACEMENT(CROSS COMPARISON)

NODE NO.	COMP. NG.	DISP. (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
29	X	.20008E-01	141	64	60	55	50	47	55	47	48	67	63	71	81	84	85
29	Y	.31668E-02	439	266	257	245	233	228	245	226	227	269	259	261	307	309	311
29	Z	.67900E-01	175	87	82	77	71	67	77	67	67	90	84	85	109	112	113
30	X	.20108E-01	140	63	59	54	49	46	54	46	47	66	62	71	80	84	85
30	Y	.48201E-04	39	11	9	24	22	20	24	20	21	44	42	48	50	70	71
30	Z	.04030E-01	165	81	76	71	65	61	71	61	62	84	78	79	102	106	106
31	X	.22706E-09	72	20	17	18	14	12	18	12	12	29	26	40	37	50	51
31	Y	.49297E-09	39	11	9	24	22	20	24	20	21	44	42	46	50	70	71
31	Z	.92931E-09	59	12	9	11	7	5	11	5	5	21	19	20	32	43	44
32	X	.37905E-01	35	47	45	87	85	84	87	84	85	132	130	137	133	141	143
32	Y	.19571E-01	75	30	24	20	14	11	20	11	14	35	29	35	57	54	59
32	Z	.70228E-02	29	-8	-8	2	1	0	2	0	1	15	14	22	16	41	41
33	X	.37352E-01	39	48	46	86	85	84	86	84	85	132	130	137	134	141	144
33	Y	.28574E-01	85	38	32	28	22	19	28	19	22	44	38	44	67	66	70
33	Z	.70125E-02	29	-8	-8	2	1	0	2	0	1	15	14	22	16	41	42
34	X	.32720E-01	40	51	49	87	85	84	87	84	85	133	131	139	135	143	146
34	Y	.24183E-01	108	58	50	47	40	37	47	37	41	66	59	65	91	92	97
34	Z	.09823E-02	30	-5	-8	2	1	0	2	0	1	15	14	22	16	41	42
35	X	.27302E-02	75	66	63	99	96	95	99	95	97	149	145	156	150	164	167
35	Y	.53949E-02	42	48	46	87	85	85	87	85	86	127	125	129	134	140	148
35	Z	.68405E-02	30	-5	-8	3	2	1	3	1	2	17	15	23	17	42	43
36	X	.91510E-04	56	40	37	57	55	52	57	52	55	101	98	106	102	109	113
36	Y	.10979E-05	60	38	35	58	53	52	56	52	54	85	82	86	98	112	116
36	Z	.55080E-02	18	-24	-24	-23	-24	-24	-23	-24	-24	-22	-22	-17	-21	-9	-9
37	X	.45818E-04	56	40	37	57	55	52	57	52	54	101	97	106	102	109	113
37	Y	.11430E-01	-12	-18	-12	18	17	16	18	16	18	42	41	43	43	56	60
37	Z	.79168E-02	67	14	10	19	15	14	19	14	18	29	25	33	30	55	59
38	X	.10333E-08	56	40	37	57	55	52	57	52	54	101	97	106	102	109	113
38	Y	.13723E-08	0	-12	-18	9	6	6	9	6	9	28	26	29	29	47	52
38	Z	.10211E-08	90	30	25	33	28	26	33	28	32	40	35	43	41	65	70

84-11

 * BM3 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	X	.17117E-00	1952	1952	1950	1954	1952	1951	1954	1951	1952	1957	1955	1972	1959	1975	1977
1	Y	.19268E-00	25709	25729	25729	25759	25759	25759	25759	25759	25759	25795	25793	25813	25811	25836	25838
1	Z	.13556E-00	874	856	849	843	836	834	843	834	841	865	858	893	870	947	957
2	X	.39730E-02	1952	1952	1950	1954	1952	1951	1954	1951	1952	1957	1955	1972	1959	1975	1977
2	Y	.10319E+01	7909	7913	7913	7922	7922	7922	7922	7922	7922	7933	7932	7951	7939	7961	7964
2	Z	.10282E+01	146	150	148	165	163	163	165	163	164	197	196	207	199	218	220
3	X	.13337E+01	2629	2630	2629	2633	2632	2632	2633	2632	2632	2637	2636	2653	2640	2659	2661
3	Y	.20560E+01	5022	5025	5025	5032	5032	5031	5032	5032	5032	5040	5040	5057	5045	5066	5068
3	Z	.26193E+01	332	324	320	323	319	319	323	319	322	349	346	365	352	391	395
4	X	.56511E-03	1502	1578	1570	1579	1571	1569	1579	1569	1572	1584	1576	1617	1590	1618	1623
4	Y	.20786E+01	6188	6192	6191	6199	6198	6198	6199	6198	6198	6207	6207	6224	6212	6233	6236
4	Z	.13265E-02	803	782	776	767	760	759	767	759	766	791	785	821	796	873	884
5	X	.32116E+02	452	449	445	449	445	444	449	444	446	452	447	464	454	465	469
5	Y	.20813E+01	6200	6205	6205	6213	6212	6212	6213	6212	6212	6221	6220	6238	6226	6247	6250
5	Z	.20774E+02	758	738	731	723	716	715	723	715	721	747	740	773	751	825	835
6	X	.42299E+02	422	420	415	421	418	415	421	415	418	424	421	444	429	444	448
6	Y	.31162E+01	4280	4279	4276	4281	4279	4277	4281	4277	4280	4289	4355	4296	4400	4408	4408
6	Z	.25063E+02	755	735	728	720	713	712	720	712	718	737	769	748	822	832	832
7	X	.30275E+03	-12	29	29	82	81	81	82	81	81	124	124	125	124	125	125
7	Y	.11514E-02	60	58	49	52	46	45	52	45	52	58	62	63	61	64	72
7	Z	.25263E+02	753	733	720	718	711	710	718	710	716	742	735	767	746	820	830
8	X	.31023E+03	-13	28	28	80	80	80	80	80	80	121	121	122	122	123	123
8	Y	.28080E+02	33	29	18	25	15	14	25	14	25	31	21	27	34	29	41
8	Z	.33637E+02	533	512	505	497	489	488	497	488	495	520	513	540	525	583	593
9	X	.31017E+03	-13	28	28	80	80	80	80	80	80	121	121	122	122	123	123
9	Y	.44208E+03	14	11	2	9	0	0	9	0	9	14	5	8	16	10	20
9	Z	.23861E+03	138	128	112	123	106	106	123	106	122	137	120	130	144	147	165
10	X	.30987E+03	-13	28	28	80	80	80	80	80	80	121	121	122	122	123	123
10	Y	.37468E+03	2	0	-8	-4	-11	-12	-4	-12	-4	1	-5	0	4	0	8
10	Z	.22699E+03	141	131	116	127	112	111	127	111	126	146	132	142	153	157	174
11	X	.30963E+03	-13	28	28	80	80	80	80	80	80	121	121	122	122	123	123
11	Y	.15791E-02	262	256	236	249	227	226	249	226	249	261	240	248	265	251	275
11	Z	.11998E+01	658	656	638	650	631	630	650	630	649	678	660	682	682	722	742
12	X	.30933E+03	-13	28	28	80	80	80	80	80	80	121	121	122	122	123	123
12	Y	.28241E+03	14	9	5	1	-3	-3	1	-3	1	12	8	12	14	16	20
12	Z	.13629E+03	227	235	227	252	245	244	252	244	251	276	269	278	278	294	304
13	X	.30900E+03	-13	28	28	80	80	80	80	80	80	121	121	122	122	123	123
13	Y	.62794E+03	-15	-20	-23	-27	-31	-31	-27	-31	-27	-18	-21	-18	-16	-16	-12
13	Z	.32405E+02	20	58	56	104	103	102	104	102	104	144	143	148	144	149	150
14	X	.28574E+03	-14	28	28	80	80	80	80	80	80	121	121	122	122	123	123
14	Y	.61802E+03	-14	-19	-23	-26	-30	-30	-26	-30	-26	-17	-20	-17	-15	-15	-11
14	Z	.13240E+02	110	110	107	132	129	127	132	127	129	183	179	196	188	199	203

64-49

 * BM3 MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	X	.45854E+01	244	198	196	188	182	180	180	180	183	265	262	279	270	284	289
15	Y	.31961E+03	-10	-15	-19	-22	-26	-26	-22	-26	-22	-13	-16	-13	-11	-11	-7
15	Z	.13282E+02	118	108	105	131	128	126	131	126	128	181	178	194	186	197	201
16	X	.19827E+03	54	62	61	98	97	97	98	97	98	150	149	156	151	158	160
16	Y	.24898E+02	30	20	17	16	14	13	16	13	15	34	32	47	41	47	50
16	Z	.13314E+02	114	107	104	130	126	124	130	124	126	180	177	193	185	195	199
17	X	.21324E+03	56	63	62	99	98	97	99	97	98	150	149	157	152	159	161
17	Y	.68461E-03	288	266	263	262	258	256	262	256	259	286	282	334	295	343	348
17	Z	.88740E+00	752	702	685	686	666	662	686	662	680	748	728	798	752	844	870
18	X	.21312E+03	57	64	62	99	98	97	99	97	98	150	149	157	152	159	161
18	Y	.19934E+03	100	85	83	90	88	86	90	86	87	122	121	142	135	145	147
18	Z	.15003E+03	189	157	153	163	158	154	163	154	156	219	213	239	231	244	249
19	X	.21278E+03	57	64	63	99	98	98	99	98	98	150	149	157	152	159	161
19	Y	.32714E+02	514	357	340	321	300	290	321	290	308	388	365	382	454	444	465
19	Z	.62759E+02	657	447	428	438	412	390	438	390	411	565	530	562	581	574	603
20	X	.19762E+03	61	66	65	99	98	98	99	98	99	151	150	158	153	160	162
20	Y	.28992E+02	586	404	386	360	339	329	360	329	346	431	407	420	510	491	514
20	Z	.54200E+02	683	461	443	457	431	408	457	408	430	589	554	584	605	595	625
21	X	.36864E+02	480	342	334	336	324	314	336	314	324	469	454	473	474	485	499
21	Y	.28969E+02	586	404	386	360	339	329	360	329	346	431	407	420	510	491	514
21	Z	.13048E+02	1495	922	921	922	922	921	922	921	922	928	927	950	930	983	986
22	X	.16041E+02	401	325	317	318	307	298	318	298	307	438	424	446	443	462	475
22	Y	.11900E+02	579	398	380	356	334	323	356	323	340	429	403	418	501	482	505
22	Z	.13087E+02	1498	922	921	923	922	921	923	921	922	928	927	951	930	983	986
23	X	.24589E+01	556	364	359	359	352	346	359	346	352	444	434	478	446	513	521
23	Y	.13769E-02	622	430	410	384	360	346	384	346	366	473	443	462	536	514	542
23	Z	.13099E+02	1498	922	921	923	922	921	923	921	922	928	927	951	930	983	986
24	X	.26151E+01	517	338	328	327	314	304	327	304	310	401	387	414	421	453	461
24	Y	.53215E+01	478	330	315	295	277	268	295	268	284	366	345	363	417	413	434
24	Z	.14964E+02	1296	798	797	799	797	795	799	795	797	813	810	843	815	898	903
25	X	.26184E+01	519	339	329	328	315	305	328	305	311	401	387	415	422	454	462
25	Y	.11972E+02	448	291	282	284	272	265	284	265	269	334	324	346	366	406	405
25	Z	.21430E+02	911	560	556	557	552	549	557	549	551	585	578	614	595	675	679
26	X	.26321E+01	527	343	333	332	319	310	332	310	316	404	390	420	424	459	467
26	Y	.43551E+02	601	376	368	351	340	333	351	333	335	384	374	383	432	439	442
26	Z	.50348E+02	613	388	374	360	342	332	360	332	334	395	380	388	446	449	452
27	X	.44989E+01	747	465	457	447	437	428	447	428	430	469	461	512	496	526	528
27	Y	.38655E+02	625	392	384	365	354	346	365	346	349	399	389	398	449	455	459
27	Z	.52659E+02	609	385	372	358	340	329	358	329	332	394	379	335	444	448	451
28	X	.11824E+02	1124	711	704	695	687	678	695	678	679	734	726	800	749	811	814
28	Y	.20707E+02	662	419	409	389	376	367	389	367	370	425	413	423	477	483	486
28	Z	.52651E+02	609	385	372	358	340	329	358	329	332	394	379	385	444	448	451

05-11

 * BMS MODEL *

EARTHQUAKE NO. 1

*ACCELERATION(CROSS COMPARISON)

NODE NO.	COMP. NO.	ACC(DY) (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
29	X	.18772E+02	1262	802	795	787	778	769	767	769	771	830	822	904	843	915	919
29	Y	.45197E+01	714	455	443	421	404	393	421	393	396	460	445	454	516	520	523
29	Z	.52643E+02	609	385	372	358	340	329	358	329	332	394	379	385	444	448	451
30	X	.19092E+02	1305	830	823	815	806	798	815	796	799	859	850	935	870	940	950
30	Y	.69962E-01	543	334	332	317	315	313	317	313	314	345	342	353	387	405	407
30	Z	.50356E+02	579	365	352	340	322	312	340	312	315	374	360	368	422	427	430
31	X	.19749E-06	1562	998	990	980	972	961	980	961	964	1024	1016	1111	1032	1122	1127
31	Y	.71554E-06	543	334	332	317	315	313	317	313	314	345	342	353	387	405	407
31	Z	.81697E-06	403	242	230	232	224	220	232	220	222	258	251	260	294	305	307
32	X	.37279E+02	501	359	350	355	341	330	355	330	341	498	480	498	502	508	524
32	Y	.30031E+02	588	406	388	362	342	333	362	333	349	431	407	419	514	496	518
32	Z	.13038E+02	1495	922	921	922	922	921	922	921	922	928	927	951	930	983	986
33	X	.36800E+02	522	376	365	373	359	346	373	346	359	525	507	523	530	531	548
33	Y	.30467E+02	592	409	391	365	345	336	365	336	353	433	410	420	519	502	523
33	Z	.13024E+02	1496	922	921	923	922	921	923	921	922	928	927	951	930	983	986
34	X	.34986E+02	513	370	359	373	357	344	373	344	357	532	512	523	536	528	546
34	Y	.28928E+02	593	410	393	367	347	339	367	339	355	433	410	420	522	506	527
34	Z	.12978E+02	1496	922	921	923	922	921	923	921	922	928	927	951	930	983	986
35	X	.46604E+01	774	489	478	495	481	475	495	475	487	575	558	597	577	653	669
35	Y	.59891E+01	532	348	324	338	314	310	338	310	333	390	365	380	435	460	488
35	Z	.12736E+02	1494	921	920	921	921	920	921	920	921	927	926	950	929	983	986
36	X	.97245E-01	747	520	503	546	526	511	546	511	528	739	715	740	744	758	782
36	Y	.14098E-02	689	437	393	424	380	377	424	377	420	457	414	428	506	521	568
36	Z	.90201E+01	1706	1056	1055	1056	1055	1055	1056	1055	1055	1057	1056	1068	1059	1075	1076
37	X	.48733E-01	747	520	503	546	526	511	546	511	529	739	715	740	744	758	782
37	Y	.10947E+02	1335	828	734	837	746	745	837	745	834	850	761	768	873	850	940
37	Z	.22167E+02	1057	646	617	645	617	617	645	617	645	652	624	637	655	669	699
38	X	.10991E-05	747	520	503	546	526	511	546	511	529	739	715	740	744	758	782
38	Y	.16198E-05	1394	865	765	872	775	774	872	774	869	882	787	792	906	855	952
38	Z	.35676E-05	1022	622	595	622	595	595	622	595	621	626	600	609	629	633	661

IS-II

 * BMS MODEL *

EARTHQUAKE NO. 1

*PIPE END MOMENTS(CROSS COMPARISON)

ELEM. NO.	MOMENT CODE	MOMENT (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	12	.16064E+04	-17	-2	-4	18	18	18	18	18	18	39	38	40	40	41	44
2	18	.16099E+04	-27	-10	-11	12	10	10	12	10	12	33	32	33	34	34	35
3	12	.41029E+04	-13	-13	-17	-10	-14	-14	-10	-14	-10	-1	-4	-1	0	1	5
4	12	.25733E+04	0	3	-2	7	3	3	7	3	7	20	18	19	23	22	26
5	18	.25545E+04	18	18	11	22	14	14	22	14	22	34	29	31	36	35	42
6	12	.61102E+04	-3	3	-1	14	11	11	14	11	14	29	24	27	31	30	35
7	18	.54598E+04	-4	3	-2	15	12	12	15	12	15	31	27	29	32	31	37
8	12	.73258E+04	20	17	10	14	7	7	14	7	14	22	14	19	25	22	31
9	12	.72706E+04	8	4	1	2	-1	-1	2	-1	2	19	16	19	21	21	25
10	12	.90816E+04	15	15	8	15	8	8	15	8	15	24	18	18	26	22	30
11	12	.01852E+04	-4	17	14	50	48	48	50	48	50	80	78	80	81	81	83
12	12	.12610E+05	-34	-4	-4	32	32	32	32	32	32	62	62	62	62	62	63
13	18	.10432E+05	-29	0	0	37	37	37	37	37	37	68	58	69	69	69	69
14	12	.16859E+05	-43	-20	-27	-3	-3	-3	-3	-3	-3	17	17	18	18	20	20
15	12	.50694E+04	1	12	11	33	32	32	33	32	33	63	63	67	66	67	68
16	18	.58030E+04	-1	1	0	10	10	9	10	9	10	38	36	40	39	41	42
17	12	.59878E+04	22	27	20	49	48	48	49	48	48	79	79	87	84	88	90
18	12	.50302E+04	-18	-4	-4	19	18	18	19	18	18	46	46	48	47	49	49
19	18	.50201E+04	-14	-7	-8	8	8	7	8	7	9	32	31	34	34	35	36
20	12	.14001E+05	-17	8	8	49	49	48	49	48	49	84	83	85	85	86	86
21	12	.38420E+04	31	23	21	52	52	49	52	49	50	82	80	84	87	98	99
22	12	.33069E+04	52	52	50	91	90	89	91	89	89	133	132	136	136	150	150
23	18	.31709E+04	55	55	53	95	94	93	95	93	93	137	136	140	141	153	154
24	12	.20453E+04	56	55	54	95	93	91	95	91	91	137	135	140	141	150	151
25	12	.07799E+03	282	160	157	153	141	133	153	133	135	173	163	176	198	207	210
26	18	.96118E+03	214	123	115	115	105	99	115	99	101	134	126	139	156	167	169
27	12	.17559E+04	36	2	0	4	1	0	4	0	0	18	14	10	26	36	37
28	12	.26310E+04	-12	-27	-27	-15	-16	-16	-15	-16	-16	-1	-2	1	1	12	12
29	18	.25401E+04	-8	-24	-25	-12	-13	-13	-12	-13	-13	2	2	5	6	18	18
30	12	.02200E+04	119	50	46	44	39	36	44	36	36	65	61	63	70	77	78
31	12	.12249E+05	51	57	55	98	98	95	98	95	98	142	139	145	147	152	154
32	12	.12100E+05	63	62	60	99	97	96	99	96	97	144	141	147	151	155	158
33	12	.11283E+05	77	70	67	104	102	100	104	100	102	151	149	154	159	163	165
34	12	.10629E+05	-11	18	18	65	65	65	65	65	65	104	104	105	104	108	108
35	18	.11071E+05	-2	22	21	67	67	66	67	66	67	107	105	108	108	112	112
36	12	.72610E+04	68	18	13	28	24	23	28	23	27	40	36	41	43	64	70
37	12	.10353E+05	43	10	6	27	24	24	27	24	26	46	43	47	47	67	72

11-52

 * BM3 MODEL *

EARTHQUAKE NO. 1

*SUPPORT FORCES (CROSS COMPARISON)

ELEM. NO.	FORCE CODE	FORCE (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	.20539E+02	-7	-10	-13	-11	-15	-15	-11	-15	-11	-4	-7	-2	-3	-2	1
2	1	.84025E+02	1	0	0	0	0	0	0	0	0	1	1	5	1	5	5
3	1	.22982E+02	-16	-18	-22	-20	-24	-24	-20	-24	-20	-15	-19	-15	-13	-13	-5
4	1	.78388E+03	-5	-8	-14	-10	-16	-16	-10	-16	-10	-6	-11	-7	-3	-1	4
5	1	.16918E+04	-46	-24	-25	2	1	1	2	1	2	23	23	24	24	24	25
6	1	.14008E+04	21	19	17	18	15	15	18	15	18	22	19	26	23	28	30
7	1	.11426E+03	-32	-28	-32	-28	-25	-25	-28	-25	-21	-12	-18	-13	-11	-12	-8
8	1	.22286E+03	-11	-13	-18	-14	-19	-19	-14	-19	-14	-8	-13	-10	-6	-4	0
9	1	.14320E+03	-18	-19	-23	-23	-27	-27	-23	-27	-24	-17	-21	-17	-15	-16	-12
10	1	.19739E+03	-3	-6	-13	-8	-18	-18	-8	-18	-8	-4	-12	-9	-2	-6	0
11	1	.13578E+03	49	59	51	77	69	69	77	60	77	98	90	94	101	100	108
12	1	.94076E+03	-47	-28	-29	-3	-3	-3	-3	-3	-3	19	19	20	19	20	20
13	1	.98778E+02	-9	-7	-8	1	0	0	1	0	1	21	20	27	24	27	28
14	1	.13520E+03	-5	-2	-4	11	9	8	11	8	10	31	29	37	33	38	40
15	1	.10979E+03	60	38	35	56	53	52	56	52	54	85	82	86	98	112	116
16	1	.65080E+03	16	-24	-24	-23	-24	-24	-23	-24	-24	-22	-22	-17	-21	-9	-9
17	1	.10333E+03	56	40	37	57	55	52	57	52	54	101	97	100	102	109	113
18	1	.13723E+03	0	-12	-10	9	6	6	9	6	9	28	26	29	29	47	52
19	1	.10211E+03	56	30	25	33	28	28	33	28	32	40	35	43	41	65	70
20	1	.24722E+04	26	0	-3	1	-1	-3	1	-3	-1	16	13	16	30	36	39
21	1	.64450E+04	83	23	18	26	22	21	26	21	26	35	30	38	35	60	65
22	1	.89491E+04	-5	-11	-15	13	11	11	13	11	13	34	32	35	35	51	56
23	1	.23760E+03	11	33	32	75	75	74	75	74	75	118	117	121	118	123	124
24	1	.16383E+03	37	3	0	-5	-9	-12	-5	-12	-9	10	4	14	24	22	26
25	1	.22706E+02	72	20	17	16	14	12	18	12	12	29	26	40	37	50	51
26	1	.49297E+02	39	11	9	24	22	20	24	20	21	44	42	43	50	70	71
27	1	.92931E+02	59	12	9	11	7	5	11	5	5	21	19	20	32	43	44
28	1	.59999E+04	119	50	46	44	39	36	44	36	36	55	51	52	71	77	78
29	1	.55051E+03	135	59	56	52	48	45	52	45	46	64	61	71	77	83	84
30	1	.16641E+04	118	49	47	42	37	34	42	34	35	54	50	61	66	72	73

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Appendix III



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IMPACT OF THE PVRC DAMPING PROPOSAL
ON THE SEISMIC TIME HISTORY RESPONSE
OF PIPING SYSTEMS

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TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	
2.0 DESCRIPTION OF PIPING MODELS	
2.1 INTRODUCTION	
2.2 ZION STRUCTURES	
2.3 PIPING MODELS	
3.0 METHOD OF ANALYSIS	
3.1 SMACS METHODOLOGY	
3.2 PVRC TIME HISTORY ANALYSIS - CASE 1 ..	
3.3 CONSTANT DAMPING TIME HISTORY ANALYSES -- CASES 2 AND 3	
3.4 COMPARISON OF THE CURRENT ANALYTICAL METHODOLOGY WITH THOSE OF PAST STUDIES	
4.0 NUMERICAL RESULTS AND INTERPRETATION	
4.1 PVRC TIME HISTORY RESULTS VS. CONSTANT 1% AND 2% DAMPING TIME HISTORY RESPONSE - CASE 1 AND CASE 2	
4.2 PVRC TIME HISTORY RESULTS VS. CONSTANT 2% AND 3% DAMPING TIME HISTORY RESPONSE - CASE 1 AND CASE 3	
4.3 PVRC DAMPING TIME HISTORY RESULTS VS. CONSTANT 5% DAMPING TIME HISTORY RESPONSE - CASE 1 AND CASE 4	
4.4 PVRC TIME HISTORY RESULTS VS. CONSTANT 4% AND 10% DAMPING TIME HISTORY RESPONSE CASE 1 AND CASES 5 AND 6	



TABLE OF CONTENTS (CONTINUED)

	<u>Page</u>
4.5 CONSTANT DAMPING RESULTS COMPARISON	
5.0 CONCLUSIONS	
6.0 REFERENCES	

LIST OF TABLES

2.1 Key Parameters of the Three Piping Models	
2.2 Piping System Frequencies (Hz)	
3.1 Variation of Input Parameters for Time History Analysis	
3.2a Comparison of Response Analysis Methods for the AFW and the RHR Piping System ..	
3.2b Comparison of Response Analysis Methods for the RCL Piping System	
4.1 Ratio of Inertial Responses - Constant 1% and 2% Damping (Case 2) vs. PVRC Damping (Case 1)	
4.2 Ratio of Inertial Responses - Constant 2% and 3% Damping (Case 3) vs. PVRC Damping (Case 1)	
4.3 Ratio of Inertial Responses - Constant 5% Damping Time History vs. PVRC Damping (Case 1)	
4.4 Ratio of Inertial Responses - Constant 4% Damping (Case 5) vs. PVRC Damping (Case 1)	

- 4.5 Ratio of Inertial Responses - Constant
10% Damping (Case 6) vs. PVRC
Damping (Case 1)
- 4.6 Constant Damping Response Comparison ...

LIST OF FIGURES

- 2.1 General Arrangement of Structures at the
Zion Plant
- 2.2 Cross Section of the Zion Containment
Building
- 2.3 A Perspective View of the Three-Dimensional
Finite Element Model for the Internal
Structure Within the Containment Building
at Zion
- 2.4 Finite Element Half-Structure Model of the
AFT Complex; Shaded Area of the Inset
Sketch Shows the Portion of the Structure
Modeled
- 2.5 Schematic of the AFW Piping Model
- 2.6 Schematic of the RHR Piping Model
- 2.7 Schematic of the RCL Model
- 3.1 Mean and Mean-plus-and-minus One Standard
Deviation Response Spectra for the
RG 1.60 Data Set.
 - a) N-S Component
 - b) E-W Component
 - c) Vertical Component
- 3.2 PVRC-Proposed Damping Values for
Piping Systems
- 4.1a Ratios of AFW Responses Given by 1%
Constant Damping Time History Analysis
(Case 2) to the PVRC Time History Analysis
(Case 1)



- 4.1b Ratios of RHR Responses Given by 1%
 Constant Damping Time History Analysis
 (Case 2) to the PVRC Time History Analysis
 (Case 1)
- 4.1c Ratios of RCL Responses Given by 2%
 Constant Damping Time History Analysis
 (Case 2) to the PVRC Time History Analysis
 (Case 1)
- 4.2a Ratios of AFW Response Given by 2%
 Constant Damping Time History Analysis
 (Case 3) to the PVRC Time History Analysis
 (Case 1)
- 4.2b Ratios of RHR Response Given by 2%
 Constant Damping Time History Analysis
 (Case 3) to the PVRC Time History Analysis
 (Case 1)
- 4.2c Ratios of RCL Response Given by 3%
 Constant Damping Time History Analysis
 (Case 3) to the PVRC Time History Analysis
 (Case 1)
- 4.3 Ratios of the Responses Given by the
 Constant 5% Damping Time History Analysis
 (Case 4) to the PVRC Time History Analysis
 (Case 1)
 - a) AFW System
 - b) RHR System
 - c) RCL System
- 4.4a Ratios of AFW Responses Given by the 4%
 Constant Damping Time History Analysis
 (Case 5) to the PVRC Time History Analysis
 (Case 1)
- 4.4b Ratios of RHR Responses Given by the 4%
 Constant Damping Time History Analysis



	(Case 5) to the PVRC Time History Analysis	
	(Case 1)	
4.4c	Ratios of RCL Responses Given by the 4%	
	Constant Damping Time History Analysis	
	(Case 5) to the PVRC Time History Analysis	
	(Case 1)	
4.5a	Ratios of AFW Responses Given by the 10%	
	Constant Damping Time History Analysis	
	(Case 6) to the PVRC Time History Analysis	
	(Case 1)	
4.5b	Ratios of RHR Responses Given by the 10%	
	Constant Damping Time History Analysis	
	(Case 6) to the PVRC Time History Analysis	
	(Case 1)	
4.5c	Ratios of RCL Responses Given by the 10%	
	Constant Damping Time History Analysis	
	(Case 6) to the PVRC Time History Analysis	
	(Case 1)	
5.1	Plot of Mean Response Ratios for Specified	
	Constant Damping Analysis Results vs. PVRC	
	Damping Analysis Results	

111
112
113
114
115
116
117
118
119
120

EXECUTIVE SUMMARY

In its Standard Review Plan (SRP), the U. S. Nuclear Regulatory Commission prescribes acceptable analysis methods to be used in the seismic design of multiply-supported equipment and components with distinct inputs. One approach is the response spectrum analysis method. The response spectrum analysis approach is specified in terms of requirements governing various aspects of the methodology. The objective of the requirements is to define a calculational procedure that introduces conservatism into the seismic analysis calculation. A partial list of these requirements follows:

- three components of input motion with broad band response spectra (U. S. NRC Regulatory Guide RG 1.60)
- damping values (RG 1.61)
- broadened in-structure spectra (RG 1.122)
- enveloping spectra at piping system supports (NRC Standard Review Plan 3.92)
- Modal combination rules (RG 1.92)

Conservatism in seismic analyses is necessary due to uncertainty in analysis methods and in defining parameters input to the analyses that dictate the dynamic characteristics of the subject components. There is concern, however, that the extent to which the procedure introduces conservatism is excessive. In response to this concern, the Technical Committee on Piping Systems of the Pressure Vessel Research Committee has attempted to reduce the conservatism in the response spectrum procedure. Task Groups on Damping and Spectrum Development have recommended changes in damping values and an alternative to spectrum peak broadening. The recommended damping values are, in

general, higher than those of RG 1.61 and are a function of the piping system frequencies - 5% damping for frequencies below 10 Hz, 2% damping for frequencies greater than 20 Hz, and a linear variation from 5% to 2% for intermediate frequencies. The alternative procedure to spectrum peak-broadening shifts the raw (unbroadened) spectra over a frequency range of $\pm 15\%$ of peak frequency. Both recommendations are currently ASME code cases. The PVRC damping proposal is ASME Code Case N-411, Alternative Damping Values for Seismic Analysis of Classes 1, 2, and 3 Piping Sections, Section III, Division 1. In this report, it is denoted PVRC damping. The alternative to spectrum peak - broadening is ASME Code Case N-397, Alternative Rules to Spectral Broadening Procedures of N-1226.3 for Classes 1, 2, and 3 Piping, Section III, Division 1.

Past studies that incorporated the PVRC recommendation into a response spectrum analysis method and applied this method to the analysis of piping systems found that the PVRC approach did reduce piping response when compared to an SRP response spectrum analysis. Margin still existed when results were compared to those of a design time history analysis.

For the present study, the PVRC damping proposal was incorporated into a multi-support time history analysis methodology. The purpose was to evaluate the impact of the proposal by comparing piping system response given by this variable damping method with those that employed different constant damping values.

Three piping system models (AFW, RHR, RCL) were considered. The characteristics of the models in terms of size, stiffness and complexity represent a range of nuclear piping configurations. However, the three models were relatively



low frequency in that their fundamental modes were below 4 Hz. These three systems have been studied extensively in past investigations. Piping response in the form of nodal accelerations and displacements and element forces and moments were determined.

Multiple time history analysis cases were studied. The analysis methodology was the same for each case, only the damping value assigned to the three piping systems changed. The first case employed the PVRC variable damping proposal for all piping systems. Subsequent cases assumed constant damping values for each piping system analysis -- 1%, 2%, 4%, 5% and 10% damping for the AFW and RHR systems and 2%, 3%, 4%, 5% and 10% damping for the RCL system.

The results of the analyses indicated that the effect of PVRC variable damping did not significantly vary from one piping system to the next. There was also little variation with respect to response type - nodal accelerations and displacements and element forces and moments were affected similarly. As to be expected, the effect of PVRC damping is most apparent when compared to piping system response that assumed the lower constant damping values. As the constant damping values increase, the difference between the PVRC and the constant damping results decrease. Little difference is seen between the PVRC damping results and those that assumed a constant 5% damping. This is due to the low frequency nature of the piping systems considered here and to the fact that the PVRC proposal specifies damping equal to 5% of critical for modal frequencies below 10 Hz. When 10% damping is assumed, lower bound response values for all piping systems are obtained.

1.0 INTRODUCTION

The seismic response of spatially distributed systems like piping is frequently separated into two parts -- the inertial or vibratory response and the pseudo-static response due to the relative motions of the system supports. Various analysis procedures have been developed to calculate each portion of the response separately. In its Standard Review Plan (SRP) [1], the US Nuclear Regulatory Commission (NRC) prescribes acceptable methods to be used in the analysis of multiply-supported equipment and components with distinct inputs. One approach is to calculate the inertial response by the response spectrum analysis method, using as input envelopes of support motions in each of three orthogonal directions (two horizontal and the vertical). Response due to the relative displacements of the supports is obtained from a static analysis by imposing support displacements on the piping system in the most unfavorable combination. A second approach prescribed by the SRP to determine total piping response states that time histories of support motions may be used to excite the subsystems. However, due to the increased analytical effort of this second approach and the increased coordination that must exist between the analyst of the primary structure and the analyst of the subsystems, multisupport time history analyses are seldom performed.

It is generally recognized that the simpler response spectrum approach introduces conservatism or margin into the analysis, i.e. trading calculational margin for simplicity. This belief was supported in a study by Johnson, et al. [2] designed to quantify this margin. The study compared the seismic response of piping calculated by two methods -- response spectrum analysis and best-estimate time history

analysis procedures [3] -- and showed that considerable conservatism is embodied in the response spectrum method as defined in the SRP.

Several areas can be identified which contribute to this conservatism, e.g., peak broadening of in-structure response spectra, conservatively specified values of damping, enveloping of in-structure response spectra, and combination of modal responses. The Technical Committee on Piping Systems of the Pressure Vessel Research Committee (PVRC) has proposed changes in two of these areas to reduce excess conservatism in the analysis procedure. Task Groups on Damping and Spectrum Development recommended changes in damping values [4] and an alternative to spectrum peak broadening [5]. The proposed damping values for piping systems are the result of a regression analysis of available damping data. In general, the damping values are higher than those specified in the regulatory guide. The PVRC damping proposal is ASME Code Case N-411 Alternative Damping Values for Seismic Analysis of Classes 1, 2, and 3 Piping Sections, Section III, Division 1. The alternative procedure to spectrum peak broadening uses the unbroadened spectra directly and takes account of the uncertainty of soil and structure characteristics by shifting the unbroadened spectra over a frequency range of $\pm 15\%$ of peak frequency. This proposal is ASME Code Case N-397 Alternative Rules to Spectral Broadening Procedures of N-1226.3 for Classes 1, 2, and 3 Piping, Section III, Division 1.

The impact of the PVRC recommendations on piping system response was studied by Chuang et al., [6]. In that study, the PVRC damping and alternative broadening procedures were incorporated into a response spectrum method and response values compared with those obtained by both an SRP response

spectrum analysis and a multi-support time history analysis using constant damping. Chuang et al., found that the PVRC damping did reduce response when compared to the SRP response spectrum analysis method but that the responses were generally still larger than those calculated by the multi-support time history analysis procedure. The time history analysis procedure used constant damping corresponding to RG 1.61 guidelines for an OBE level earthquake - 1% damping for the AFW and RHR piping system and 2% damping for the RCL.

The purpose of the present study is to evaluate the impact on piping system response of including the PVRC variable damping proposal in a multi-support time history analysis methodology. To that end, analyses of three different piping systems were conducted. These piping systems varied in their size and dynamic characteristics and, as such, are representative of a broad range of piping systems typically found at nuclear power plants. The response of the piping systems analyzed with the PVRC damping proposal were compared to those of time history analyses that assumed different constant damping values in an effort to bracket and quantify the effect of the variable damping.

The balance of this report is as follows. Section 2 describes the three piping systems of the Zion nuclear power plant which formed the basis of this study. Section 3 describes the methods of analyses employed herein - the multi-support time history analysis procedure and the procedure as modified by the PVRC variable damping - and the analyses performed. Section 4 presents the numerical results while Section 5 draws conclusion from the results.



2.0 DESCRIPTION OF PIPING MODELS

2.1 INTRODUCTION

We applied our methods of analysis to three piping systems of the nuclear power plant at Zion, Illinois. In this section we briefly describe the structures in which the piping systems are located, the three piping models, and their key parameters.

2.2 ZION STRUCTURES

Figure 2-1 illustrates the arrangement of buildings at the Zion plant. The piping systems of interest in this study are housed in two structures, the containment building and the auxiliary, fuel-handling, turbine building (AFT) complex. The AFT complex consists of connected buildings housing the turbines, fuel-handling equipment, diesel generators, etc. Models of these structures were originally developed for the NRC-sponsored Seismic Safety Margins Research Program (SSMRP) [7].

Containment Building. The containment building has two separate structures, the containment shell and an internal structure, on a common basemat (Fig. 2-2).

The pre-stressed concrete containment shell is modeled with beam elements. The model includes rotational inertias that affect bending and torsion of the shell. Masses and rotational inertias are lumped at node points. We included the first 13 modes in our dynamic analysis. These modes cover all the structure's natural modes below 33 Hz.

Within the containment shell, a separate concrete internal structure (Fig. 2-2) supports a four-loop pressurized-water reactor (PWR) Westinghouse nuclear steam-supply system

(NSSS). The internal structure, including an appropriate representation of the NSSS, is modeled with three-dimensional finite elements (Fig. 2-3). The elements are beams, trusses, plates, straight and curved pipes, etc. Masses are lumped at selected node points. We included the first 60 modes in our dynamic analysis which defined the structure's natural modes below 33 Hz.

AFT Complex. The T-shaped AFT complex is treated as being symmetrical about a vertical east-west plane between the two containment buildings. A three-dimensional finite-element model of half of the complex containing over 3800 degrees-of-freedom was constructed (Fig. 2-4). Applying appropriate boundary conditions along the plane of symmetry and extracting symmetrical and anti-symmetrical modes led to the description of the dynamic characteristics of the structure. One hundred and thirteen modes were included in the dynamic analyses.

2.3 PIPING MODELS

Three piping models were considered in this study: a model of part of the auxiliary feedwater system (AFWS), a model of part of the residual heat-removal and safety injection system (RHR/SIS), and a model of the reactor coolant system (RCS). We refer to these as the AFW-1, the RHR/SI-1, and the RCL models. The mathematical models used in this study were previously developed [8].

AFW-1 Model. The AFWS is for emergency cooling if the main feedwater system fails. Only part of the AFWS, the piping from steam generator 1A to containment penetrations was considered (Fig. 2-5). The AFW-1 model consists of a 16-inch main feedwater (MFW) line from the steam generator nozzle to a containment penetration and a 3-inch auxiliary

feedwater (AFW) line branched from the 16-inch MFW line to a containment penetration.

RHR/SI-1 Model. The RHR system removes residual heat from the core and reduces the temperature of the reactor coolant system. The SIS cools the core and limits the metal-water interaction. We modeled one part of the RHR/SIS, the piping inside the AFT complex and one small portion inside the containment shell (Fig. 2-6). The RHR/SI-1 model consists of a 12-inch piping line from a wall anchor at the internal structure of the containment building to an anchor in the AFT complex, and an 8-inch pipe line from the refueling water storage tank (RWST) nozzle to the 12-inch pipe.

RCL Model. The RCS transfers heat generated in the core to the steam generators which produce the steam to drive the turbines. A portion of the RCS was modeled, namely, all four reactor coolant loops (RCL), six branch lines of the loops, and all major NSSS's equipment, including the reactor pressure vessel (RPV), four steam generators (SG), four reactor coolant pumps (RCP), and a pressurizer (Fig. 2-7). Each of the four reactor coolant loops consists of a 29-inch hot leg from the nozzle of RPV to SG, one 31-inch crossover leg from the nozzle of SG to RCP, and a 27.5-inch cold leg from the nozzle of RCP to RPV.

The six branch lines are:

- The 14-inch pressurizer surge line from the pressurizer to the hot leg of the RCL No. 4
- The 14-inch line from the hot leg of RCL No. 1 to the RHRS.
- The 8-inch SI line to the cold leg of RCL No. 1.
- The 8-inch bypass line from the hot leg to the cold leg of RCL No. 1

- The two 4-inch pressurizer spray lines from the cold leg of RCL Nos. 3 and 4 to the pressurizer.

Basis for Selection. These piping models were selected to cover a wide range of parameters. As can be seen in Table 2.1, the piping systems vary considerably in size and complexity. In terms of the number of support motions and modes considered, the RHR/SI-1 model is smallest and least complex, the RCL model is the largest and most complex, and the AFW-1 model is intermediate. Table 2.2 lists the first ten natural frequencies of each piping system.

Features of the Models. The models had several features in common:

- Piping was assumed to be linearly elastic.
- Appropriate stiffnesses were incorporated for piping supports (including rigid hangers, lateral restraints, and snubbers), except those of RHR/SI-1 model, where the piping supports were assumed to be rigid.
- Constant and variable spring hangers were not included because their small stiffnesses were negligible compared to the stiffness of piping and other types of restraints (snubbers, etc.).
- The stiffness formulation of curved pipe (elbow or bend) elements included the effect of internal pressure on the flexibility of curved pipes.

Response of Models. For each piping model, responses at selected nodes and elements were calculated. Response locations were the same as those selected in previous studies where emphasis was placed on determining response at locations of high stress, i.e., elbows, tees, reducers, etc. We calculated nodal accelerations and displacements,



reaction forces in supports, and pipe resultant moments--the amplitude of the vector sum of the two orthogonal bending moments and the torsional moment were calculated. In all, the following responses were determined:

- 50 accelerations, 63 displacements, 28 support reactions, and 23 pipe resultant moments for the AFW-1 model
- 28 accelerations, 51 displacements, 15 support reactions, and 22 pipe resultant moments for the RHR/SI-1 model.
- 51 accelerations, 94 support reactions, and 118 pipe resultant moments for the RCL model.

Table 2.1

KEY PARAMETERS OF THE THREE PIPING MODELS.

Piping Model	No. of Nodes	No. of Equations	No. of Support Motions	No. of Modes Considered
AFW	263	945	45	36
RHR/SI	96	423	21	18
RCL	760	2941	127	130



Table 2.2

PIPING SYSTEM FREQUENCIES (HZ)

<u>Mode</u>	<u>AFW</u>	<u>RHR</u>	<u>RCL</u>
1	2.86	3.86	1.43
2	3.76	8.11	2.41
3	4.48	9.35	3.26
4	4.89	10.89	3.47
5	7.27	12.22	4.39
6	7.56	13.83	4.84
7	7.86	14.88	5.25
8	8.01	16.82	5.99
9	9.05	19.95	6.03
10	9.63	21.74	6.40

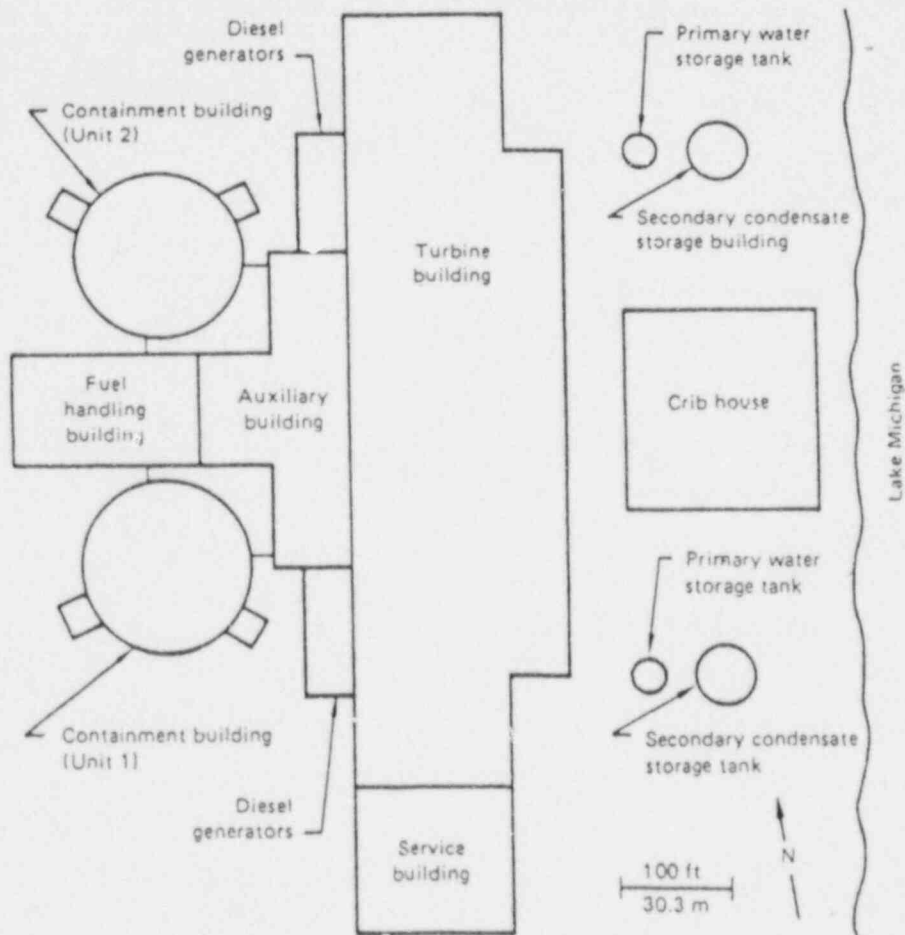


Fig. 2.1 General Arrangement of Structures at the Zion Plant.

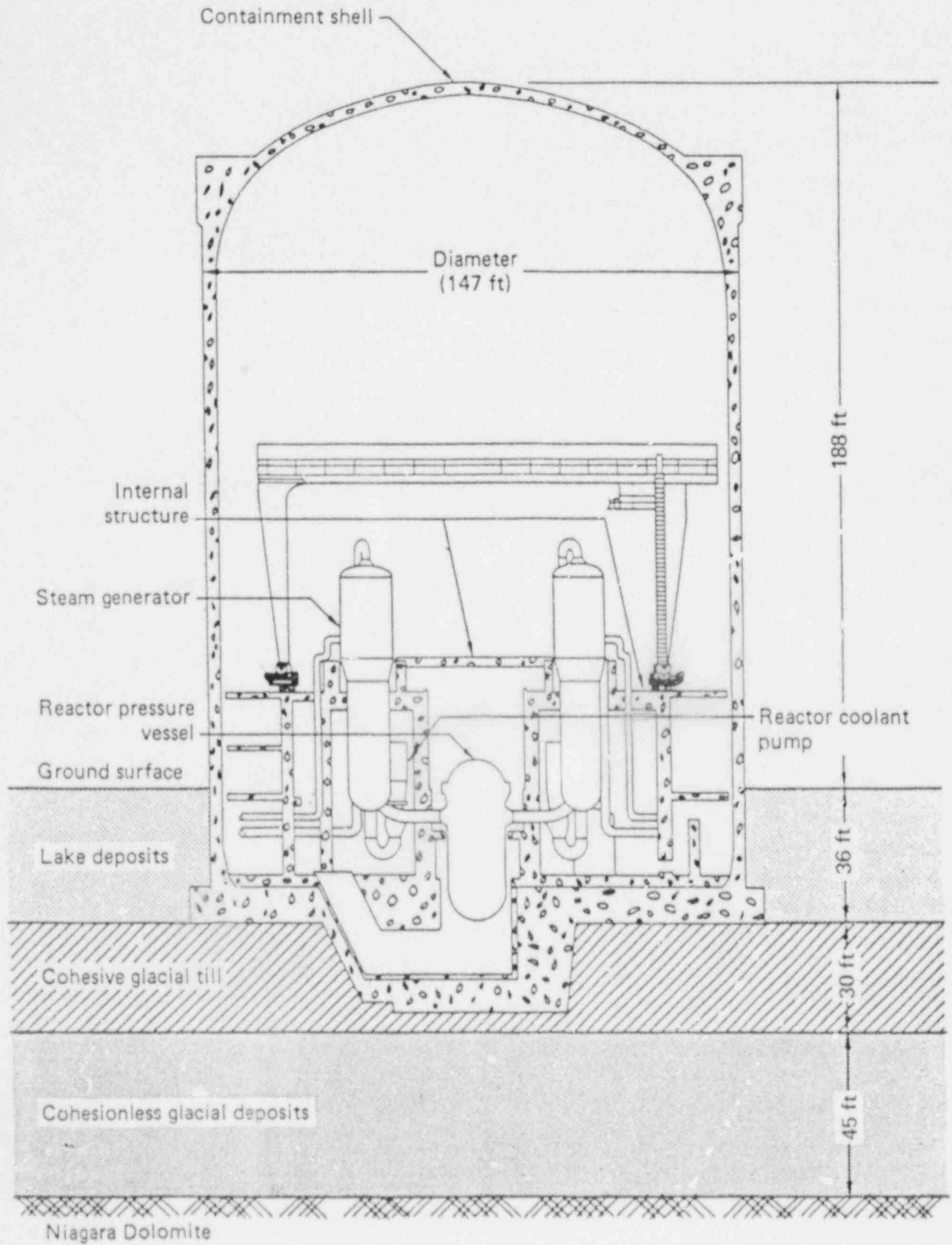


Fig. 2.2 Cross Section of the Zion Containment Building.

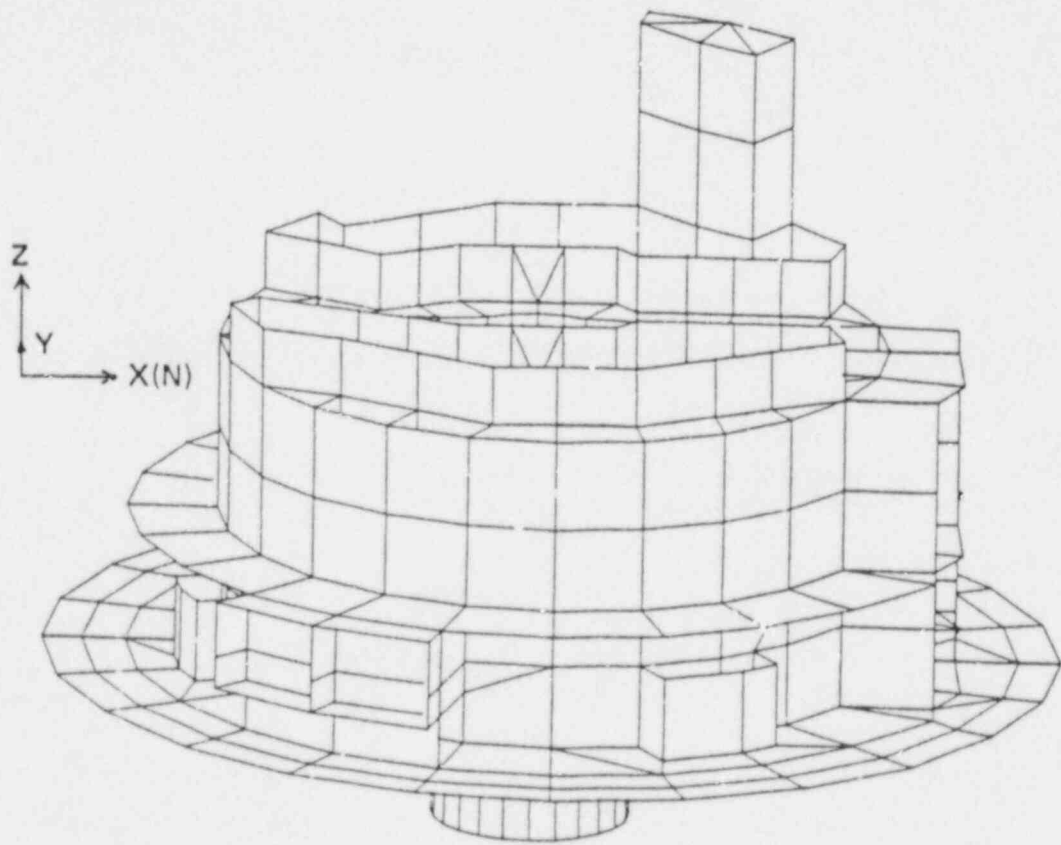


Fig. 2.3 A Perspective View of the Three-Dimensional Finite Element Model for the Internal Structure Within the Containment Building at Zion.

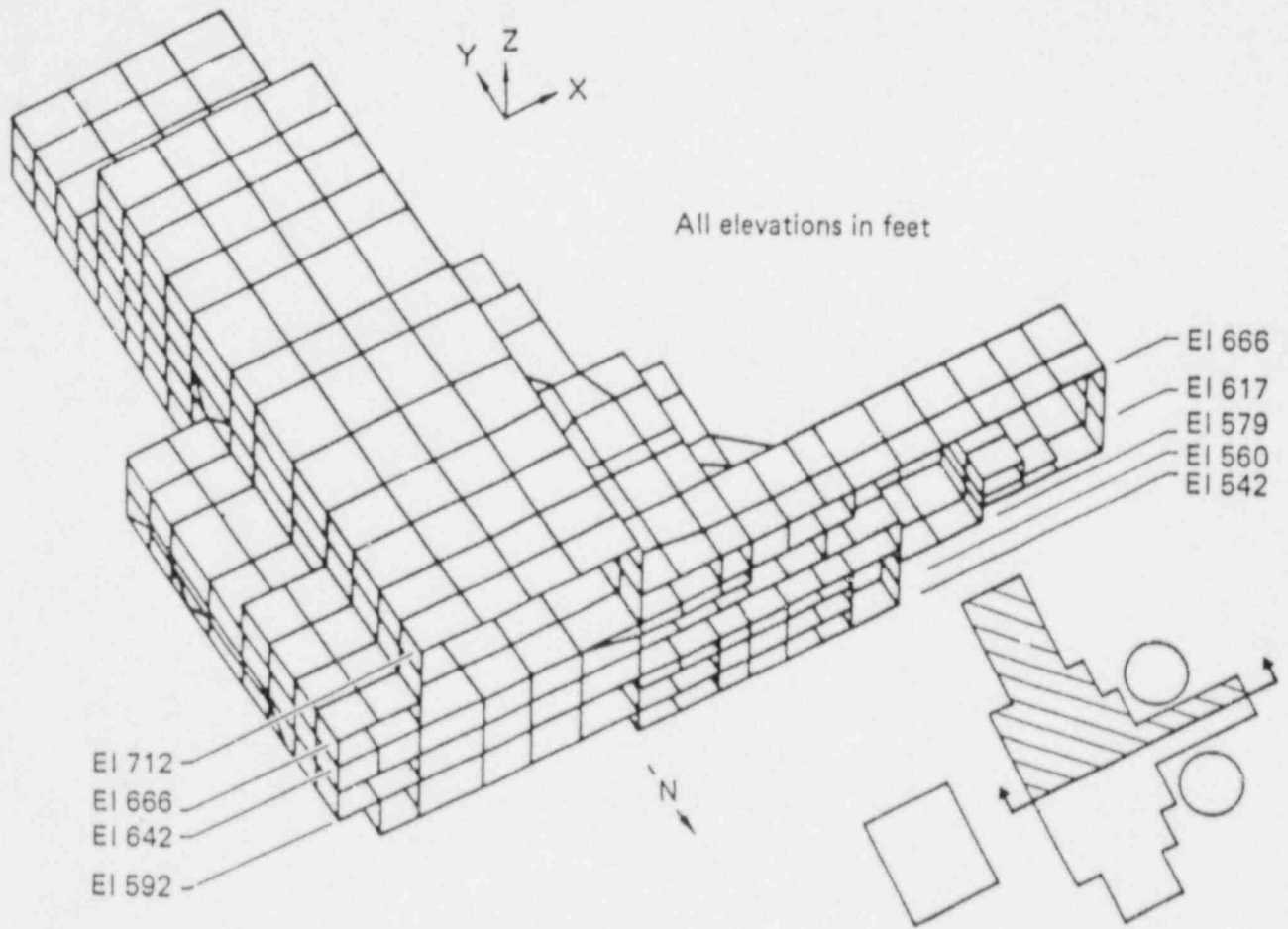


Fig. 2.4 Finite Element Half-Structure Model of the AFT Complex; Shaded Area of the Inset Sketch Shows the Portion of the Structure Modeled.

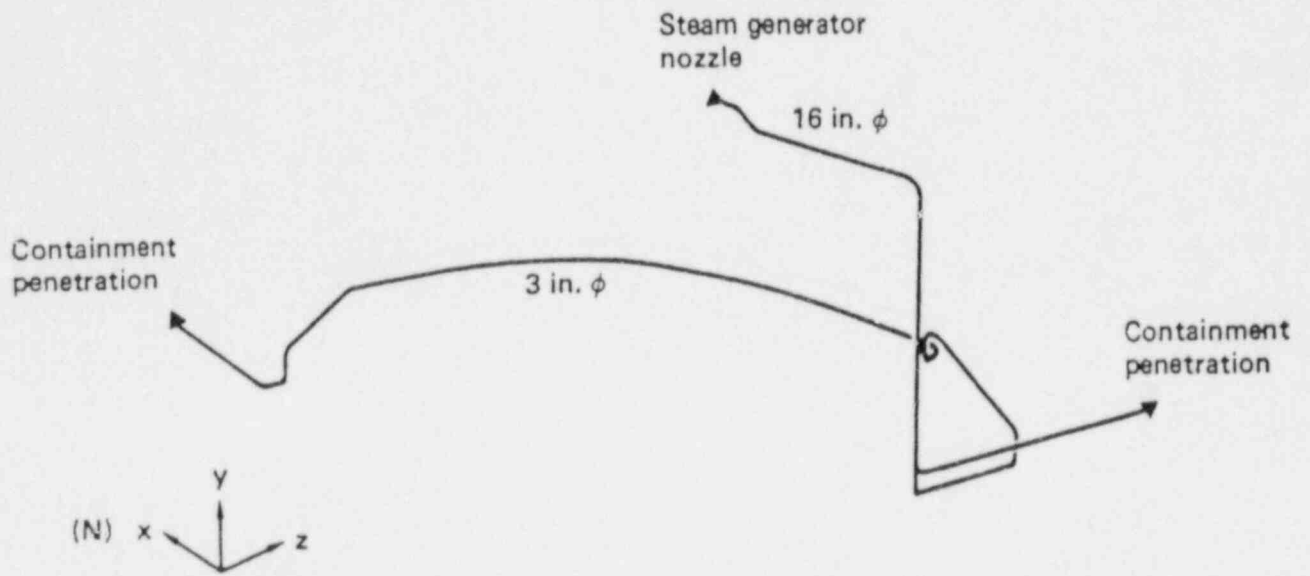


Fig. 2.5 Schematic of the AFW Piping Model.

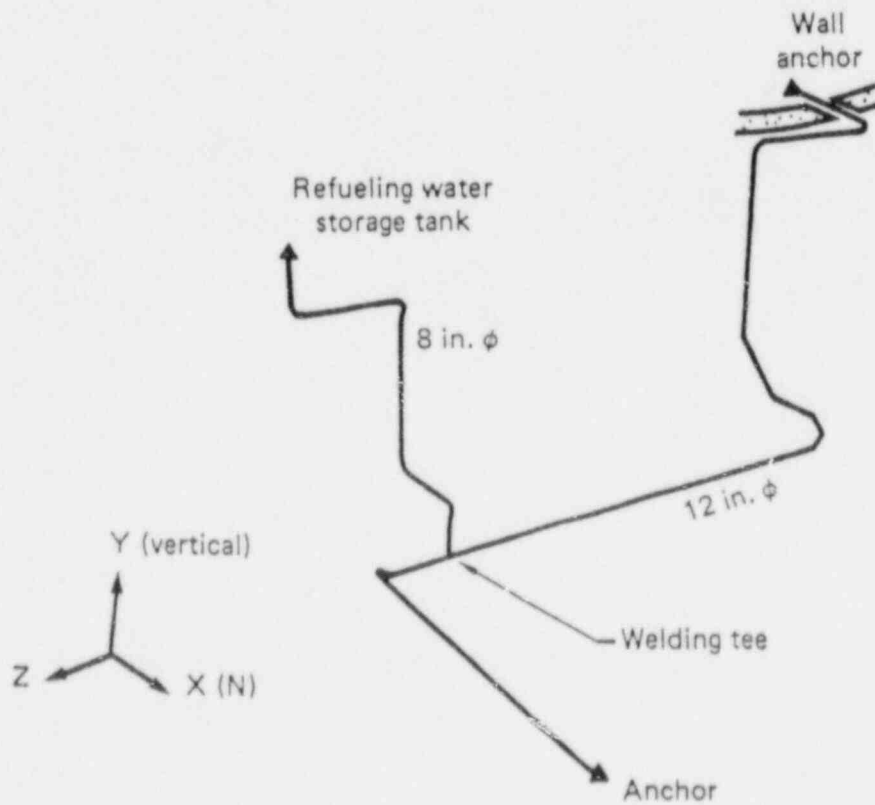


Fig. 2.6 Schematic of the RHR Piping Model.

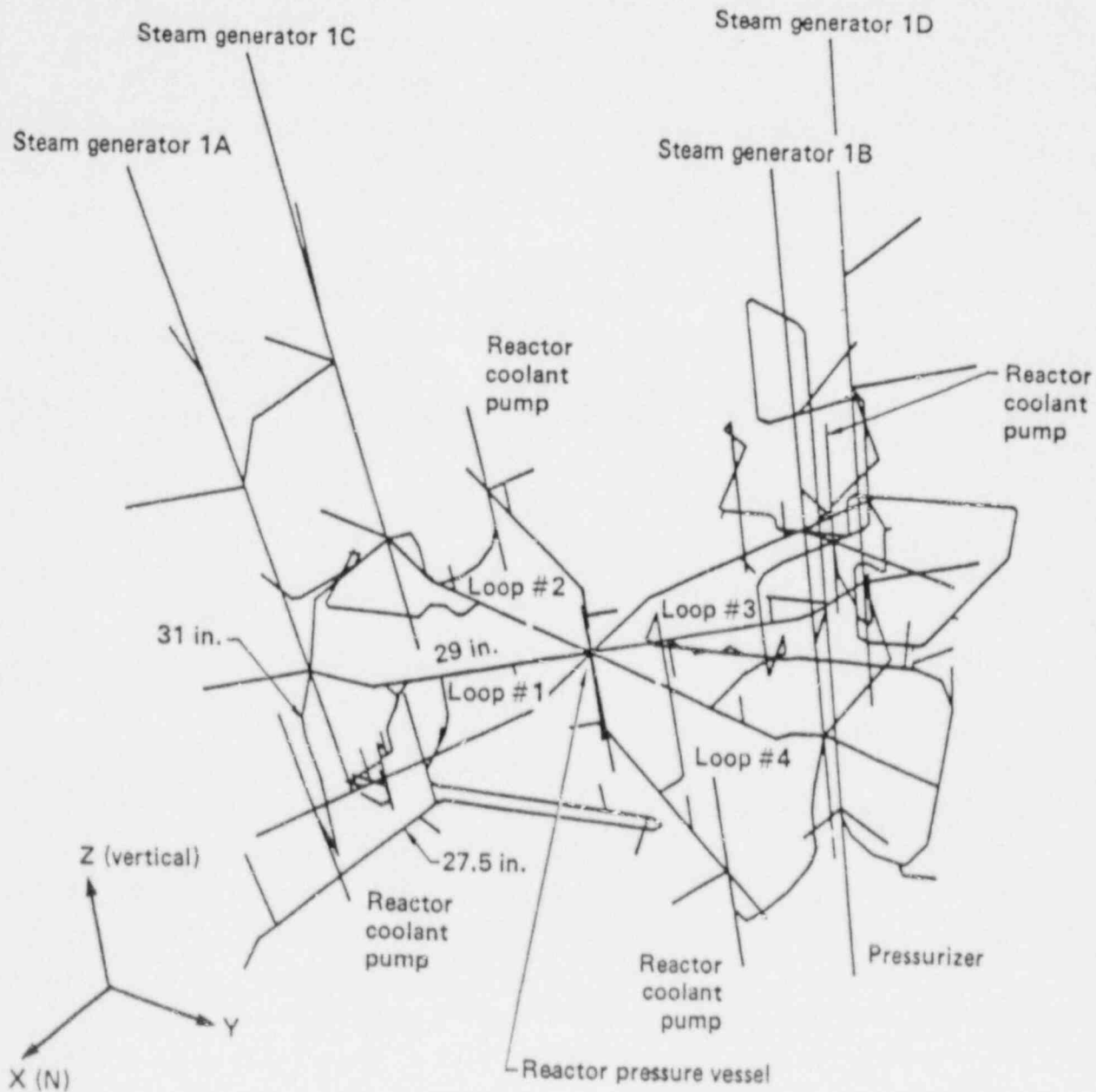


Fig. 2.7 Schematic of the RCL Model.



3.0 METHOD OF ANALYSIS

For this study multiple sets of analyses were performed for each piping system. In every case, a multi-support time history analysis was conducted. The only distinction between the cases was the way in which piping system damping was treated. In the first case, the PVRC variable damping recommendation was employed. In the other cases, different constant damping values were used. The procedure used for all analyses is embodied in the computer program SMACS. This code was first developed at Lawrence Livermore National Laboratory (LLNL) as part of the SSMRP [9]. SMACS was subsequently implemented on the Brookhaven National Laboratory (BNL) computer system where it was modified to incorporate the PVRC variable damping proposal. Both laboratory computer systems were used for the analyses conducted in this study.

3.1 SMACS METHODOLOGY

The multi-support time history analysis procedure used in our analyses is embodied in the computer program SMACS and calculates the seismic response of structures and piping systems and the variation in these responses. SMACS performs time history analysis linking seismic input with soil-structure interaction (SSI), major structural response, and piping system response. The seismic input is defined by an ensemble of acceleration time histories in three orthogonal directions (two horizontal and the vertical) on the surface of the soil. SSI and detailed structural response are determined simultaneously using the substructure approach. Detailed structural responses in the form of time histories and peak values of accelerations, displacements, and forces are computed. Piping systems are analyzed using the pseudostatic mode method assuming the



Each of these items will be briefly discussed below. The PVRC variable damping method will be presented in the section describing the treatment of piping system damping.

Free-field motion. In these analyses, the seismic input was defined as an ensemble of artificially generated time histories developed by the nuclear industry that met the requirements of NRC Regulatory Guide 1.60 [10]. We used 30 sets of data that represented 30 earthquakes. Each data set was three acceleration time histories -- two horizontal and a vertical. The horizontal components had equal peak accelerations of 0.18 g and the vertical component had a peak acceleration of 0.12 g. We verified for all sets that the three components were statistically independent (correlation coefficients less than 0.16). Figure 3-1 shows the RG 1.60 data set response spectra (mean plus and minus one standard deviation). Notice that spectral acceleration varies little with frequency, because each time history was constrained by the same target response spectrum. Coefficients of variation (COVs) of approximately 0.1 are typical for the frequency range in which amplification occurs (1-10 Hz), and the COVs are smaller outside that range.

Models of SSI, structures, and piping systems. SSI, structure, and piping models used in this study were originally developed for the SSMRP. The SSI model is discussed in detail in Johnson et al. [11]; structure and piping models were discussed in Sec. 2 of this report. These models were consistent with the SSMRP Phase 1 analysis and identical to those used in Refs. 2 and 6. Later SSMRP analyses, in particular, the Phase 2 Zion risk analysis, used revised values of some parameters, such as damping, which reflected a re-evaluation of Zion specific information.

The PVRC variable damping method. Unlike the treatment used in the soil and structure models where damping was chosen from a distribution defined by a nominal value and a variation, piping system damping was defined by a procedure recommended by the Pressure Vessel Research Committee (PVRC).

This recommendation resulted from a review of available piping system damping by the Task Group on Damping of the PVRC Technical Committee on Piping Systems [4]. The review found pipe damping to be frequency dependent and justified an increase in damping values over those specified in RG 1.61 [12], especially for piping system frequencies below 10 Hz.

The PVRC proposal is illustrated in Fig. 3-2. This proposal assumes 5% damping for frequencies below 10 Hz, linearly varying damping from 5% at 10 Hz to 2% at 20 Hz, and 2% damping at frequencies above 20 Hz. The figure shows both the proposal and the current RG 1.61 requirements. Note that the PVRC proposal is dependent on frequency but independent of seismic excitation level or piping size.

Input parameter variations. As discussed in Sec. 3.1, uncertainties in seismic input, SSI, structure response, and piping system response are treated explicitly in the SMACS response calculations. A limited number of input parameters are used to incorporate uncertainty: in the seismic input, an ensemble of time histories; in SSI, the mechanism to include variability is soil shear modulus and material damping in the soil, in the structure, variations in frequencies and damping are the mechanisms. Variabilities in material properties assumed here were identical to those of Refs. 2 and 6 and represent total uncertainty. For the present study, piping systems frequencies were held constant

at their nominal values; in this analysis case, pipe damping was defined by the PVRC recommendation. Variability in the input parameters is described by assumed lognormal distributions. Table 3.1 tabulates the COVs used in the present study.

Experimental Design. The SMACS analysis used a Latin hypercube experimental design [13]. The design efficiently sampled the parameter spaces so that the number of simulations is reasonably limited. The process is described here. For our RG 1.60 analysis, 30 earthquake simulations were performed. Hence, 30 sets of earthquake time histories were selected. Next, the distribution of each variable input parameter was divided into 30 equal-probability intervals. A value was randomly selected from each interval, and the 30 values for each variable were rearranged randomly. The 30 sets of time histories and the permuted values of the variable parameters were then grouped to give 30 combinations of input values for the dynamic analyses. Therefore, in a series of 30 analyses, each time history set is used once, and a parameter value was selected once from each of the 30 intervals in each of the parameter distributions. The set of 30 input combinations is called a Latin hypercube sampling set. The 30 seismic analyses gave 30 values for every piping system response calculated. For each response request the median of the distribution of the 30 seismic responses was used for comparisons in Sec. 4. For this analysis case, the responses of the AFW and RHR piping systems were calculated on the BNL computer system; response of the RCL model was calculated on the LLNL computer system.

3.3 CONSTANT DAMPING TIME HISTORY ANALYSES

To provide a basis for evaluating the impact of the PVRC damping method on piping system response, time history



analyses using different constant damping values were performed. These analyses employed virtually the same methodology as just described for the PVRC analysis - the same ensemble of earthquake time histories, the same soil, structures and piping models, the same variations of system parameters, and the same combination of parameters into a set of 30 earthquake analyses. Only the treatment of piping system damping changed. Differences in response therefore can be attributed directly to the different damping techniques.

In one case, referred to here as Case 2, a constant damping value of 1% was assigned to the AFW and RHR piping systems while 2% damping was assigned to the RCL. For Case 3 the AFW and RHR systems assumed damping equal to 2% of critical while the RCL system assumed 3% damping. Case 4 assigned a constant 5% damping to all three piping systems. This value was chosen since it represents an upper bound on the damping values allowed by the PVRC variable damping procedure. Case 5 assumed 4% damping, while Case 6 used constant 10% damping.

In each of these analysis cases, thirty earthquake simulations were run yielding thirty values for every piping system response request. The median value for each response request was used in the comparisons that appear in the next section. All constant damping analyses were run at LLNL as part of either the current study or past studies referenced earlier in this report.

Table 3.2 presents a summary of the many analyses of the AFW, RHR and RCL piping systems that have been performed. For the three piping systems, each step of the seismic analysis chain-seismic input, soil-structure interaction (SSI) and structural modeling, method of piping analysis, piping damping, and piping response - is summarized for all analyses conducted. It is important to understand the differences in the various analysis methods to properly compare the results and evaluate the conclusions drawn in each study.



Table 3.1

VARIATION OF INPUT PARAMETERS FOR TIME HISTORY ANALYSIS

<u>Element of Analysis Chain</u>	<u>Key Parameter</u>	<u>Coefficient of Variation (COV)</u>
Seismic input	Time history sets	See section 3.2
Soil	Shear modulus	0.7
	Damping	1.0
Structure	Frequency	0.5
	Damping	0.7
Piping	Frequency	0 (no variation)
	Damping	See sections 3.2 and 3.3



Table 3.2a
COMPARISON OF RESPONSE ANALYSIS METHODS FOR THE AFW AND THE RHR PIPING SYSTEM

Analysis Case	Seismic Input	Variability SSI/Structure	Piping Method of Analysis	Damping Nominal(%)	Var	Piping Response	Reference	Comments
1	EC (90 EQ)	Yes	TH	2	Yes	50%, 84% NEP	[2]	-
2	RG 1.60 (30 EQ)	Yes	TH	2	No	50% NEP	[2]	-
3	RG 1.60 (3 EQ)	No	RS	2	No	Avg of 3	[2]	-
4	RG 1.60 (30 EQ)	Yes	TH	1	No	50% NEP	[6]	-
5	RG 1.60 (30 EQ)	Yes	TH	2	No	50% NEP	[6]	Same as Case 2
6	RG 1.60 (1 EQ)	No	RS	1	No	-	[6]	-
7	RG 1.60 (1 EQ)	RG Broad	RS	PVRC Damp	-	-	[6]	-
8	RG 1.60 (1 EQ)	PVRC Broad	RS	RG Damp	No	-	[6]	-
9	RG 1.60 (1 EQ)	PVRC Broad	RS	PVRC Damp	-	-	[6]	-
10	RG 1.60 (30 EQ)	Yes	TH	1	No	50% NEP	*	Same as Case 4
11	RG 1.60 (30 EQ)	Yes	TH	2	No	50% NEP	*	Same as Case 2
12	RG 1.60 (30 EQ)	Yes	TH	1	No	50% NEP	*	-
13	RG 1.60 (30 EQ)	Yes	TH	PVRC Damp	-	50% NEP	*	-
14	RG 1.60 (30 EQ)	Yes	TH	4	No	50% NEP	*	-
15	RG 1.60 (30 EQ)	Yes	TH	10	No	50% NEP	*	-

For the AFW system, an additional series of analyses were conducted by Chuang, et al. using the methodology of cases 6 and 9 above. These analyses investigated alternative support configurations of the AFW model.

Notes

- TH = Time history analysis
- RS = Response spectrum analysis
- * = Current Study

III-33

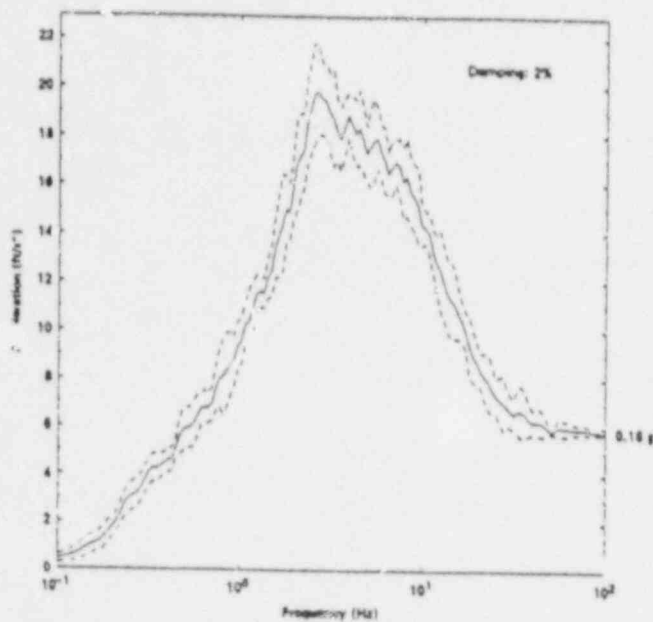
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Table 3.2b
COMPARISON OF RESPONSE ANALYSIS METHODS FOR THE RCL PIPING SYSTEM

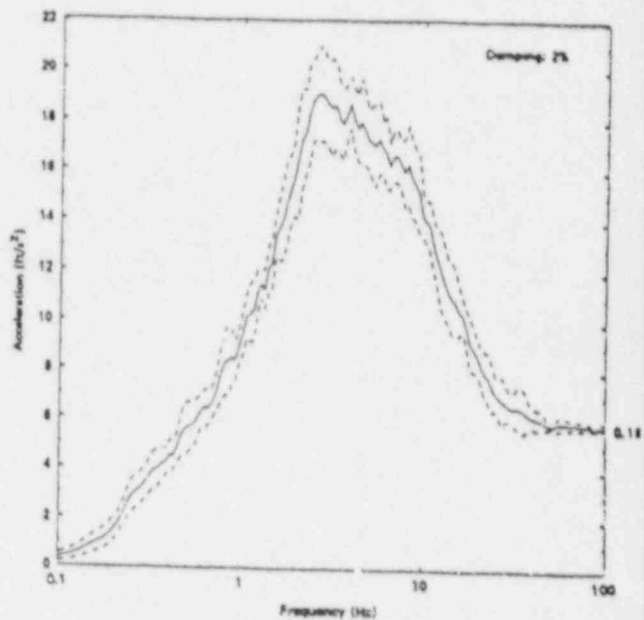
Analysis Case	Seismic Input	Variability SSI/Structure	Piping Method of Analysis	Damping Nominal(%)	Var	Piping Response	Reference	Comments
1	BE (90 EQ)	Yes	TH	2	Yes	50%, 84% NEP	(2)	-
2	PG 1.60 (30 EQ)	Yes	TH	2	No	50% NEP	(2)	-
3	RG 1.60 (3 EQ)	No	RS	2	No	Avg of 3	(2)	-
4	RG 1.60 (30 EQ)	Yes	TH	2	No	50% NEP	(6)	-
5	RG 1.60 (1 EQ)	No	RS	2	No	-	(6)	Same as Case 2
6	RG 1.60 (1 EQ)	RG Broad	RS	PVRC Damp	No	-	(6)	-
7	RG 1.60 (1 EQ)	PVRC Broad	RS	- RC Damp	No	-	(6)	-
8	RG 1.60 (1 EQ)	PVRC Broad	RS	PVRC Damp	No	-	(6)	-
9	RG 1.60 (30 EQ)	Yes	TH	2	No	50% NEP	*	-
10	RG 1.60 (30 EQ)	Yes	TH	3	No	50% NEP	*	Same as Case 4
11	RG 1.60 (30 EQ)	Yes	TH	5	No	50% NEP	*	-
12	RG 1.60 (30 EQ)	Yes	TH	PVRC Damp	No	50% NEP	*	-
13	RG 1.60 (30 EQ)	Yes	TH	4	-	50% NEP	*	-
14	RG 1.60 (30 EQ)	Yes	TH	10	No	50% NEP	*	-

Notes

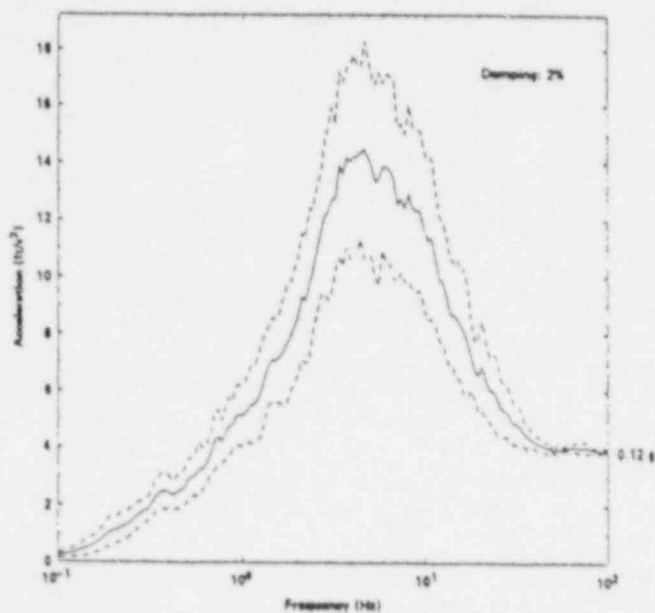
TH = Time history analysis
RS = Response spectrum analysis
* = Current Study



a) N-S Component



b) E-W Component



c) Vertical Component

Fig. 3.1 Mean and mean-plus-and-minus One Standard Deviation Response Spectra of the RG 1.60 Data Set.

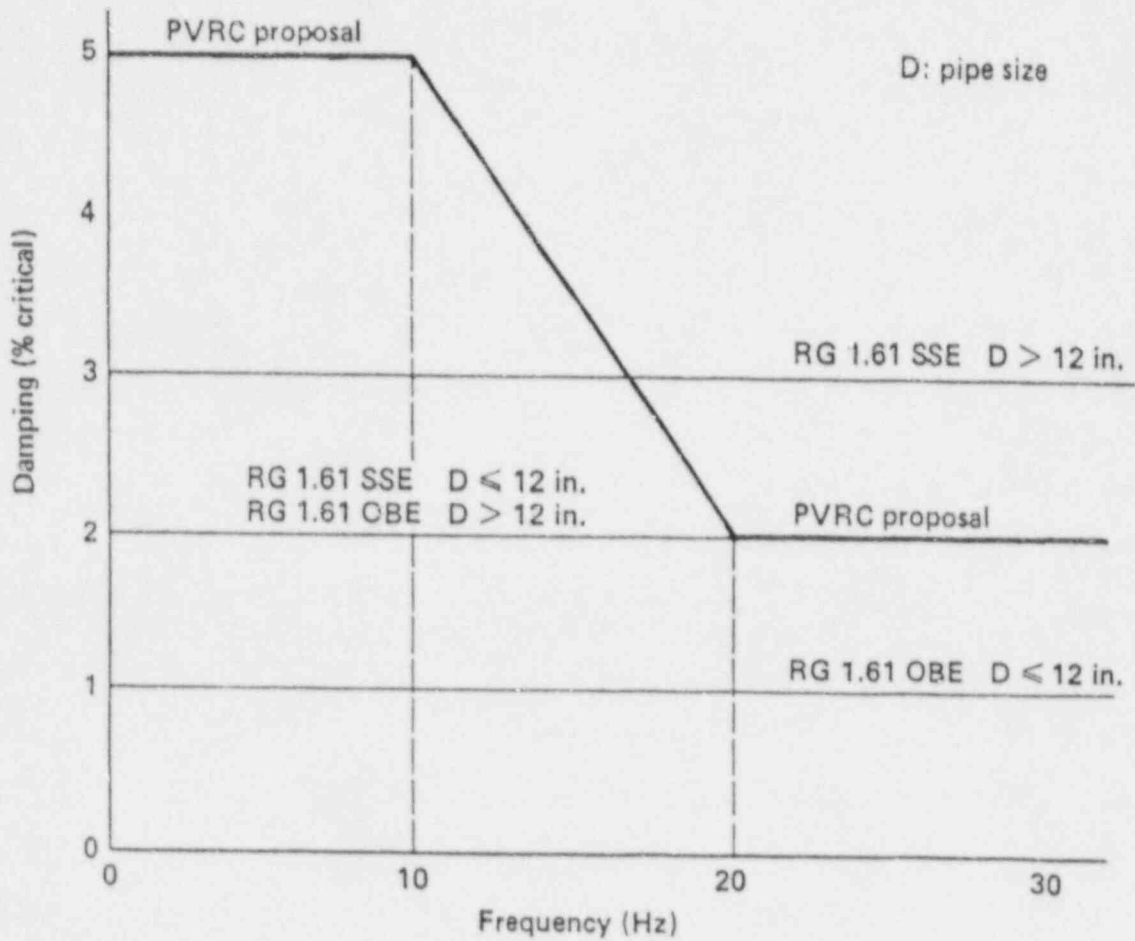


Fig. 3.2 PVRC-Proposed Damping Values for Piping Systems.

4. NUMERICAL RESULTS AND INTERPRETATION

The principal results are presented herein as comparisons of piping responses from time history analyses that reflect the PVRC variable damping proposal and constant damping values. Only the inertial component of response is considered. Comparisons are presented in two forms:

- Figures which display ratios of responses for individual node or element locations grouped according to response type e.g., displacements, accelerations, support forces, and piping moments.
- Tables that summarize the results and present statistics of the ratios for each piping system and each type of response.

The response quantities of most interest are accelerations, support forces, and piping moments. These enter directly into qualification or fragility assessment of valves and design or fragility assessment of piping and its supports. Displacements were also calculated for the RHR and the AFW models and have been included for completeness.

4.1 PVRC DAMPING TIME HISTORY RESULTS VS. CONSTANT 1% AND 2% DAMPING TIME HISTORY RESPONSE - CASE 1 AND CASE 2

An initial comparison was made between time history responses that reflect the PVRC damping proposal (Case 1) with those that employ the lowest damping values considered in this study (Case 2) - 1% for the AFW and RHR piping systems and 2% for the RCL system. The comparison quantifies the extent that the variable damping method reduces response compared to a time history analysis procedure employing damping values consistent with Regulatory Guide (RG) 1.61 requirements for an Operating

Basis Earthquake (OBE) level. Figures 4-1a, b, and c show the response ratios for the AFW, RHR and RCL piping systems, respectively. In calculating the ratios, the PVRC response values were taken as the denominator.

The figures show that the PVRC damping proposal has a rather uniform effect on piping system response. For each piping system, within a given response type - accelerations, displacements, forces or moments - there is little variation in the ratios. Ratios for nodal acceleration were slightly larger than the ratios for displacements, moments or forces. Both the AFW and the RHR piping systems have greater response ratios than the RCL. This can be attributed to the lower damping values assigned to the two former piping systems.

Although the trend just described applies to most response ratios, there are exceptions. Virtually each piping system shows selected response ratios that are considerably less than other ratios of the same response component type. A probable explanation is that, even for flexible piping systems such as those considered here, there are locations and response quantities for which high frequency modes are important. Nodal accelerations and displacements for points near supports are determined by support response and the response of high frequency modes. Consequently, response ratios for components at these locations are dominated by these two concerns. If component responses are dominated by support motions, they will be nearly independent of piping system damping and response ratios will be approximately one. If dynamic amplification of higher frequency modes is important, response ratios will reflect the lower damping values assigned by the PVRC variable damping method to these higher frequency modes.

Table 4.1 summarizes the data of Fig. 4-1 in statistical form. The mean of the response ratios for each response component and its coefficient of variation are listed. These parameters are calculated as follows. For a given piping system, e.g. the AFW system and a given response component, e.g. nodal accelerations, the mean response ratio is

$$\bar{m} = \frac{\sum_{i=1}^N \frac{R_{ci}}{R_{vi}}}{N}$$

where R_{ci} = median of the thirty values for acceleration response request i predicted by the constant damping analysis method,

R_{vi} = median of the thirty values for acceleration response request i predicted by the PVRC variable damping method,

N = the number of acceleration response requests.¹

The coefficient of variation (COV) is calculated as the standard deviation (σ) of the above data divided by the mean (m). Note that the COV shows the variation between component median response ratios, not variations in responses due to the 30 earthquake simulations.

4.2 PVRC DAMPING TIME HISTORY RESPONSE VS. CONSTANT 2% AND 3% DAMPING TIME HISTORY RESULTS - CASE 1 AND CASE 3

A comparison was made between the PVRC damping results (Case 1) and results that employed 2% damping for the AFW and RHR models and 3% damping for the RCL (Case 3). These constant damping values correspond to those specified by Regulatory Guide (RG) 1.61 for a Safe Shutdown Earthquake (SSE) level. Figure 4.2 shows the same kind of response ratio comparisons illustrated previously. For the most part, the trends described in Sec. 4.1 also hold for these comparisons. The overall reduction in the response ratio values compared to those of the previous section reflects the effect of increased damping used in the Case 3 analyses. Table 4.2 summarizes the comparison data.

4.3 PVRC TIME HISTORY RESULTS VS. CONSTANT 5% TIME HISTORY RESPONSE - CASE 1 AND CASE 4

By comparing the response given by the PVRC analysis to a constant damping case, the effect of the variable damping itself becomes evident. For this comparison, a constant piping damping of 5% was selected (Case 4). This damping represents the highest value defined by the PVRC method and corresponds to the damping assigned to piping system modes with frequencies less than 10 Hz.

Figures 4-3a, b, and c show the response ratios given by comparing Cases 1 and 4. The data is presented in the same format as shown in the previous section. As before, the PVRC response is the denominator. Table 4.3 summarizes these results. We see there is very little difference in the results given by the two cases; all response ratios are very near one, and coefficients of variation are very small. It appears that, despite the range of damping values afforded by the PVRC proposal and despite the significant



variation in the size and complexity of the piping systems considered here, the impact of this variable damping method in a time history analysis can be adequately approximated by assuming constant 5% damping. This result reinforces the observation that the subject piping systems have similar dynamic characteristics described by dominant modes with frequencies below 10 Hz.

4.4 PVRC TIME HISTORY RESULTS VS. CONSTANT 4% AND 10% DAMPING TIME HISTORY RESPONSE CASE 1 AND CASES 5 AND 6.

To provide a greater basis for piping response comparison, two additional analysis cases were run. One case assumed a constant 4% damping in the time history analysis (Case 5) while the other assumed 10% damping (Case 6). The results of these analyses are illustrated in Figs. 4-4 which show the comparison between Case 1 and Case 5 and Figs. 4-5 which show the comparison between Case 1 and Case 6. Tables 4.4 and 4.5 summarize the results.

4.5 CONSTANT DAMPING VALUE RESPONSE COMPARISONS

The primary thrust of this report is to quantify the effect of the PVRC variable damping method on piping response. To that end, the comparisons of the previous sections were made. For the sake of completeness this section provides comparisons between selected constant damping analyses. The comparisons are made in the same format as shown previously. Figure 4-6 shows response comparisons for the AFW model - 1% vs. 5% damping, 2% vs. 5% damping, and 1% vs. 2% damping. Figure 4-7 gives the same comparison for the RHR model. Figure 4-8 illustrates the RCL response - 2% vs. 5% damping, 3% vs. 5% damping, and 2% vs. 3% damping. The data are summarized in Table 4.6.

Table 4.1

RATIO OF INERTIAL RESPONSE - CONSTANT 1% AND 2%
DAMPING (CASE 2) VS. PVRC DAMPING (CASE 1)

<u>FW - 1% Damping</u>	<u>Number Components</u>	<u>Mean Ratio</u>	<u>COV</u>
Accelerations	50	1.84	0.08
Displacements	63	1.55	0.09
Piping Moments	23	1.62	0.04
Support Forces	28	1.51	0.09
<u>HR - 1% Damping</u>			
Accelerations	28	1.90	0.09
Displacements	51	1.67	0.14
Piping Moments	22	1.69	0.11
Support Forces	15	1.59	0.16
<u>CL - 2% Damping</u>			
Accelerations	51	1.42	0.09
Piping Moments	118	1.39	0.09
Support Forces	94	1.26	0.11

Table 4.2

RATIO OF INERTIAL RESPONSE - CONSTANT 2% AND 3%
DAMPING (CASE 3) VS. PVRC DAMPING (CASE 1)

<u>AFW - 2% Damping</u>	<u>Number of Components</u>	<u>Mean Ratio</u>	<u>COV</u>
Accelerations	50	1.40	0.06
Displacements	63	1.28	0.07
Piping Moments	23	1.32	0.03
Support Forces	28	1.25	0.06
<u>RHR - 2% Damping</u>			
Accelerations	28	1.44	0.08
Displacements	51	1.34	0.09
Piping Moments	22	1.34	0.08
Support Forces	15	1.29	0.11
<u>RCL - 3% Damping</u>			
Accelerations	51	1.18	0.07
Piping Moments	118	1.19	0.05
Support Forces	94	1.17	0.07

Table 4.3

RATIO OF INERTIAL RESPONSES - CONSTANT 5%
DAMPING (CASE 4) VS. PVRC DAMPING (CASE 1)

<u>AFW</u>	<u>Number of Components</u>	<u>Mean Ratio</u>	<u>COV</u>
Accelerations	50	0.96	0.05
Displacements	63	0.98	0.02
Piping Moments	23	0.99	0.01
Support Forces	28	0.97	0.02
 <u>RHR</u>			
Accelerations	28	0.96	0.04
Displacements	51	0.98	0.02
Piping Moments	22	0.97	0.02
Support Forces	15	0.98	0.02
 <u>RCL</u>			
Accelerations	51	0.93	0.08
Piping Moments	118	0.98	0.02
Support Forces	94	0.98	0.02

Table 4.4

RATIO OF INERTIAL RESPONSES - CONSTANT 4%
DAMPING (CASE 5) VS. PVRC DAMPING (CASE 1)

<u>AFW</u>	<u>Number of Components</u>	<u>Mean Ratio</u>	<u>COV</u>
Accelerations	50	1.05	0.05
Displacements	63	1.05	0.02
Piping Moments	23	1.07	0.01
Support Forces	28	1.04	0.02
<u>RHR</u>			
Accelerations	28	1.06	0.05
Displacements	51	1.06	0.03
Piping Moments	22	1.06	0.02
Support Forces	15	1.05	0.03
<u>RCL</u>			
Accelerations	51	1.03	0.07
Piping Moments	118	1.04	0.04
Support Forces	94	1.07	0.03

Table 4.5

RATIO OF INERTIAL RESPONSES - CONSTANT 10%
DAMPING (CASE 6) VS. PVRC DAMPING (CASE 1)

<u>AEW</u>	<u>Number of Components</u>	<u>Mean Ratio</u>	<u>COV</u>
Accelerations	50	0.70	0.07
Displacements	63	0.83	0.06
Piping Moments	23	0.81	0.04
Support Forces	28	0.84	0.06
<u>RHR</u>			
Accelerations	28	0.69	0.04
Displacements	51	0.80	0.08
Piping Moments	22	0.80	0.07
Support Forces	15	0.82	0.08
<u>RCL</u>			
Accelerations	51	0.70	0.12
Piping Moments	118	0.84	0.08
Support Forces	94	0.78	0.08

	<u>1% vs. 5%</u>		<u>2% vs. 5%</u>		<u>1% vs. 2%</u>	
	<u>Mean</u>	<u>COV</u>	<u>Mean</u>	<u>COV</u>	<u>Mean</u>	<u>COV</u>
<u>AFW</u>						
Accelerations	1.94	0.10	1.47	0.07	1.31	0.04
Displacements	1.58	0.09	1.30	0.06	1.21	0.03
Piping Moment	1.64	0.04	1.34	0.03	1.23	0.02
Support Forces	1.55	0.09	1.29	0.06	1.20	0.03
<u>RHR</u>						
Accelerations	1.98	0.09	1.50	0.07	1.32	0.03
Displacements	1.71	0.13	1.37	0.09	1.25	0.06
Piping Moments	1.74	0.11	1.38	0.07	1.26	0.05
Support Forces	1.62	0.15	1.32	0.10	1.22	0.07
	<u>2% vs. 5%</u>		<u>3% vs. 5%</u>		<u>2% vs. 3%</u>	
	<u>Mean</u>	<u>COV</u>	<u>Mean</u>	<u>COV</u>	<u>Mean</u>	<u>COV</u>
<u>RCL</u>						
Accelerations	1.53	0.11	1.26	0.06	1.21	0.05
Piping Moments	1.42	0.09	1.21	0.05	1.17	0.04
Support Forces	1.28	0.11	1.14	0.06	1.12	0.05

1% DAMPING TIME HISTORY
 PVRC TIME HISTORY

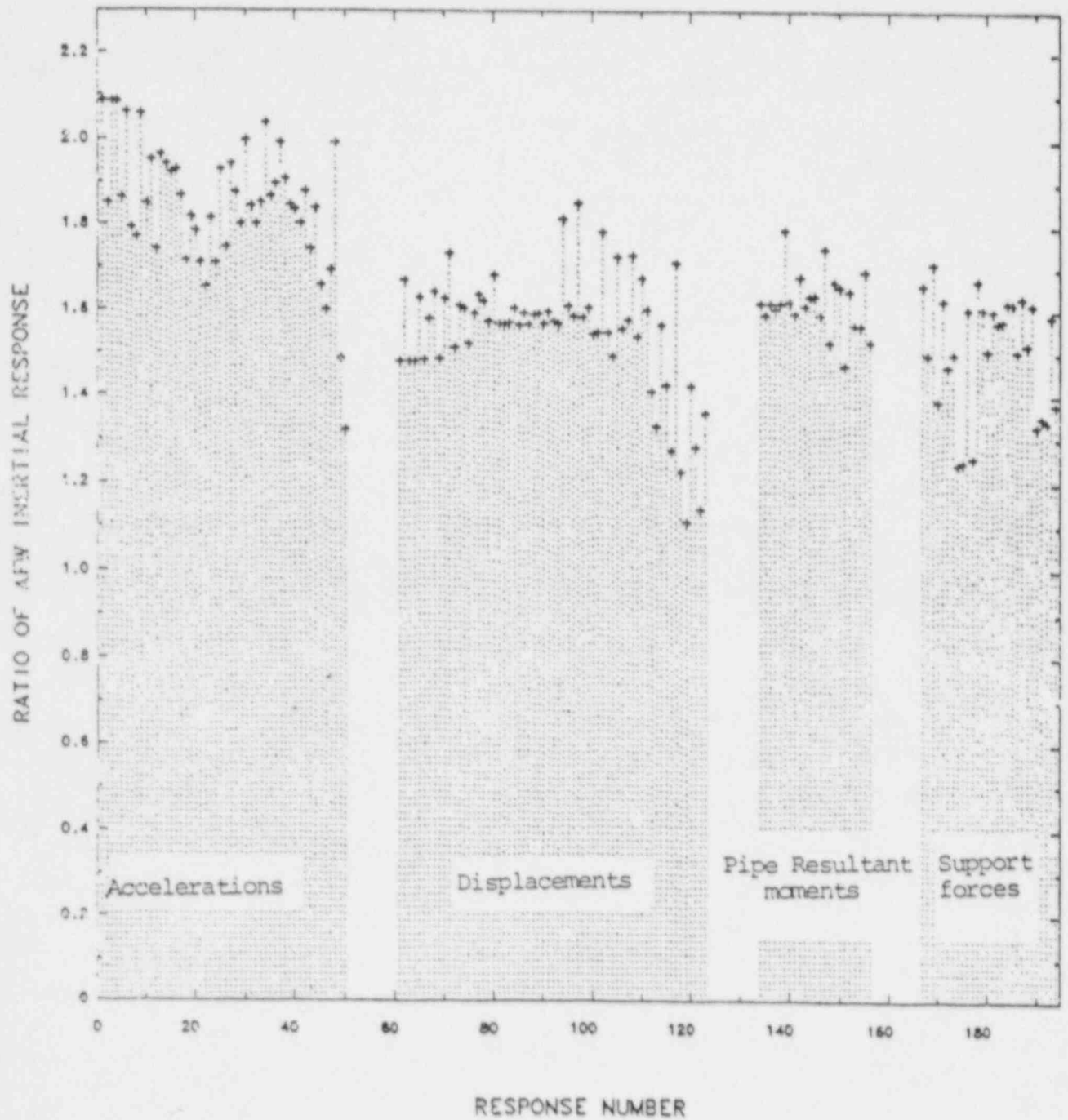


Fig. 4.1a Ratios of AFW Responses Given by 1% Constant Damping Time History Analysis (Case 2) to the PVRC Time History Analysis (Case 1)



1% DAMPING TIME HISTORY
 PVRC TIME HISTORY

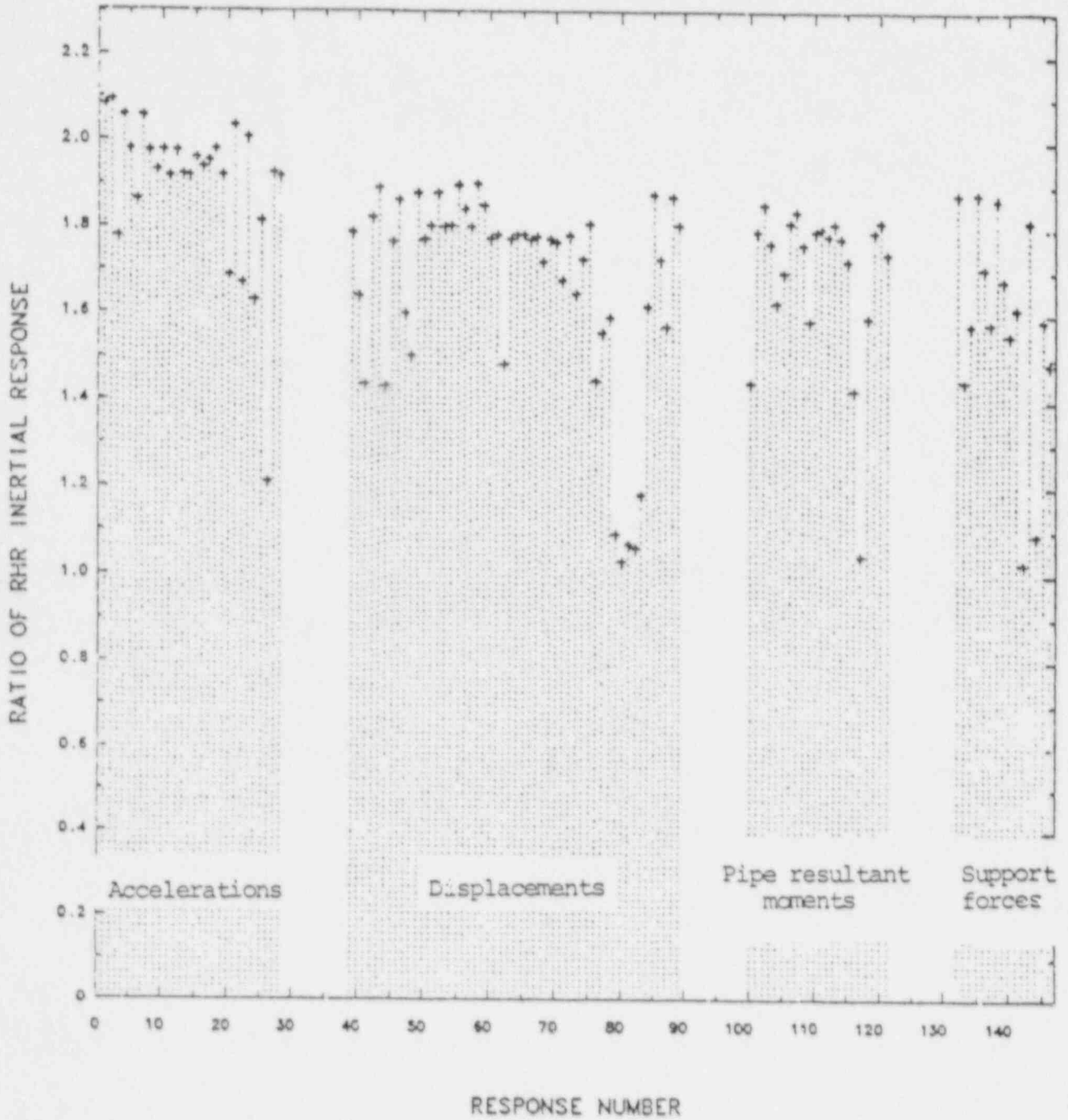


Fig. 4.1b Ratios of RHR Responses Given by 1% Constant Damping Time History Analysis (Case 2) to the PVRC Time History Analysis (Case 1)

2% DAMPING TIME HISTORY VS.
PVRC TIME HISTORY

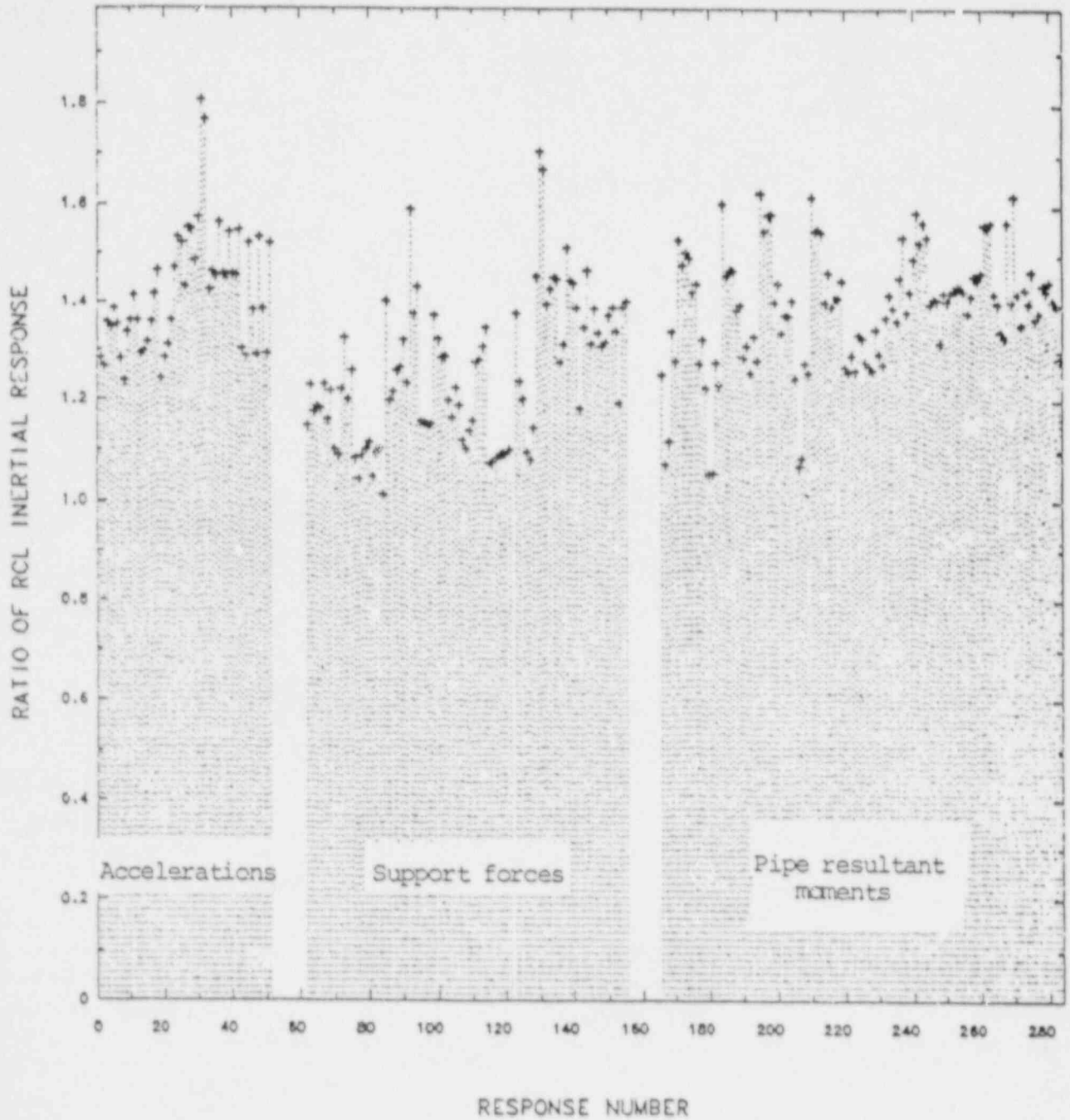


Fig. 4.1c Ratios of RCL Responses Given by 2% Constant Damping Time History Analysis (Case 2) to the PVRC Time History Analysis (Case 1)

2% DAMPING TIME HISTORY VS.
PVRC TIME HISTORY

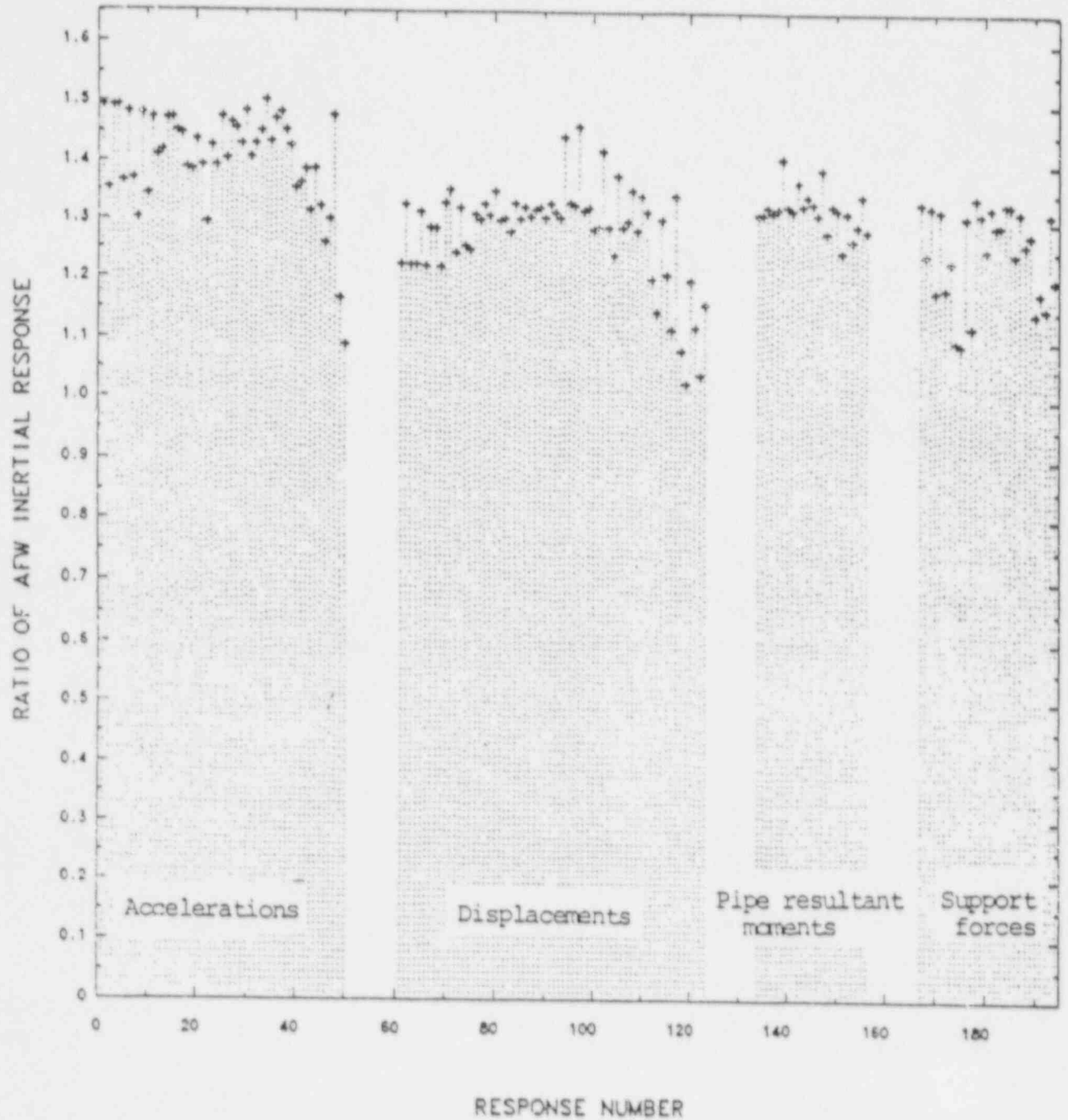


Fig. 4.2a Ratios of AFW Response Given by 2% Constant Damping Time History Analysis (Case 3) to the PVRC Time History Analysis (Case 1)



2% DAMPING TIME HISTORY VS.
PVRC TIME HISTORY

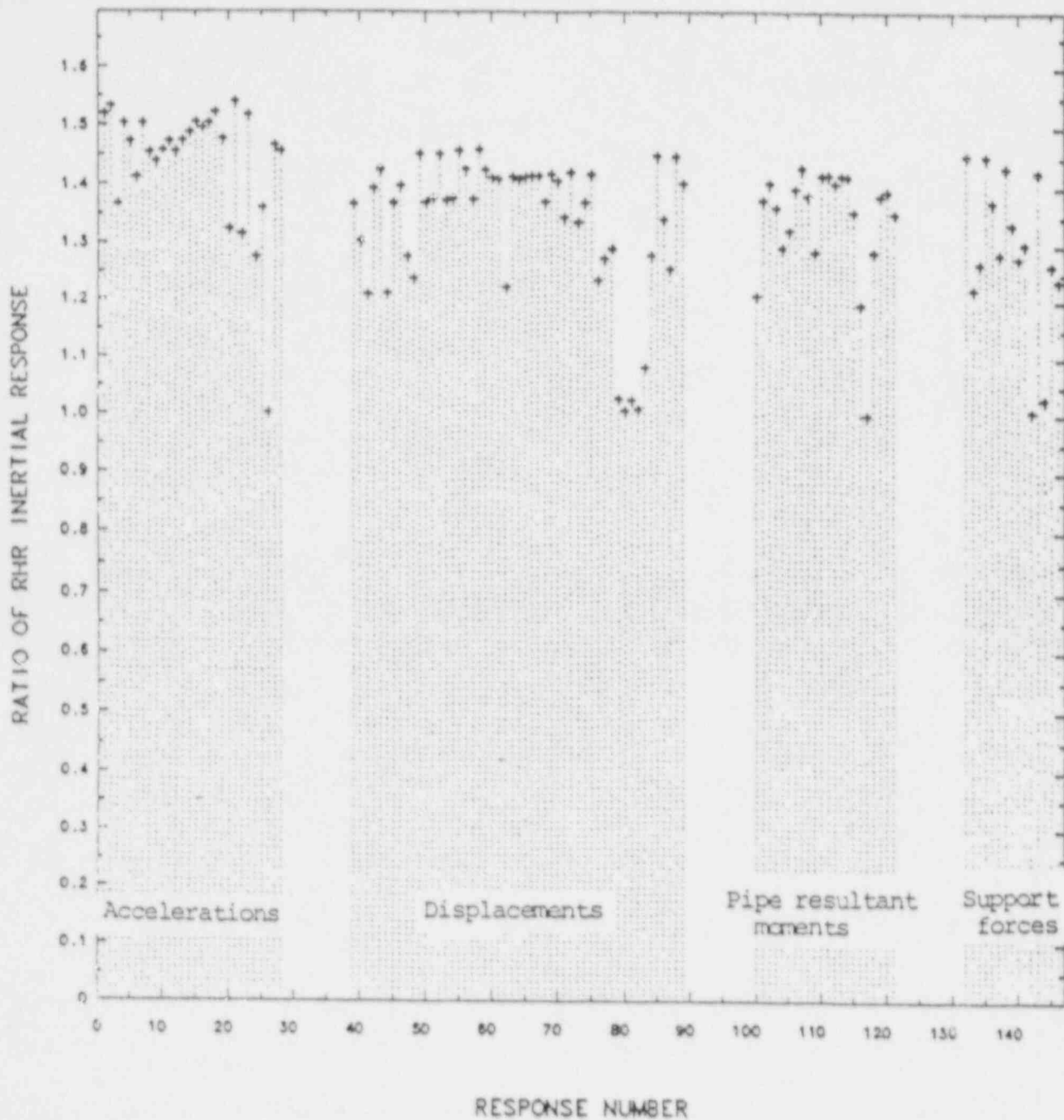


Fig. 4.2b Ratios of RHR Response Given by 2% Constant Damping Time History Analysis (Case 3) to the PVRC Time History Analysis (Case 1)

3% DAMPING TIME HISTORY VS.
PVRC TIME HISTORY

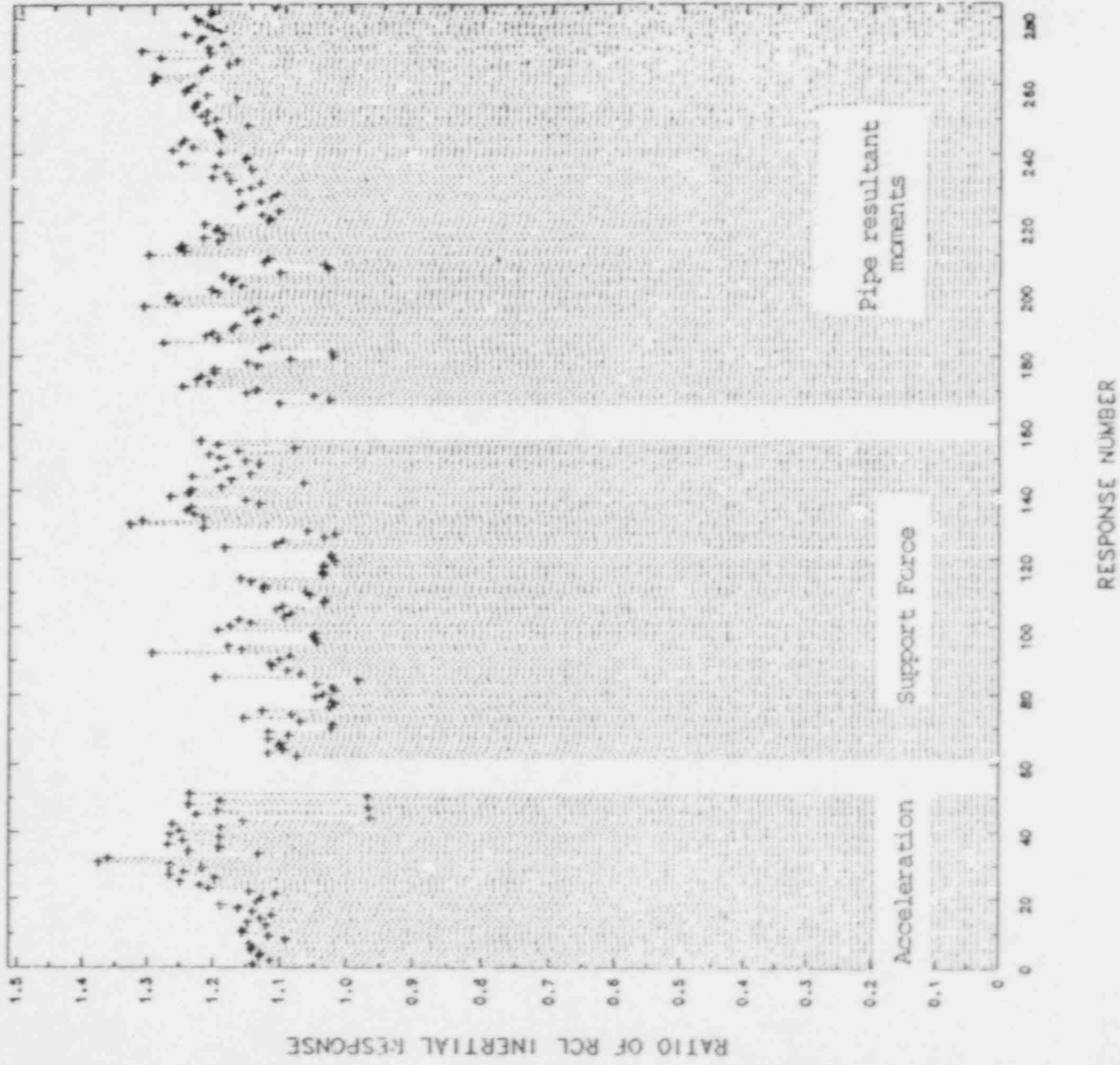


Fig. 4.2c Ratios of RCL Response Given by 3% Constant Damping Time History Analysis (Case 3) to the PVRC Time History Analysis (Case 1)

5% DAMPING TIME HISTORY
 PVRC TIME HISTORY

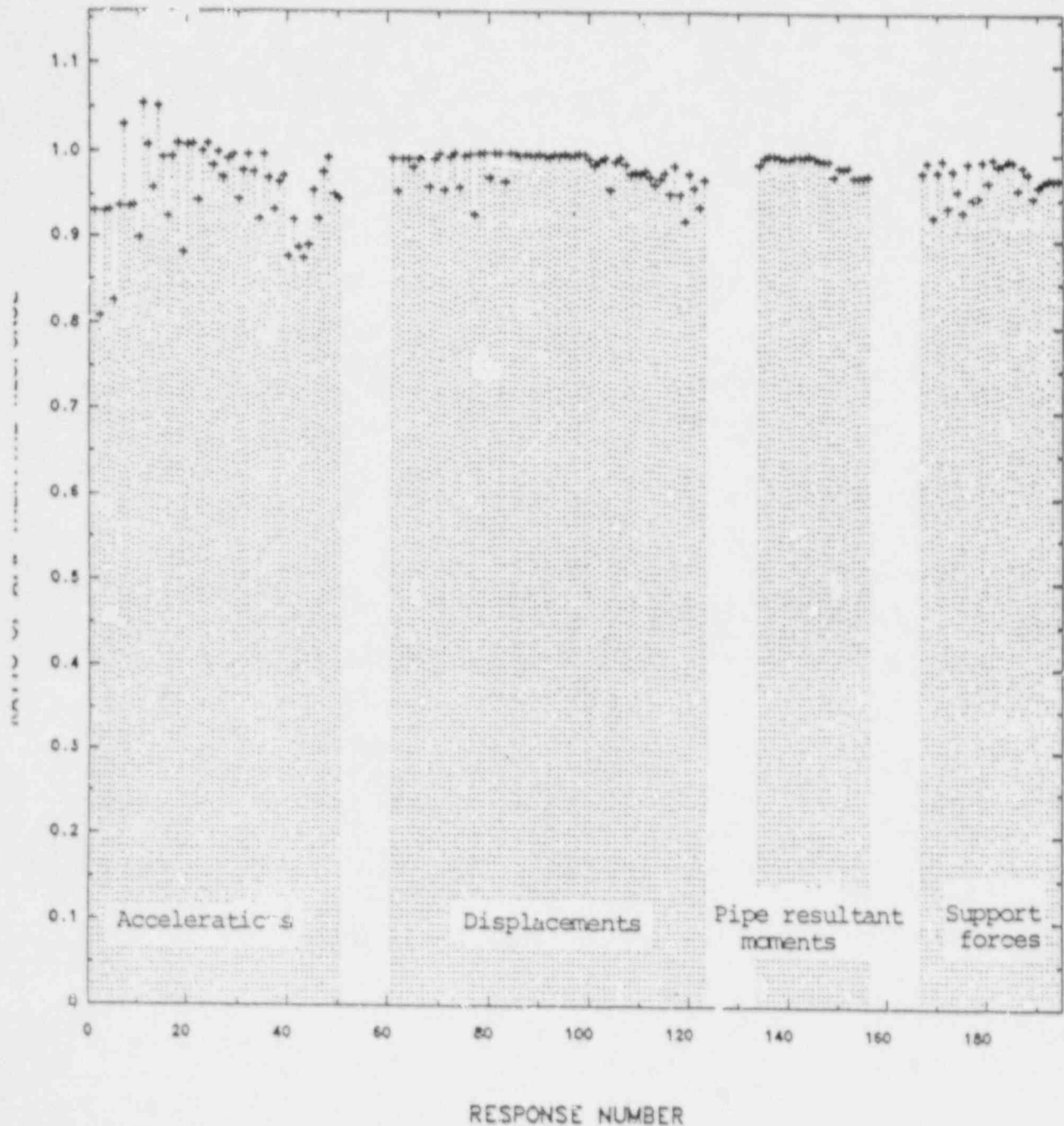


Fig. 4.3 Ratios of the Responses Given by the Constant 5% Damping Time History Analysis (Case 4) to the PVRC Time History Analysis (Case 1)
 a) AFW System.

10/27/68

5% DAMPING TIME HISTORY
 PYRC TIME HISTORY

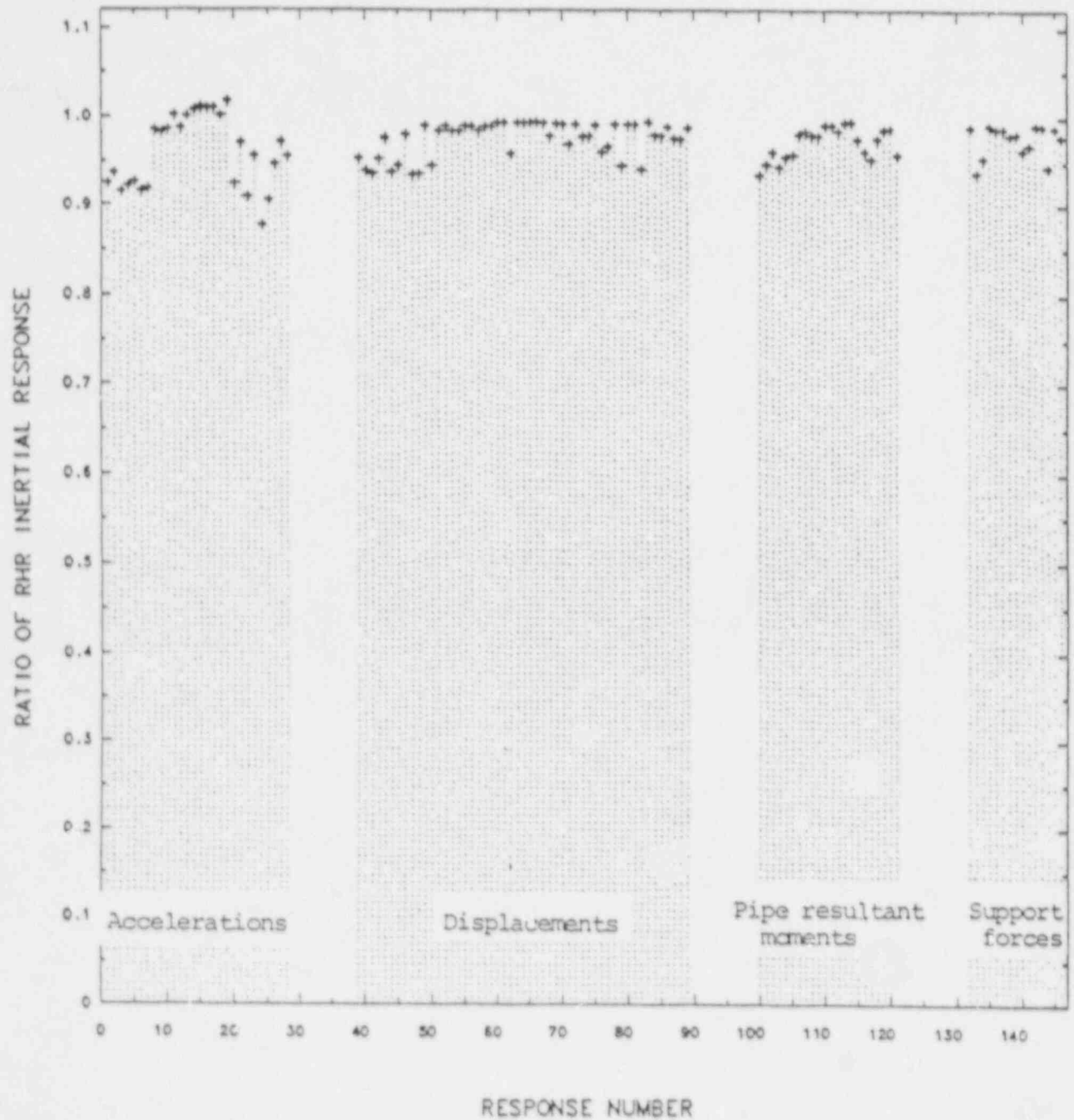


Fig. 4.3 Ratios of the Responses Given by the Constant 5% Damping Time History Analysis (Case 4) to the PYRC Time History Analysis (Case 1)
 b) RHR System.

5% DAMPING TIME HISTORY
 PVRC TIME HISTORY

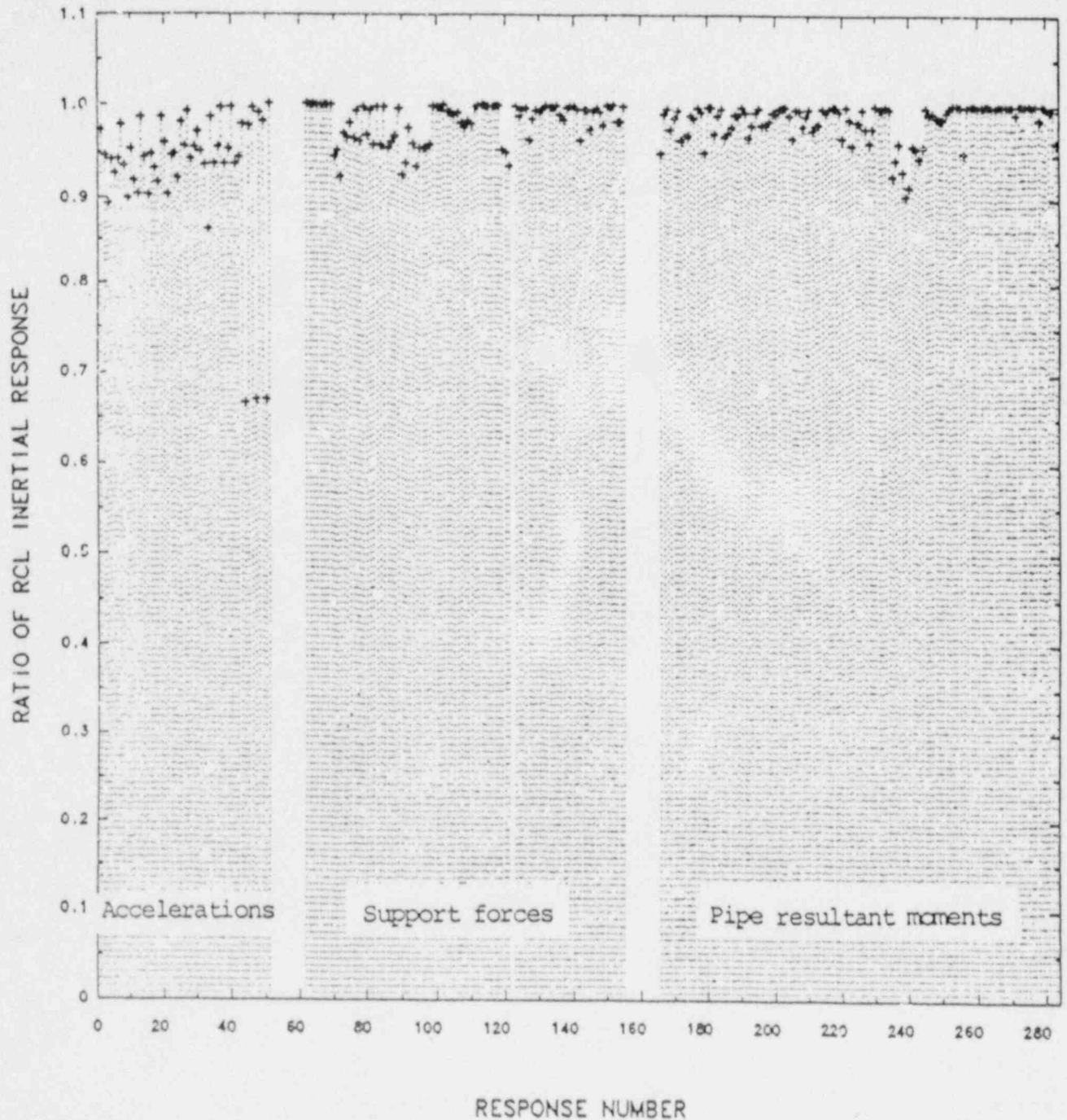


Fig. 4.3 Ratios of the Responses Given by the Constant 5% Damping Time History Analysis (Case 4) to the PVRC Time History Analysis (Case 1)
 c) RCL System.



4% DAMPING TIME HISTORY
PVRC TIME HISTORY

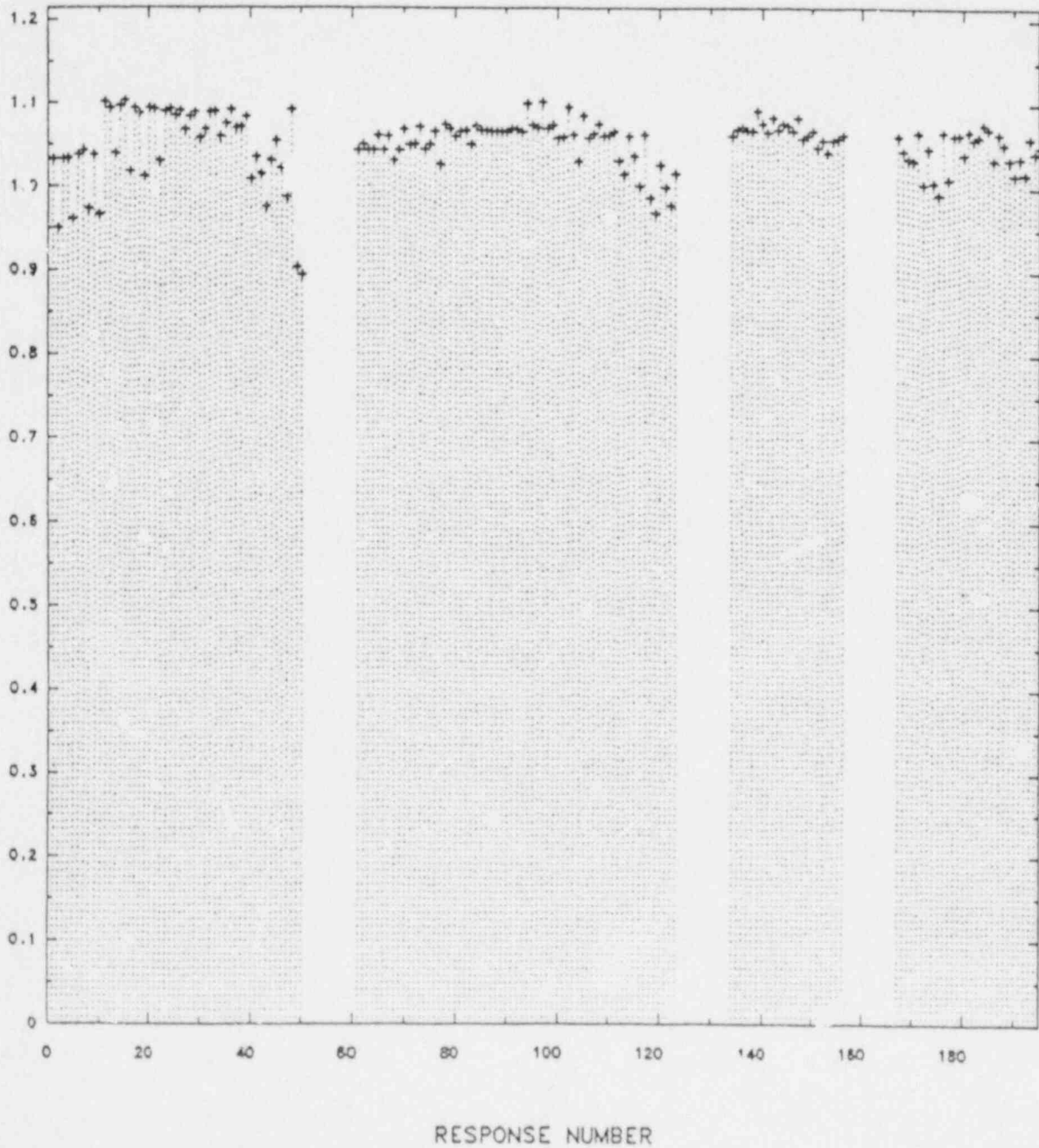


Fig. 4.4a: Ratios of AFW Responses Given by 4% Constant Damping Time History Analysis (Case 5) to the PVRC Time History Analysis (Case 1)

4% DAMPING TIME HISTORY
PVRC TIME HISTORY

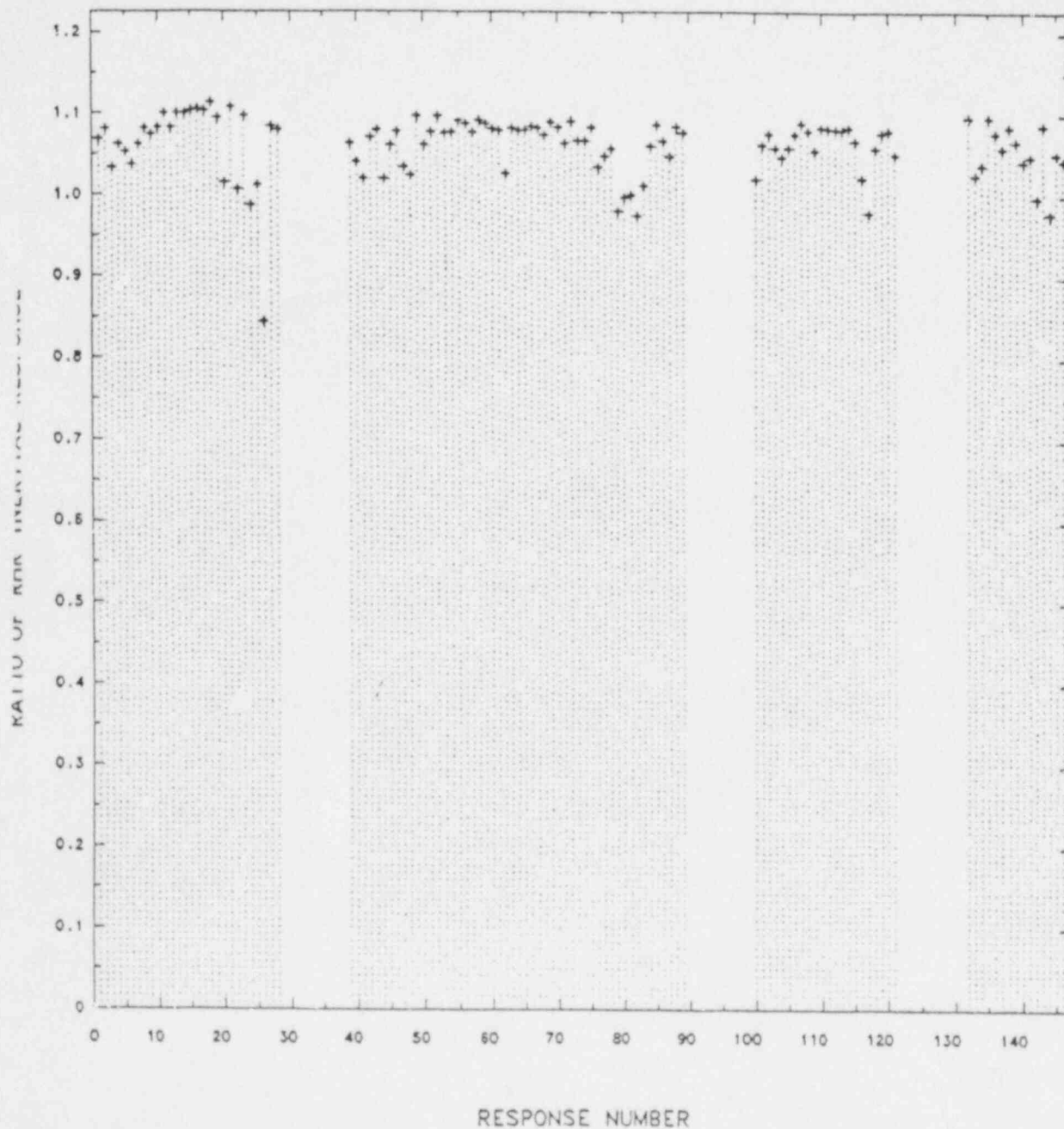


Fig. 4.4b: Ratios of RHR Responses Given by 4% Constant Damping Time History Analysis (Case 5) to the PVRC Time History Analysis (Case 1).

4% DAMPING TIME HISTORY
PVRC TIME HISTORY

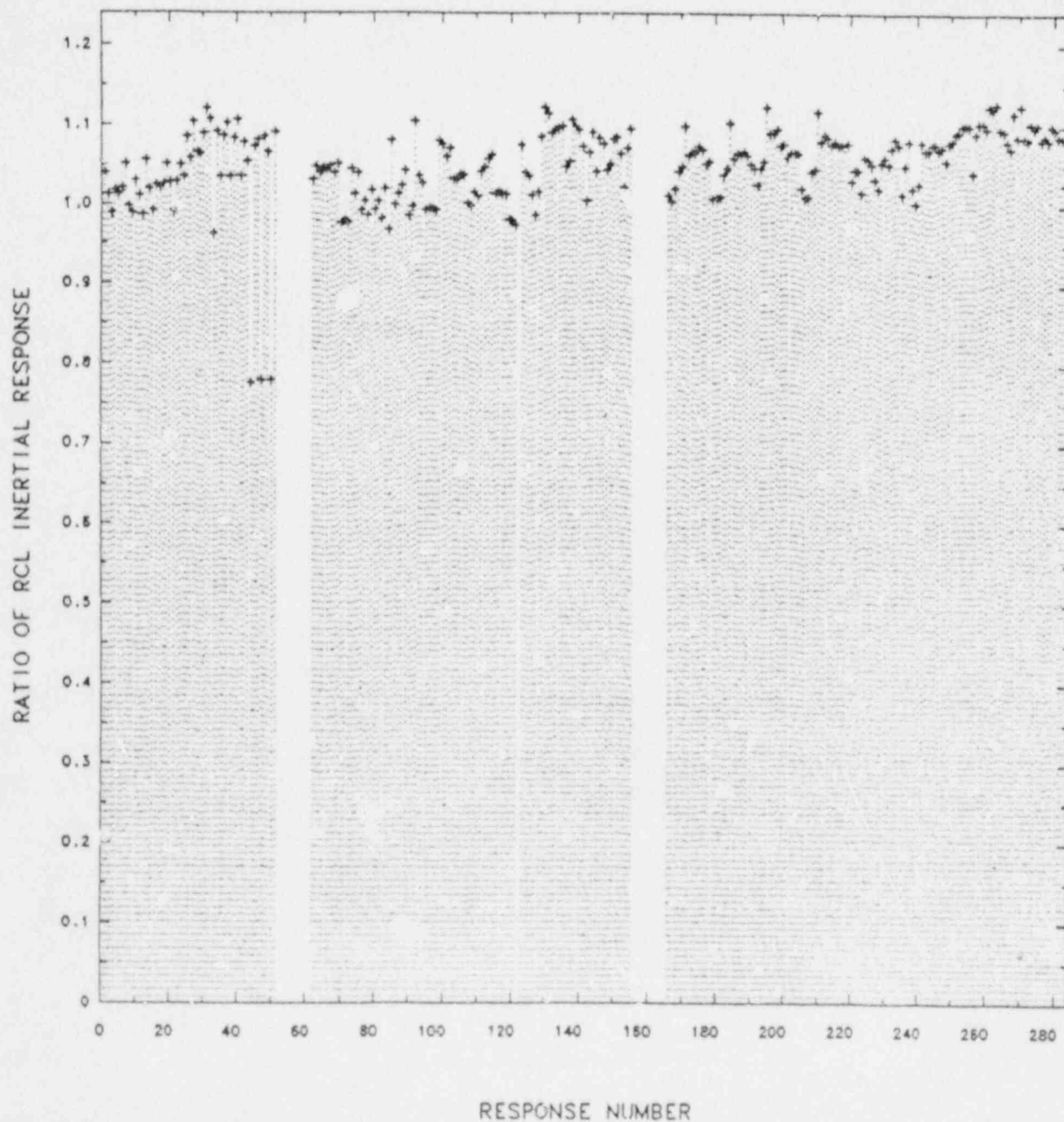


Fig. 4.4c: Ratios of RCL Responses Given by 4% Constant Damping Time History Analysis (Case 5) to the PVRC Time History Analysis (Case 1).

10% DAMPING TIME HISTORY
PVRC TIME HISTORY

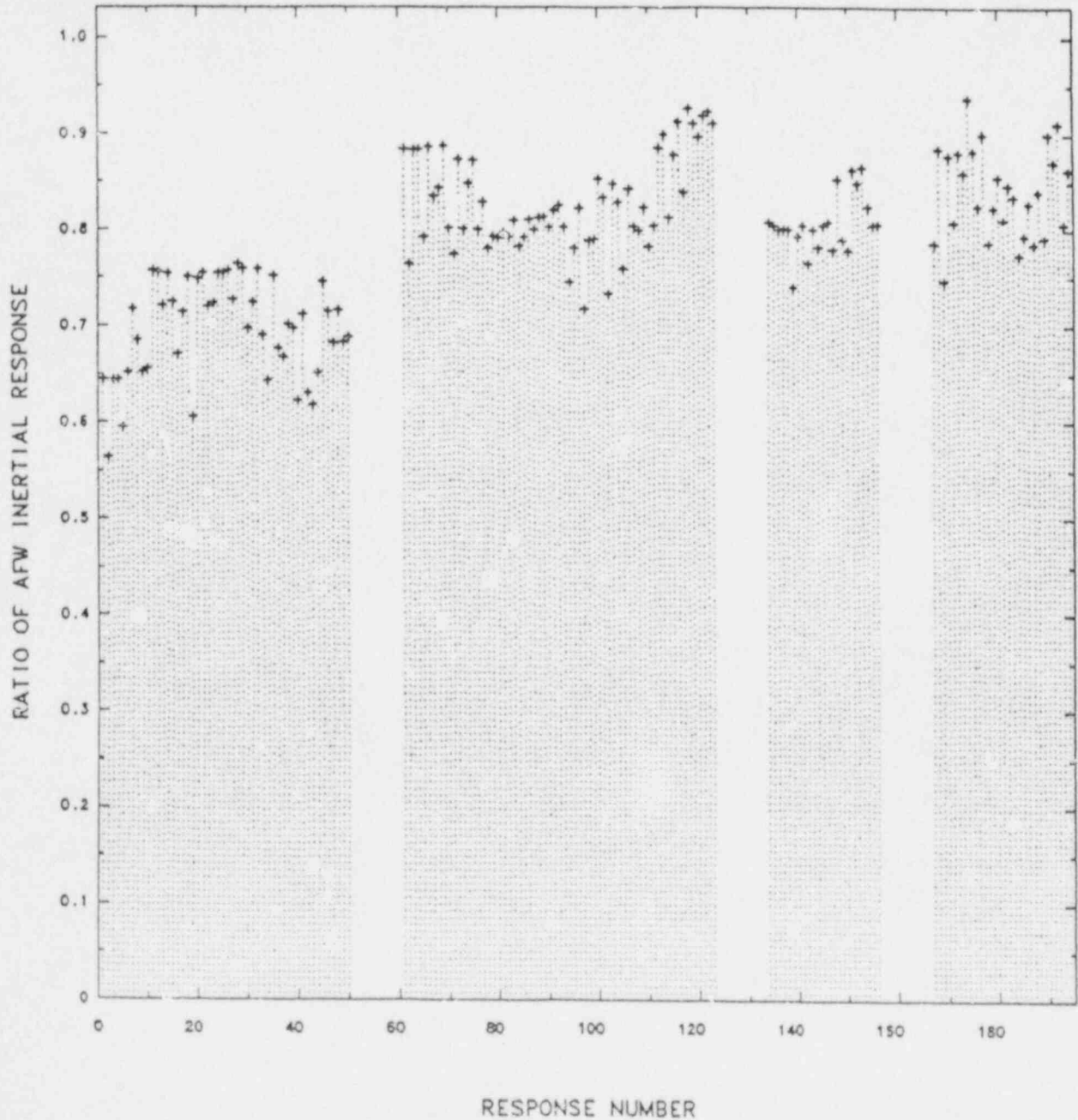


Fig. 4.5a: Ratios of AFW Responses Given by 10% Constant Damping Time History Analysis (Case 6) to the PVRC Time History Analysis (Case 1).

10% DAMPING TIME HISTORY
PVRC TIME HISTORY

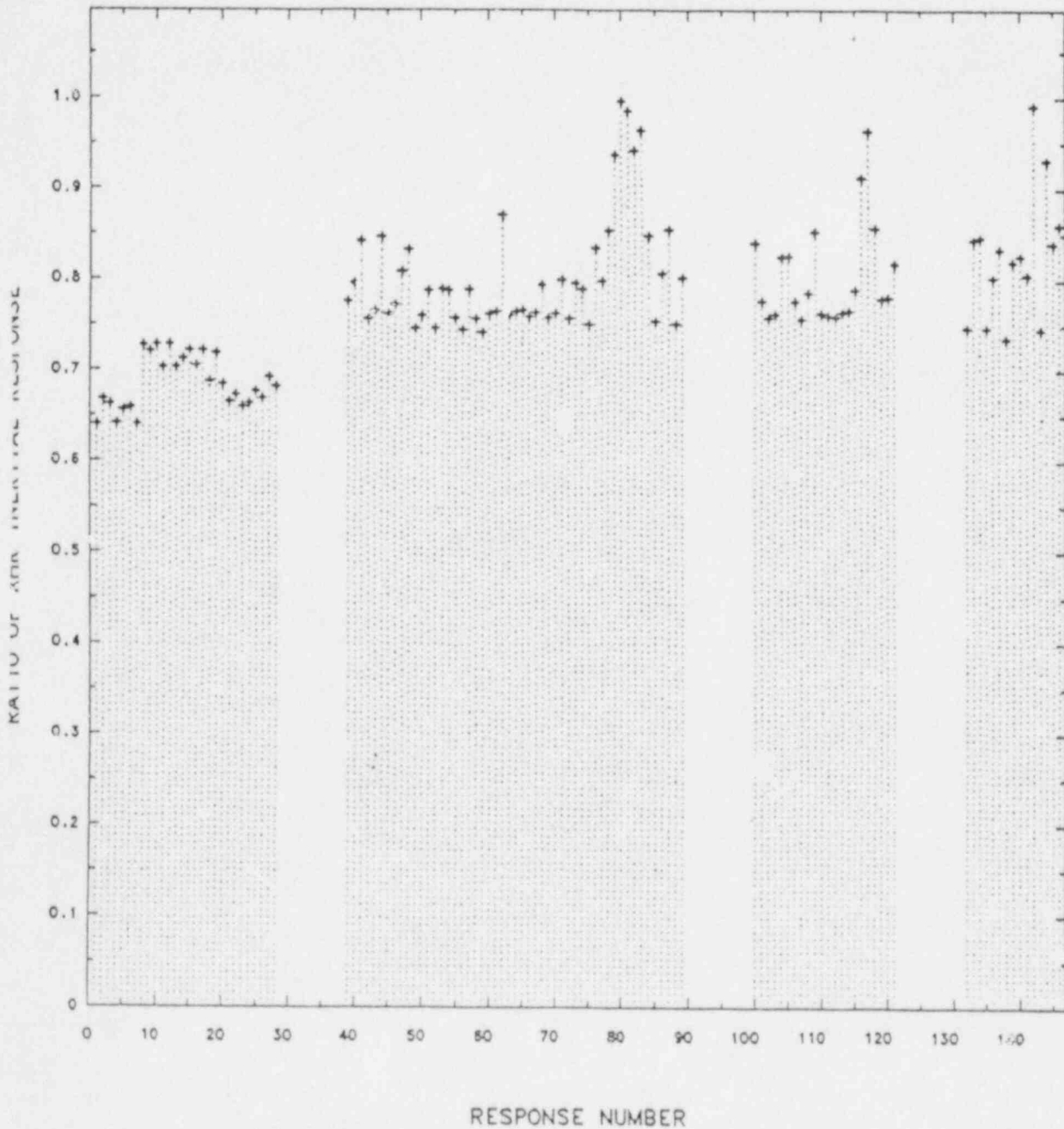


Fig. 4.5b: Ratios of RHR Responses Given by 10% Constant Damping Time History Analysis (Case 6) to the PVRC Time History Analysis (Case 1).



10% DAMPING TIME HISTORY
PVRC TIME HISTORY

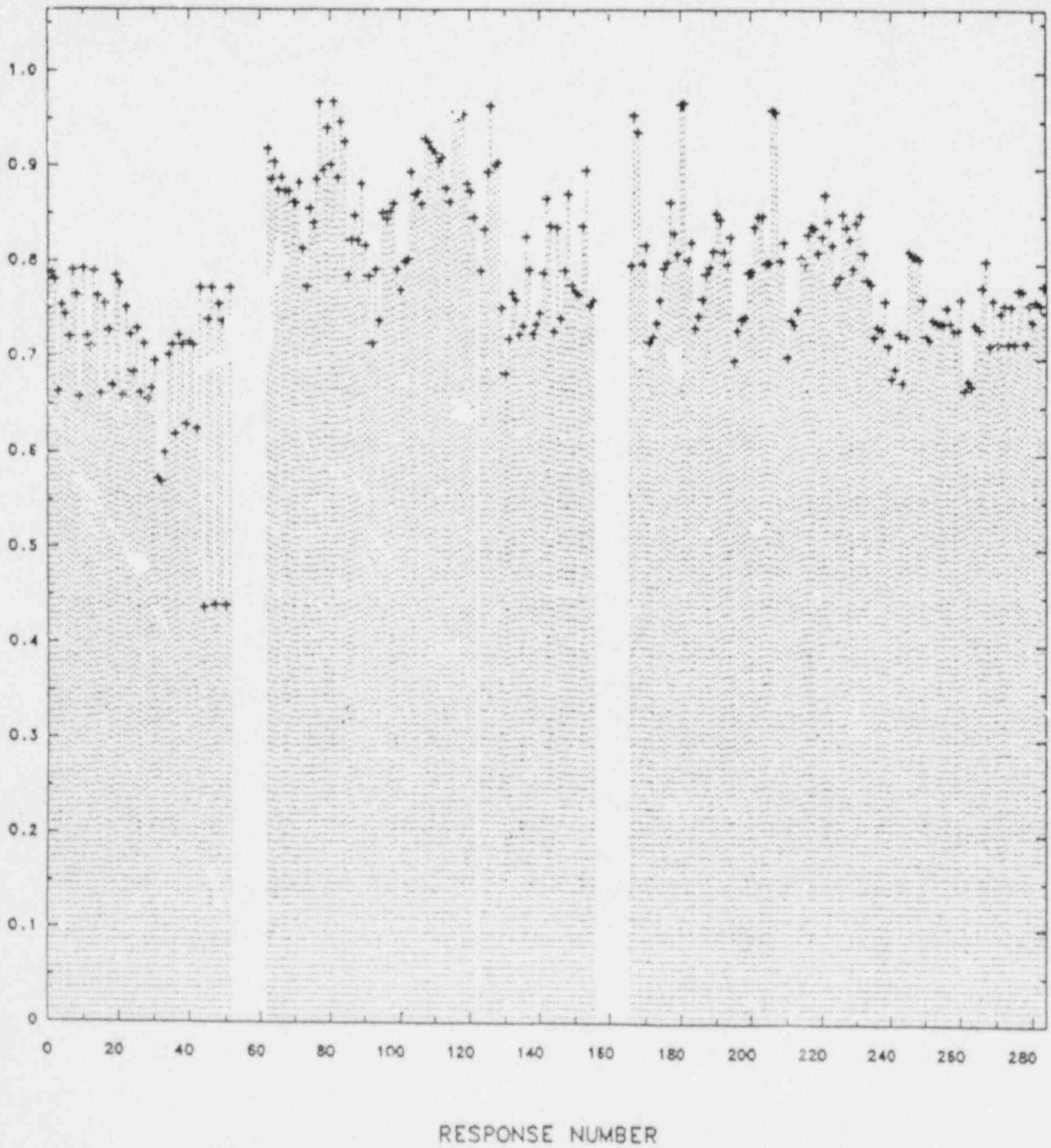


Fig. 4.5c: Ratios of RCL Responses Given by 10% Constant Damping Time History Analysis (Case 6) to the PVRC Time History Analysis (Case 1)

1% DAMPING TIME HISTORY VS.
5% DAMPING TIME HISTORY

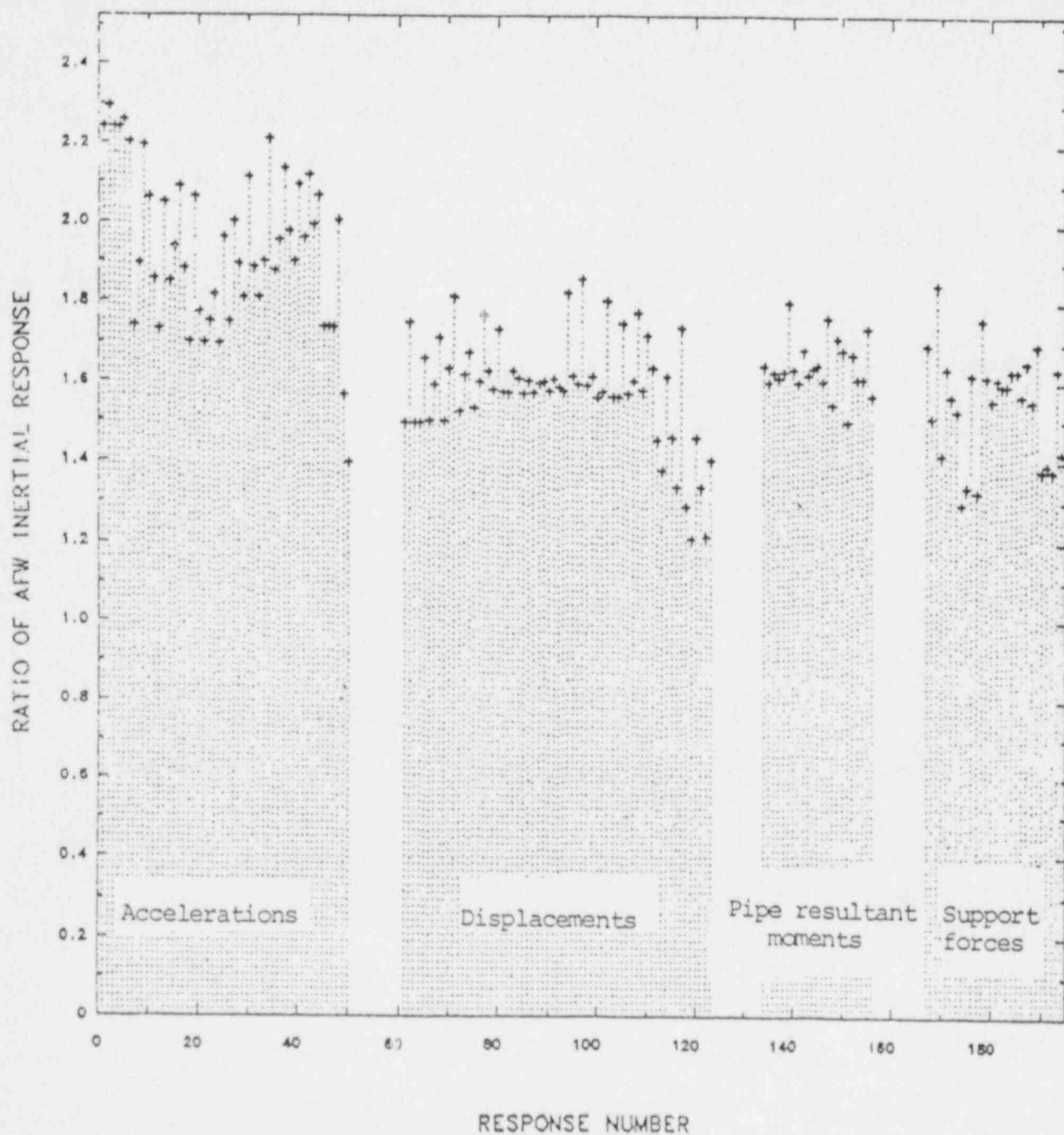
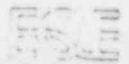


Fig. 4.6: AFW Response Ratios a) Case 2 (1%) vs. Case 4 (5%)



2% DAMPING TIME HISTORY VS.
5% DAMPING TIME HISTORY

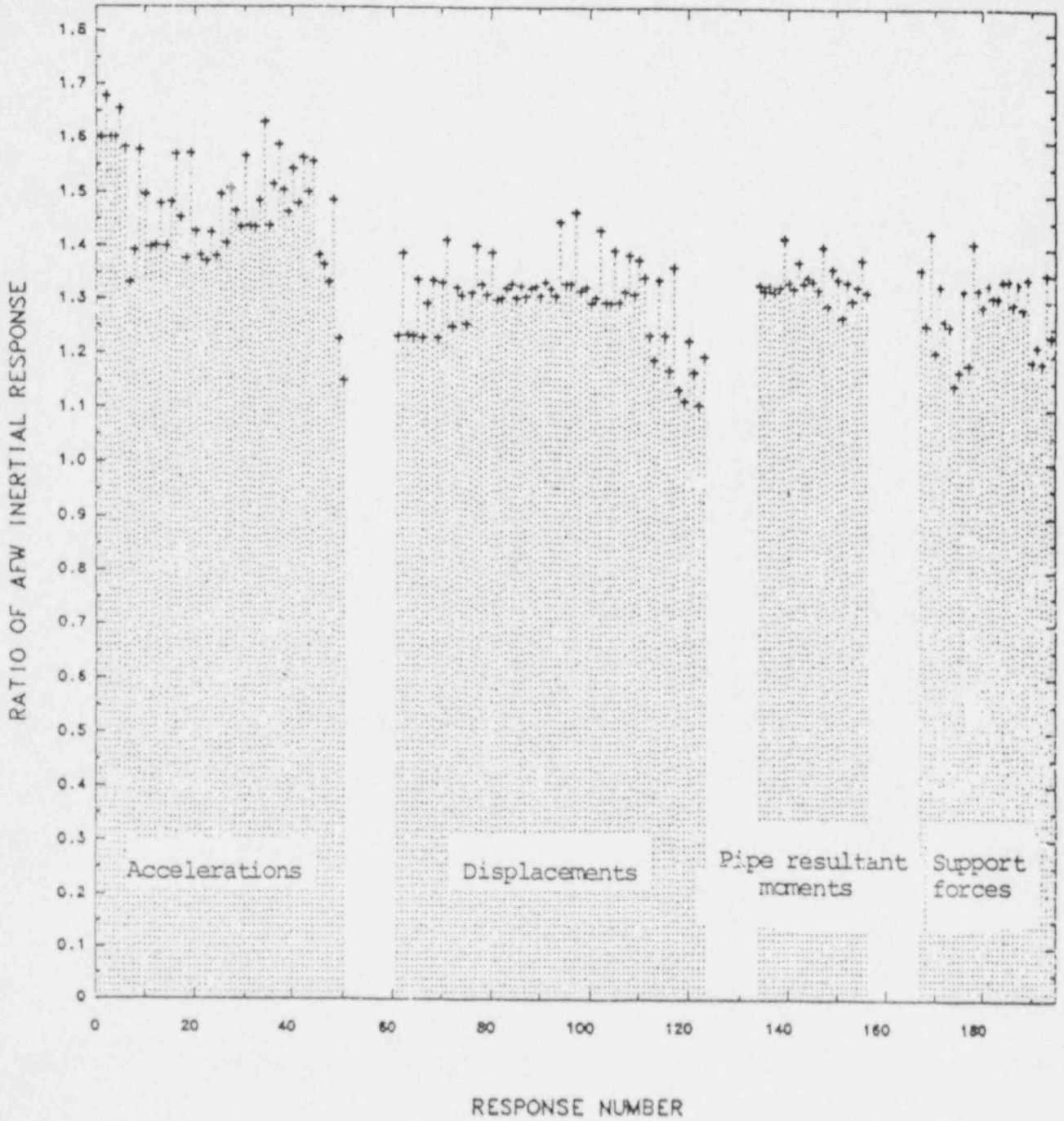


Fig. 4.6: AFW Response Ratios b) Case 3 (2%) vs. Case 4 (5%)



1% DAMPING TIME HISTORY VS.
2% DAMPING TIME HISTORY

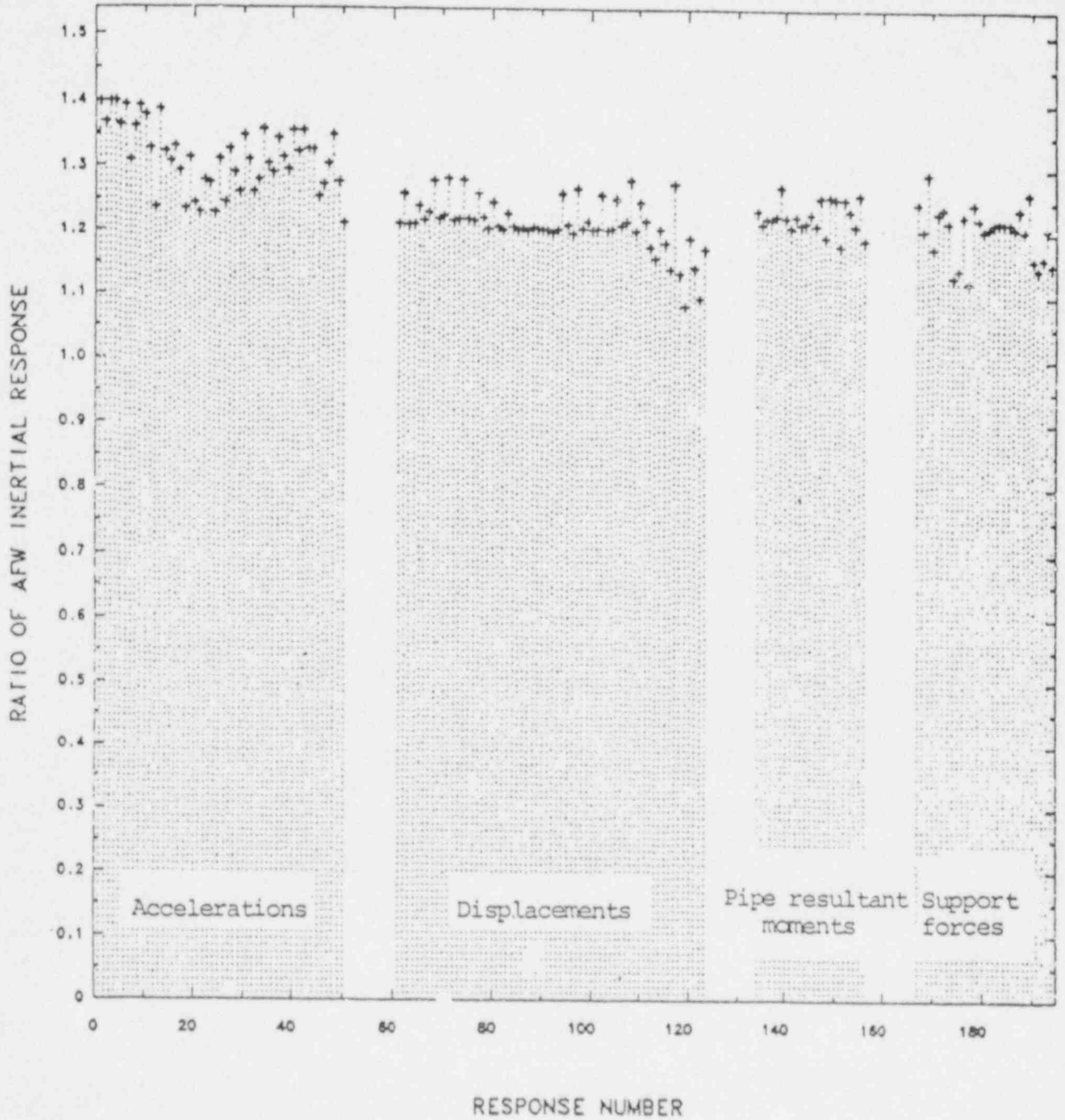


Fig. 4.6: AFW Response Ratios c) Case 2 (1%) vs. Case 3 (2%)

1% DAMPING TIME HISTORY VS.
5% DAMPING TIME HISTORY

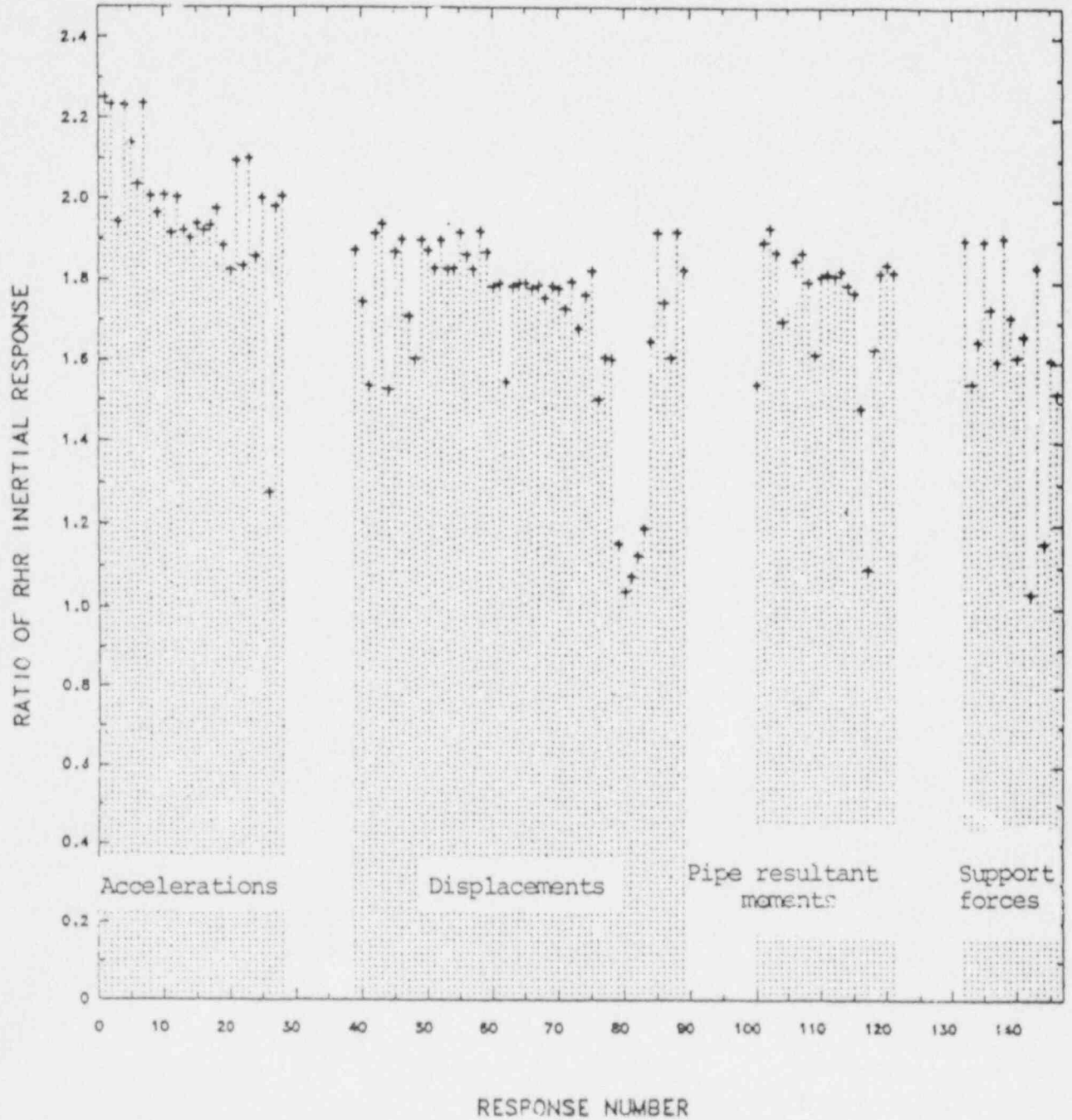


Fig. 4.7: RHR Response Ratios a) Case 2 (1%) vs. Case 4 (5%)

2% DAMPING TIME HISTORY VS.
5% DAMPING TIME HISTORY

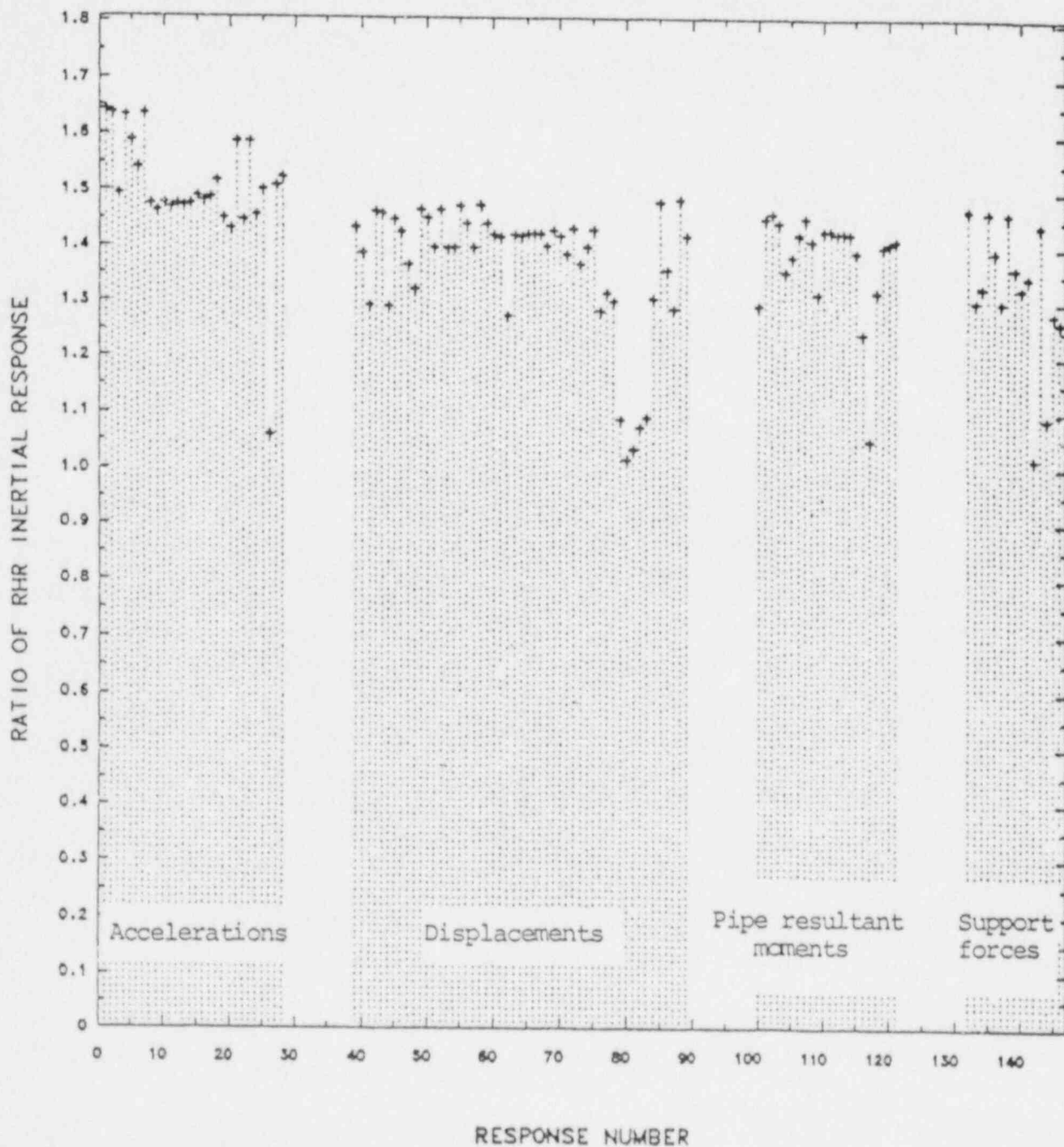


Fig. 4.7: RHR Response Ratios b) Case 3 (2%) vs. Case 4 (5%)

1% DAMPING TIME HISTORY VS.
2% DAMPING TIME HISTORY

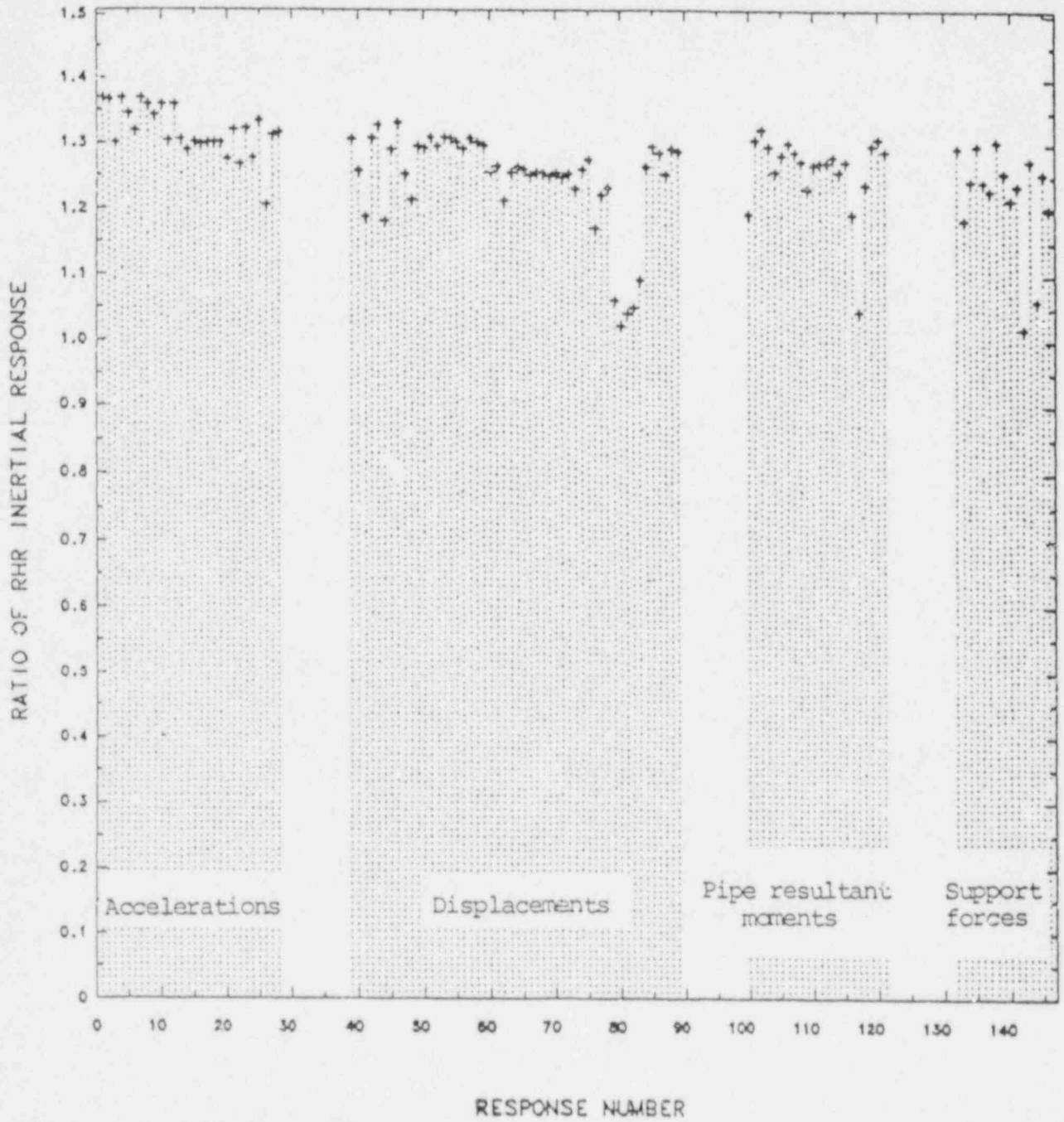


Fig. 4.7: RHR Response Ratios c) Case 2 (1%) vs. Case 3 (2%)

2% DAMPING TIME HISTORY VS.
3% DAMPING TIME HISTORY

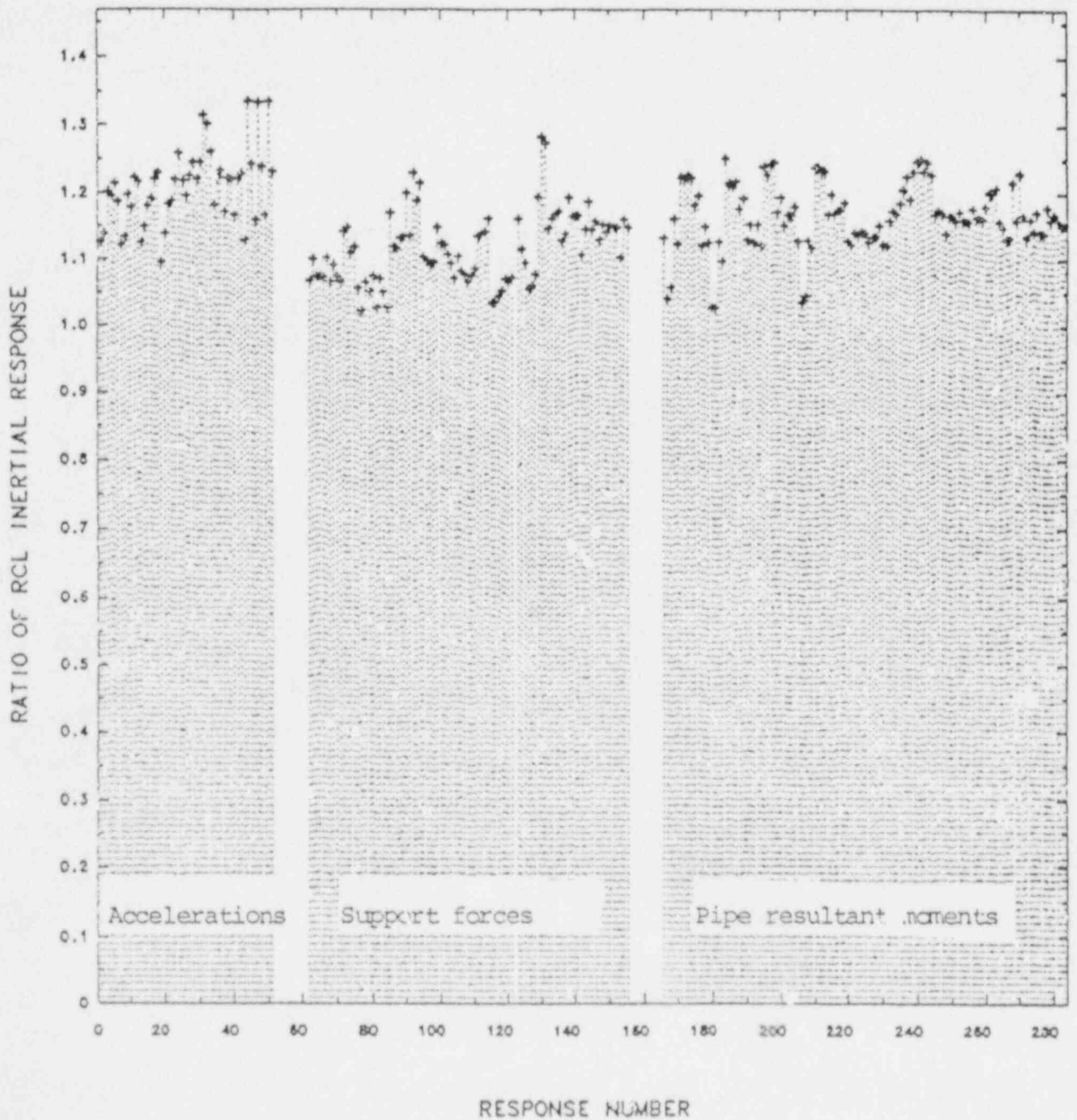


Fig. 4.8: RCL Response Ratios c) Case 2 (2%) vs. Case 3 (3%)

3% DAMPING TIME HISTORY VS.
5% DAMPING TIME HISTORY

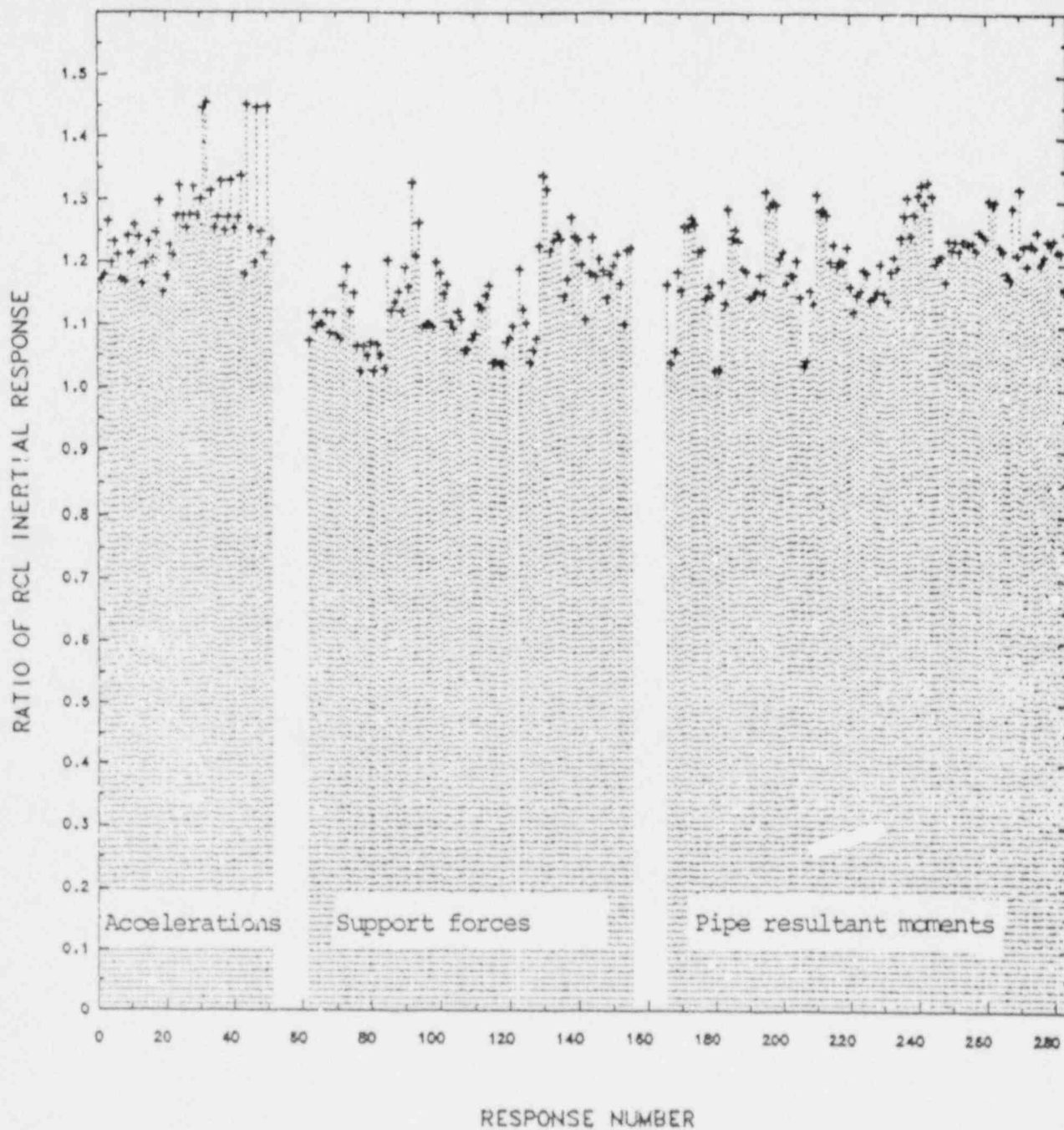


Fig. 4.8 RCL Response Ratios b) Case 3 (3%) vs. Case 4 (5%)

2% DAMPING TIME HISTORY VS.
5% DAMPING TIME HISTORY

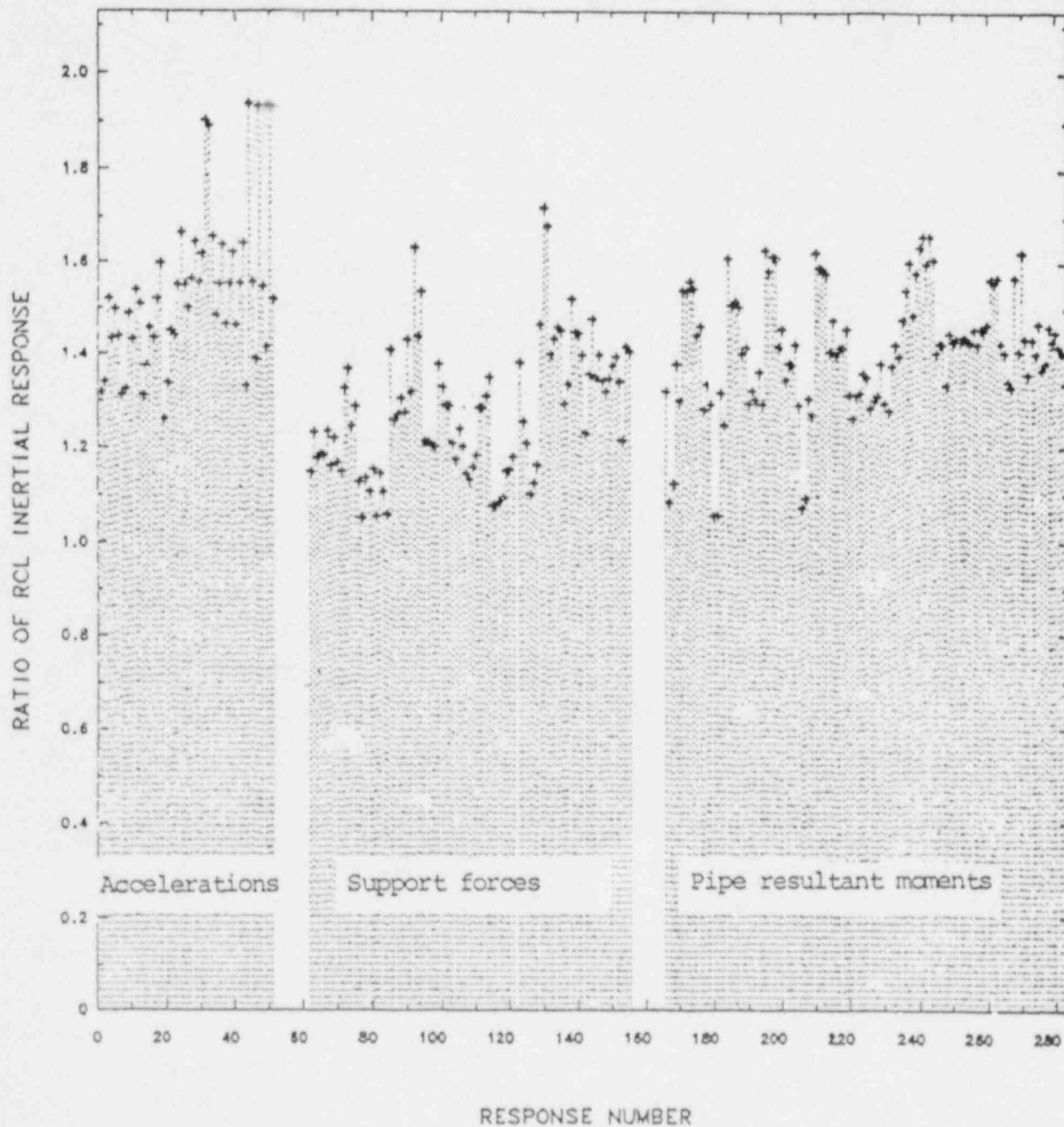


Fig. 4.8 RCL Response Ratios a) Case 2 (2%) vs. Case 4 (5%)

5.0 CONCLUSIONS

Recognizing that considerable margin exists in piping system response calculated by current, acceptable seismic design analysis procedures and attempting to reduce this margin, the Pressure Vessel Research Committee has proposed changes in the treatment of piping system damping. Their recommendation calls for damping defined as a function of system frequency and specifies damping values that are, in general, greater than those currently given in RG 1.61.

In this study we investigated the effect on piping response of the PVRC variable damping proposal as implemented in a multi-support time history analysis method. We found that the PVRC damping proposal has a rather uniform impact on piping response, that is, when results from the variable damping analyses and constant damping analyses are compared, the ratios of these responses do not significantly vary among the three piping systems considered here. Nor do the response ratios vary with the response quantity - nodal displacements and accelerations or element forces and moments. As would be expected, the magnitude of the response ratios do change as the assumed constant damping values vary. This trend is illustrated graphically in Fig. 5-1 which shows mean response ratios plotted against the value of piping system damping used in the constant damping analyses.

The uniform effect of the PVRC damping on the response of the three piping systems results from the fact that, although the piping systems considered here varied significantly in size and complexity, they were all rather low frequency in that their fundamental modes were below 4 Hz. The low frequency nature of the piping systems was reinforced by the comparison between the PVRC damping

analysis, which assigned 5% damping to piping modes below 10 Hz, and the analysis which assumed 5% damping for all modes. Since each case assigns the same damping value to the low frequency modes that dominate piping response, little difference between the two analyses was seen. This observation, that the PVRC variable damping can be approximated by a uniform 5% damping method, would apply to all systems whose response is dominated by modes with frequencies below 10 Hz.

Even for such flexible systems, however, there are locations and response quantities for which high frequency modes are important. Nodal accelerations and displacements for points near supports can be dominated by support accelerations and the response of high frequency modes. Consequently, response ratios for such locations are dependent on these two factors. If a response is dominated by support accelerations, it will be nearly independent of piping system damping, and response ratios will be approximately one for all comparisons. If dynamic amplification of higher frequency modes is important, response ratios will reflect the lower damping values assigned by the PVRC variable damping method to these higher frequency modes. This is the probable explanation for those few outlying response ratios seen in the figures of Sec. 4. For these cases and for cases where a stiffer piping system is considered, the impact of PVRC variable damping would be different than the general trend seen here.

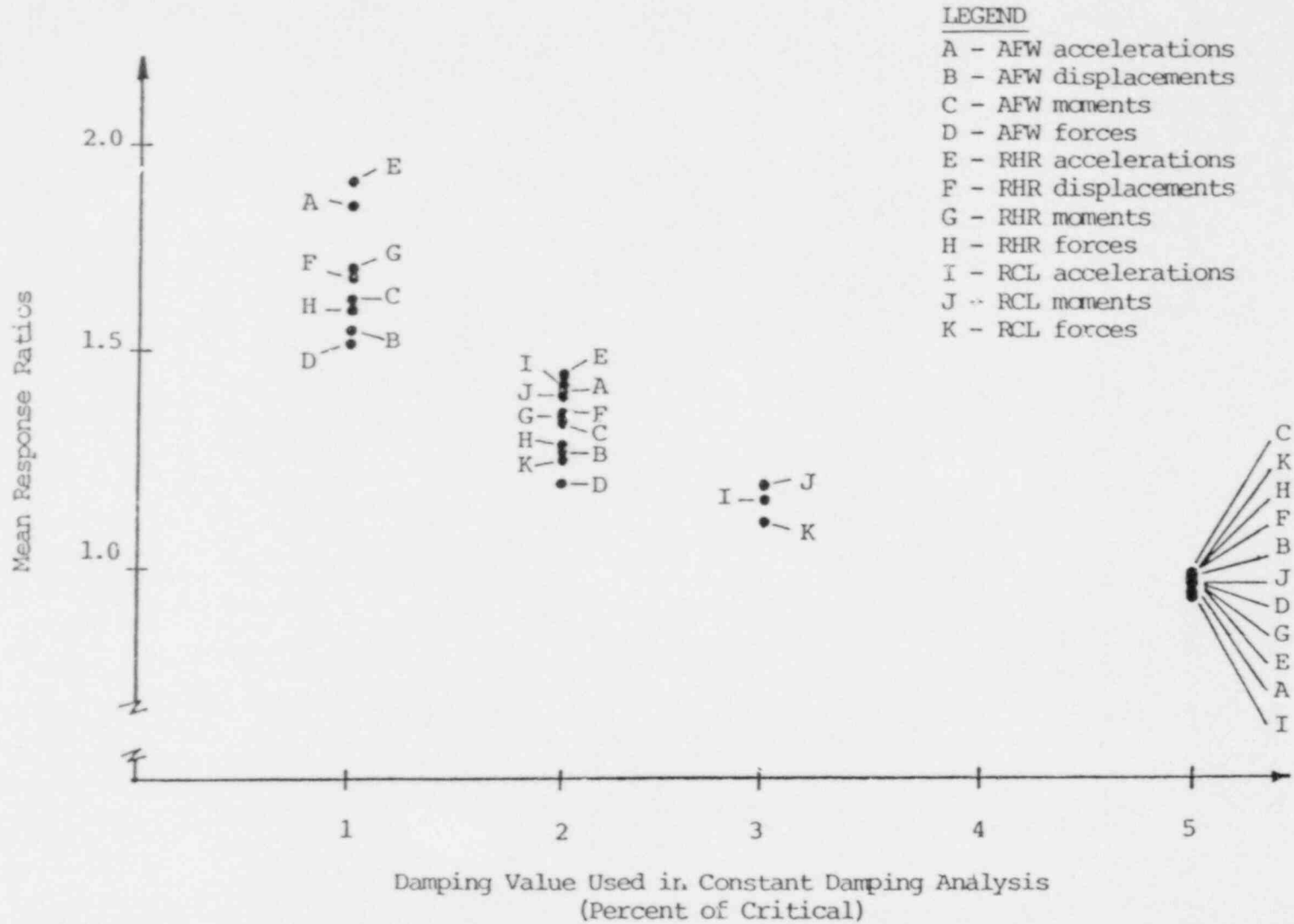


Fig. 5.1 Plot of Mean Response Ratios for Specified Constant Damping Analysis Results vs. PVRC Damping Analysis Results.

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APPENDIX IV

STRESS RESPONSE TABLES

Page

● UNIFORM DAMPING.....

● RHR Model

● AFW Model.....

● Z Bend.....

● BM1.....

● BM2.....

● BM3.....

● PVRC DAMPING.....

● RHR Model.....

● Z Bend.....

● BM1.....

● BM2.....

● BM3.....

 * RHR511 MODEL *

EARTHQUAKE NO. 1

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.52087E+05	205	119	119	100	99	99	100	99	99	245	244	293	284	337	338
2	ST	.29234E+05	193	105	104	171	170	170	171	170	170	420	419	483	512	578	578
3	BEND	.12627E+06	153	74	74	145	145	145	145	145	145	376	376	435	464	528	529
6	BEND	.13508E+06	184	96	96	147	147	147	147	147	147	374	373	439	457	526	527
9	BEND	.11994E+06	156	84	84	166	165	165	166	165	165	412	411	464	496	550	551
16	BEND	.11335E+06	223	113	113	181	181	181	181	181	181	451	451	510	563	618	618
19	BEND	.31085E+06	117	49	49	172	172	172	172	172	172	438	437	467	535	570	570
20	BEND	.36864E+06	106	51	51	204	204	204	204	204	204	501	501	525	605	630	630
21	ST	.10450E+06	140	66	66	208	207	207	208	207	208	516	515	554	631	683	683
22	ST	.66356E+05	170	84	84	214	214	214	214	214	214	520	520	546	635	670	670
32	BEND	.49874E+06	31	24	23	214	214	214	214	214	214	526	526	528	629	631	631
33	BEND	.41892E+06	33	24	24	211	211	211	211	211	211	521	521	524	623	627	627
36	BEND	.34510E+06	132	83	82	229	229	229	229	229	229	553	553	574	670	694	695
39	BEND	.57681E+06	49	37	37	234	234	234	234	234	234	567	567	572	678	684	684
42	BEND	.73890E+06	29	23	23	216	216	216	216	216	216	530	530	531	633	634	634
47	BEND	.10432E+06	66	35	34	152	152	152	152	152	152	402	402	425	491	515	517
54	BEND	.58860E+05	109	65	64	186	185	185	186	185	186	462	461	500	559	595	598
59	ST	.21649E+05	118	59	54	43	37	35	43	35	41	137	127	172	180	218	228
60	ST	.80819E+05	171	75	75	161	161	161	161	161	161	415	415	449	521	568	569
61	BEND	.20894E+06	131	67	66	221	221	221	221	221	221	541	541	571	658	699	699
62	BEND	.26331E+06	106	46	46	182	182	182	182	182	182	461	461	488	563	602	602
70	ST	.63652E+05	127	57	53	143	141	141	143	141	142	369	367	408	453	490	491

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 * RHRS11 MODEL *

EARTHQUAKE NO. 2

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.91073E+05	63	45	45	37	37	36	37	35	37	130	129	152	155	179	160
2	ST	.45023E+05	63	40	39	108	108	108	108	108	108	298	297	338	355	392	393
3	BEND	.19519E+06	34	13	13	85	85	85	85	85	85	259	259	294	312	346	346
6	BEND	.21567E+06	50	29	29	80	80	80	80	80	80	242	242	277	291	326	326
9	BEND	.19102E+06	46	28	27	108	108	108	108	108	108	297	298	331	355	385	335
16	BEND	.14876E+06	89	51	51	132	131	131	132	131	131	354	353	396	426	464	465
19	BEND	.39020E+06	44	15	14	164	163	163	164	163	163	419	418	446	492	518	518
20	BEND	.50076E+06	35	14	14	182	182	182	182	182	182	456	456	476	534	552	553
21	ST	.15894E+06	36	4	3	149	148	148	149	148	148	395	395	420	472	496	497
22	ST	.69982E+05	110	61	60	251	250	250	251	250	250	590	589	615	685	711	712
32	BEND	.72394E+06	16	5	4	193	192	192	193	192	192	477	477	478	562	563	563
33	BEND	.60635E+06	16	4	4	190	190	190	190	190	190	473	473	476	557	559	559
36	BEND	.47508E+06	82	35	34	202	201	201	202	201	201	494	493	506	582	597	597
39	BEND	.87918E+06	20	6	6	194	194	194	194	194	194	482	482	484	567	570	570
42	BEND	.10851E+07	12	2	2	190	190	190	190	190	190	474	474	475	558	558	558
47	BEND	.13409E+06	54	12	11	153	153	153	153	153	153	400	400	438	476	492	492
54	BEND	.84419E+05	83	28	27	158	157	157	158	157	157	404	403	436	479	507	508
59	ST	.27852E+05	130	45	40	31	27	25	31	25	30	121	113	161	157	196	204
60	ST	.80345E+05	101	46	45	178	177	177	178	177	178	451	450	489	531	572	573
61	BEND	.31926E+06	35	6	6	163	162	162	163	162	162	422	422	440	501	500	520
62	BEND	.37024E+06	23	0	0	149	148	148	149	148	148	393	393	412	466	486	486
70	ST	.64890E+05	120	54	48	181	179	179	181	179	179	442	439	489	510	554	553

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 * RHR511 MODEL *

EARTHQUAKE NO. 3

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.76492E+05	65	31	31	55	54	54	55	54	54	171	170	205	199	235	236
2	ST	.40701E+05	81	45	45	183	162	162	163	162	162	418	418	469	496	547	548
3	BEND	.17626E+06	56	26	25	141	141	140	141	140	141	381	381	427	454	502	502
6	BEND	.18590E+06	69	36	36	138	138	138	138	138	138	372	371	421	442	493	493
9	BEND	.15296E+06	82	43	42	171	171	171	171	171	171	433	433	480	518	564	564
16	BEND	.15147E+06	83	51	51	180	180	180	180	180	180	474	473	520	566	610	610
19	BEND	.41616E+06	69	36	35	204	204	204	204	204	204	504	503	537	586	628	628
20	BEND	.53928E+06	68	32	32	207	207	207	207	207	207	508	507	532	596	629	629
21	ST	.19016E+06	32	3	3	129	129	129	129	129	129	369	368	399	454	482	482
22	ST	.10339E+06	73	42	41	206	206	206	206	206	206	506	506	533	581	611	611
32	BEND	.92021E+06	29	-4	-5	134	134	134	134	134	134	369	368	370	456	458	458
33	BEND	.76156E+06	30	-3	-4	136	136	136	136	136	136	371	371	375	460	462	462
36	BEND	.57495E+06	64	32	31	171	171	171	171	171	171	439	439	455	528	545	546
39	BEND	.10978E+07	33	-1	-1	141	141	141	141	141	141	383	383	386	472	475	475
42	BEND	.13937E+07	26	-7	-7	130	130	130	130	130	130	361	361	362	447	448	448
47	BEND	.14589E+06	58	23	23	143	143	143	143	143	143	385	385	407	473	490	491
54	BEND	.96023E+05	82	41	40	143	142	142	143	142	143	375	374	415	459	489	491
59	ST	.36859E+05	83	44	41	27	23	21	27	21	26	103	96	142	136	168	176
60	ST	.11644E+06	58	34	33	175	175	175	175	175	175	450	450	488	515	558	558
61	BEND	.32687E+06	61	25	25	183	182	182	183	182	182	472	472	499	572	600	600
62	BEND	.37653E+06	56	22	22	181	180	180	181	180	181	464	464	493	555	588	588
70	ST	.93681E+05	73	39	35	163	162	161	163	161	162	407	405	448	456	500	501

IV-4

 * RHRS11 MODEL *

EARTHQUAKE NO. 4

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.61367E+05	132	58	57	99	98	98	99	98	98	251	250	298	289	340	341
2	ST	.35083E+05	146	78	77	218	217	217	218	217	217	526	525	588	635	697	698
3	BEND	.14936E+06	117	59	59	195	195	195	195	195	195	487	487	544	593	651	651
6	BEND	.16485E+06	123	61	61	179	179	179	179	179	179	450	450	509	546	606	607
9	BEND	.15186E+06	123	57	56	205	204	204	205	204	204	500	500	551	607	655	656
16	BEND	.19426E+06	71	30	29	124	124	124	124	124	124	353	353	392	441	477	477
19	BEND	.34482E+06	136	75	74	275	274	274	275	274	274	645	644	687	770	817	818
20	BEND	.40836E+06	159	87	87	325	324	324	325	324	324	744	744	777	889	927	927
21	ST	.14095E+06	122	60	59	241	241	240	241	240	241	592	592	635	729	769	769
22	ST	.9766E+05	121	66	65	236	235	235	236	235	236	566	566	595	672	704	705
32	BEND	.56326E+06	159	75	74	337	337	337	337	337	337	778	777	780	946	948	948
33	BEND	.47973E+06	154	72	71	327	327	327	327	327	327	757	757	762	922	925	925
36	BEND	.35347E+06	225	139	139	383	383	383	383	383	383	867	867	892	1043	1069	1070
39	BEND	.66652E+06	171	84	84	353	353	353	353	353	353	810	810	815	984	988	988
42	BEND	.83658E+06	159	74	74	338	338	338	338	338	338	781	781	783	950	951	951
47	BEND	.10846E+06	176	89	88	270	270	270	270	270	270	642	641	676	783	807	808
54	BEND	.83897E+05	182	83	82	212	211	210	212	210	211	514	513	564	628	664	667
59	ST	.38917E+05	155	54	51	32	28	26	32	26	31	116	116	155	153	186	194
60	ST	.12620E+06	68	33	32	142	141	141	142	141	141	382	382	418	459	500	500
61	BEND	.32913E+06	96	41	41	208	208	208	208	208	208	522	522	550	641	669	669
62	BEND	.33352E+06	111	53	53	238	238	238	238	238	238	580	580	613	705	741	742
70	ST	.63718E+05	210	112	105	273	270	270	273	270	270	621	618	693	718	785	786

 * FEMSI1 MODEL *

EARTHQUAKE NO. 5

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME FACTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.62590E+05	85	58	58	43	43	42	43	42	43	142	141	178	173	214	215
2	ST	.31332E+05	122	82	82	129	128	128	129	128	128	342	342	410	441	503	503
3	BEND	.13100E+06	100	64	64	114	114	113	114	113	114	319	318	384	415	476	477
6	BEND	.15842E+06	88	58	57	90	90	89	90	89	89	264	264	325	343	403	403
9	BEND	.15302E+06	72	38	37	91	91	90	91	90	91	276	275	325	360	405	406
16	BEND	.14954E+06	90	61	61	97	97	97	97	97	97	281	281	328	369	410	410
19	BEND	.34040E+06	79	30	35	119	118	118	119	118	119	341	341	374	446	482	482
20	BEND	.42972E+06	76	28	27	131	131	131	131	131	131	372	372	395	485	509	509
21	ST	.15666E+06	53	19	19	96	96	96	96	96	96	298	297	333	393	429	430
22	ST	.74405E+05	103	54	53	136	135	135	136	135	136	373	372	389	484	505	505
32	BEND	.62479E+06	60	8	8	139	139	139	139	139	139	395	395	397	515	517	517
33	BEND	.52281E+06	60	8	8	138	138	138	138	138	138	392	392	395	511	515	515
36	BEND	.39461E+05	98	35	34	154	154	153	154	153	154	417	416	428	541	555	556
39	BEND	.71300E+06	72	16	16	155	155	155	155	155	155	430	430	433	538	561	561
42	BEND	.93031E+06	58	7	7	138	138	138	138	138	138	395	395	396	515	515	516
47	BEND	.91008E+05	102	43	42	167	166	166	167	166	166	444	443	464	575	593	595
54	BEND	.72810E+05	81	38	36	119	117	117	119	117	118	336	334	364	440	463	465
59	ST	.23751E+05	96	73	66	55	47	45	55	45	53	139	128	166	190	218	231
60	ST	.94960E+05	76	43	42	84	84	84	84	84	84	260	259	290	345	382	382
61	BEND	.29050E+06	64	23	23	115	115	115	115	115	115	339	339	366	445	475	475
62	BEND	.33797E+06	55	17	17	101	101	101	101	101	101	305	309	336	408	439	439
70	ST	.45573E+05	169	99	90	170	167	166	170	166	167	422	417	473	540	592	595

9-1-6

 * RHRS11 MODEL *

EARTHQUAKE NO. 6 UNIFORM DAMPING *PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.50084E+05	82	50	49	37	36	36	37	36	36	136	135	173	167	209	209
2	ST	.38822E+05	45	17	17	69	69	69	69	69	69	228	228	261	287	326	327
3	BEND	.16778E+06	28	3	3	55	55	55	55	55	55	204	204	235	260	298	298
6	BEND	.18587E+06	32	6	6	46	46	46	46	46	46	182	182	215	233	270	270
9	BEND	.13403E+06	50	24	24	103	103	103	103	103	103	296	296	328	362	399	399
16	BEND	.18664E+06	30	2	2	42	42	42	42	42	42	178	178	202	234	258	259
19	BEND	.32625E+06	50	20	20	125	124	124	125	124	124	344	343	365	422	451	451
20	BEND	.33699E+06	70	41	40	194	194	194	194	194	194	482	482	502	579	602	602
21	ST	.14940E+06	21	1	1	96	96	96	96	96	96	290	290	310	358	390	390
22	ST	.1205E+05	78	40	40	145	145	145	145	145	145	384	383	398	471	492	493
32	BEND	.43855E+06	32	29	29	237	237	237	237	237	237	570	570	571	674	675	675
33	BEND	.36821E+06	32	29	29	234	234	234	234	234	234	564	564	566	667	670	670
36	BEND	.27108E+06	97	76	76	266	266	266	266	266	266	626	625	640	745	762	763
39	BEND	.54045E+06	34	30	30	235	235	235	235	235	235	566	566	569	670	674	674
42	BEND	.66006E+06	29	26	26	234	234	234	234	234	234	564	564	565	667	667	667
47	BEND	.76411E+05	55	45	44	211	211	211	211	211	211	517	515	535	616	638	639
54	BEND	.50831E+05	72	58	56	201	200	200	201	200	201	490	488	521	585	618	621
59	ST	.19062E+05	75	56	50	46	39	37	46	37	44	139	129	173	185	223	234
60	ST	.99195E+05	53	16	16	70	70	70	70	70	70	235	235	255	304	334	334
61	BEND	.28261E+06	24	5	5	115	115	115	115	115	115	327	327	343	400	426	426
62	BEND	.32171E+06	25	3	3	106	106	106	106	106	106	310	310	327	381	408	408
70	ST	.49886E+05	102	59	54	147	145	145	147	145	145	377	375	413	463	497	498

IV-7

 * RHR511 MODEL *

EARTHQUAKE NO. 7

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.63229E+05	101	84	84	97	96	96	97	96	96	241	241	278	275	313	314
2	ST	.33109E+05	103	79	78	189	189	189	189	189	189	457	457	515	538	590	591
3	BEND	.13745E+06	78	55	55	170	170	170	170	170	170	427	427	481	506	557	557
6	BEND	.16730E+06	76	55	55	138	138	137	138	137	138	356	356	407	423	471	471
9	BEND	.17483E+06	44	30	29	129	129	129	129	129	129	343	342	380	404	437	438
16	BEND	.13250E+06	102	65	65	170	169	169	170	169	170	433	433	485	522	566	566
19	BEND	.36279E+05	54	30	30	193	192	192	193	192	193	477	476	506	560	587	588
20	BEND	.49056E+06	37	23	22	195	195	195	195	195	195	481	480	501	563	582	582
21	ST	.16194E+06	30	3	3	146	146	146	146	146	146	392	391	416	469	494	494
22	ST	.73343E+05	100	67	66	251	250	250	251	250	250	589	589	614	690	716	717
32	BEND	.73619E+06	8	2	1	186	186	186	186	186	186	465	465	465	546	547	547
33	BEND	.61300E+06	9	2	2	185	185	185	185	185	185	464	464	467	545	547	547
36	BEND	.47240E+06	71	39	39	207	207	207	207	207	207	504	504	517	595	612	613
39	BEND	.90189E+06	12	4	4	186	186	186	186	186	186	466	466	469	547	551	551
42	BEND	.11252E+07	3	-1	-1	179	179	179	179	179	179	451	451	452	530	531	531
47	BEND	.13967E+06	33	8	7	144	144	144	144	144	144	381	381	398	454	472	473
54	BEND	.83574E+05	58	26	25	161	160	160	161	160	161	410	409	439	486	512	514
59	ST	.28120E+05	78	28	24	23	18	16	23	16	21	109	102	144	145	180	188
60	ST	.85808E+05	91	51	50	181	180	180	181	180	180	456	456	492	544	584	584
61	BEND	.31969E+06	31	10	9	165	165	165	165	165	165	427	427	447	508	529	529
62	BEND	.3651E+06	24	7	7	157	157	157	157	157	157	410	410	430	486	508	508
70	ST	.76583E+05	78	39	35	152	151	151	152	151	151	385	384	423	451	488	489

8-11

 * RHRSI : MODEL *

EARTHQUAKE NO. 8 UNIFORM DAMPING *PIPE STRESSES (INERTIAL COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.10041E+06	59	46	46	69	68	68	69	68	69	193	193	225	221	255	255
2	ST	.53576E+05	93	39	39	120	119	119	120	119	119	325	324	374	396	444	445
3	BEND	.22401E+06	80	21	20	103	102	102	103	102	102	298	298	345	368	415	415
6	BEND	.26704E+06	74	24	24	87	87	87	87	87	87	260	260	306	320	367	367
9	BEND	.21404E+06	68	31	31	121	120	120	121	120	120	326	325	372	399	443	444
16	BEND	.18042E+06	174	63	62	156	155	155	156	155	155	410	410	462	508	556	557
19	BEND	.44620E+06	104	33	32	183	182	182	183	182	183	462	461	496	556	595	596
20	BEND	.66500E+06	50	8	8	149	148	148	149	148	148	394	393	415	479	506	506
21	ST	.20086E+06	81	7	6	125	125	124	125	124	125	358	357	390	453	481	482
22	ST	.12710E+06	86	23	22	147	146	146	147	146	146	389	389	411	466	492	493
32	BEND	.90640E+05	-1	-8	-8	145	145	145	145	145	145	391	390	392	490	492	492
33	BEND	.75429E+05	1	-7	-7	145	145	145	145	145	145	391	391	395	491	493	494
36	BEND	.59553E+06	61	35	39	170	170	170	170	170	170	441	441	458	542	560	561
39	BEND	.10846E+07	5	-3	-3	151	151	151	151	151	151	405	405	408	507	510	510
42	BEND	.13353E+07	-2	-9	-9	147	147	147	147	147	147	396	396	397	497	497	497
47	BEND	.16469E+06	36	19	19	127	126	126	127	126	127	353	353	376	443	460	462
54	BEND	.10697E+06	57	37	36	129	128	128	129	128	129	346	345	385	431	463	465
59	ST	.33606E+05	106	77	73	61	54	52	61	52	59	145	136	193	181	227	237
60	ST	.14234E+06	111	23	22	122	122	122	122	122	122	345	344	374	415	452	453
61	BEND	.35573E+06	90	23	22	167	167	167	167	167	167	440	440	467	548	575	575
62	BEND	.38989E+06	94	23	23	174	174	174	174	174	174	452	452	480	556	589	589
70	ST	.11411E+06	54	26	21	113	112	111	113	111	112	313	311	352	365	406	407

6-ΔI

 * RHR511 MODEL *

EARTHQUAKE NO. 9 UNIFORM DAMPING *PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.90863E+05	67	45	45	18	18	18	18	18	18	101	101	125	124	148	149
2	ST	.40371E+05	72	49	49	83	82	82	83	82	82	255	254	305	324	362	363
3	BEND	.15395E+06	56	35	35	84	84	84	84	84	84	265	264	316	339	379	379
6	BEND	.19936E+06	57	35	35	57	57	57	57	57	57	294	204	249	262	300	300
9	BEND	.16332E+06	61	40	40	82	82	82	82	82	82	253	252	299	324	359	360
16	BEND	.13444E+06	93	64	63	122	121	121	122	121	122	346	345	396	439	475	477
19	BEND	.26458E+06	62	39	37	181	173	179	181	179	180	466	464	503	584	619	621
20	BEND	.33357E+06	50	31	30	192	192	192	192	192	192	490	490	517	617	643	644
21	ST	.13131E+06	27	7	6	125	125	125	125	125	125	361	360	398	466	493	494
22	ST	.58935E+05	83	54	52	202	201	201	202	201	201	508	507	536	632	660	661
32	BEND	.51736E+06	14	4	4	174	174	174	174	174	174	454	453	456	582	585	585
33	BEND	.43173E+06	15	5	4	173	173	173	173	173	173	452	452	457	580	584	585
36	BEND	.31813E+06	79	51	50	213	212	212	213	212	213	519	518	536	659	682	683
39	BEND	.58105E+06	24	12	12	197	197	197	197	197	197	503	503	507	642	646	646
42	BEND	.75181E+06	12	2	2	178	178	178	178	178	178	466	466	467	597	598	598
47	BEND	.84761E+05	61	36	34	177	176	176	177	176	176	452	451	476	579	601	603
54	BEND	.52469E+05	102	71	68	190	189	188	190	188	190	469	467	512	598	633	637
59	ST	.25506E+05	81	52	46	33	27	24	33	24	31	110	100	138	152	181	191
60	ST	.77623E+05	61	32	31	133	132	132	133	132	132	372	371	409	468	504	505
61	BEND	.4044E+06	32	13	12	151	150	150	151	150	150	411	411	439	527	551	552
62	BEND	.25527E+06	35	16	16	158	158	158	158	158	158	426	426	456	543	571	571
70	ST	.37843E+05	156	115	104	240	236	235	240	235	237	555	550	625	677	745	749

01-11

 * FHRS11 MODEL *

EARTHQUAKE NO. 10

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.33019E+05	79	39	36	56	55	55	56	55	55	178	177	214	211	246	247
2	ST	.16873E+05	120	87	86	282	287	287	288	287	287	659	658	795	767	814	815
3	BEND	.72012E+05	93	66	66	259	259	258	259	258	259	606	606	666	708	752	753
6	BEND	.02948E+05	86	56	56	212	212	211	212	211	212	510	510	530	598	639	639
9	BEND	.87644E+05	72	47	46	240	240	240	240	240	240	568	568	597	660	686	687
16	BEND	.92032E+05	47	26	26	150	150	150	150	150	150	393	393	424	470	496	498
19	BEND	.17619E+06	94	72	71	335	335	335	335	335	335	759	758	781	878	905	906
20	BEND	.19788E+06	137	110	110	463	463	463	463	463	463	1011	1010	1027	1162	1179	1180
21	ST	.85507E+05	67	47	47	282	283	283	283	283	283	659	659	677	766	790	791
22	ST	.40015E+05	104	80	79	327	327	327	327	327	327	743	743	758	862	879	879
32	BEND	.36938E+06	98	76	76	400	400	400	400	400	400	886	886	887	1019	1020	1020
33	BEND	.31537E+06	93	71	71	386	386	386	386	386	386	859	859	861	989	990	990
36	BEND	.22416E+06	126	100	100	415	415	415	415	415	415	918	918	926	1058	1066	1067
39	BEND	.45381E+06	97	75	75	396	396	396	396	396	396	880	880	882	1012	1014	1014
42	BEND	.54573E+06	99	77	77	405	404	404	405	404	405	896	896	897	1031	1031	1031
47	BEND	.74861E+05	73	53	52	284	284	284	284	284	284	657	657	671	760	772	773
54	BEND	.56395E+05	69	49	47	227	226	226	227	226	227	539	538	569	626	650	652
59	ST	.25969E+05	34	16	12	14	10	8	14	8	12	90	85	125	120	152	159
60	ST	.48248E+05	56	38	37	163	163	163	163	163	163	422	421	456	505	546	546
61	BEND	.16856E+06	75	56	55	312	312	312	312	312	312	715	715	729	829	847	847
62	BEND	.17900E+06	76	57	57	314	314	314	314	314	314	719	719	734	833	853	853
70	ST	.31125E+05	130	95	86	264	261	261	264	261	261	608	605	662	708	753	755

11-11

 * RHRS11 MODEL *

EARTHQUAKE NO. 11

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1	ST	.10595E+06	87	54	54	15	15	15	15	15	15	94	93	115	113	136	136	
2	ST	.46031E+05	104	59	58	64	64	64	64	64	34	64	207	207	252	262	301	301
3	BEND	.16960E+06	96	48	48	68	68	68	68	68	68	221	220	270	282	326	326	
6	BEND	.21914E+06	93	51	51	48	48	48	48	48	18	48	174	174	218	222	262	262
9	BEND	.14970E+06	133	84	84	104	103	103	104	103	103	284	283	329	349	388	389	
16	BEND	.14216E+06	156	87	87	106	106	106	106	106	106	293	292	347	374	416	416	
19	BEND	.28870E+06	112	49	48	152	151	151	152	151	151	398	397	430	501	530	531	
20	BEND	.37381E+06	91	37	37	159	159	159	159	159	159	415	414	438	516	536	537	
21	ST	.10725E+06	114	43	42	165	164	164	165	164	165	427	426	465	534	577	578	
22	ST	.56569E+05	177	94	93	213	212	212	213	212	213	518	517	544	650	678	679	
32	BEND	.54947E+06	34	0	0	155	155	155	155	155	155	409	409	410	501	504	504	
33	BEND	.46387E+06	34	0	0	152	151	151	152	151	151	402	401	405	493	497	498	
36	BEND	.32024E+06	126	72	72	219	219	219	219	219	219	522	522	542	649	672	673	
39	BEND	.64694E+06	43	6	6	166	166	166	166	166	166	431	431	435	529	535	535	
42	BEND	.75698E+06	42	5	5	174	174	174	174	174	174	449	449	451	549	551	551	
47	BEND	.94332E+05	72	29	28	152	151	151	152	151	152	395	394	417	492	521	522	
54	BEND	.60176E+05	94	45	43	151	150	150	151	150	151	390	389	424	485	519	521	
59	ST	.20524E+05	116	60	55	44	37	34	44	34	41	136	125	168	182	217	229	
60	ST	.67002E+05	179	29	87	163	162	162	163	162	163	417	416	453	539	581	582	
61	BEND	.19516E+06	127	56	55	203	203	203	203	203	203	502	502	533	624	662	663	
62	BEND	.22837E+06	117	49	42	183	183	183	183	183	183	463	463	492	577	613	613	
70	ST	.50408E+05	155	85	79	161	158	158	161	158	159	402	399	448	510	551	552	

 * RHR311 MODEL *

EARTHQUAKE NO. 12

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.81205E+05	130	85	85	76	75	75	76	75	75	196	195	224	227	258	258
2	ST	.33990E+05	166	107	107	197	196	196	197	196	196	464	464	523	545	599	600
3	BEND	.14620E+06	119	68	68	165	165	164	165	164	165	412	412	465	488	538	538
6	BEND	.15625E+06	157	100	100	170	170	170	170	170	170	411	411	466	483	538	538
9	BEND	.18615E+06	81	45	45	125	124	124	125	124	124	328	328	365	388	421	422
16	BEND	.13926E+06	151	78	78	168	168	168	168	168	168	427	426	478	511	555	556
19	BEND	.37678E+06	69	28	27	188	187	187	188	187	187	466	466	496	545	573	573
20	BEND	.50348E+06	49	22	22	193	193	193	193	193	193	476	476	497	556	576	576
21	ST	.13686E+06	76	24	24	193	193	193	193	193	193	487	487	518	580	609	609
22	ST	.83964E+05	100	50	49	216	216	216	216	216	216	523	522	547	609	633	634
32	BEND	.68749E+06	19	11	11	206	206	206	206	206	206	506	506	507	595	596	597
33	BEND	.58537E+06	18	10	9	199	199	199	199	199	199	492	492	495	579	581	582
36	BEND	.42147E+06	111	66	65	249	249	249	249	249	249	589	589	606	694	714	715
39	BEND	.84369E+06	23	13	13	206	206	206	206	206	206	506	506	509	596	599	599
42	BEND	.10243E+07	15	10	10	206	206	206	206	206	206	506	506	508	595	596	596
47	BEND	.12480E+06	63	29	28	175	175	175	175	175	175	444	444	466	528	548	549
54	BEND	.74519E+05	102	56	55	197	196	196	197	196	197	480	479	520	568	602	605
59	ST	.31739E+05	93	36	33	24	19	17	24	17	22	105	98	141	137	173	181
60	ST	.87190E+05	122	51	50	189	189	189	189	189	189	474	473	512	557	596	597
61	BEND	.28465E+06	65	25	25	200	200	200	200	200	200	498	498	521	590	613	613
62	BEND	.32323E+06	58	22	22	194	194	194	194	194	194	484	484	508	571	595	595
70	ST	.75397E+05	110	49	44	169	167	167	169	167	168	418	416	460	484	523	524

 * RHR511 MODEL *

EARTHQUAKE NO. 13

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.52292E+05	152	85	85	76	76	76	76	76	76	202	201	247	240	291	292
2	ST	.31504E+05	123	70	70	126	125	125	126	125	125	334	333	391	425	481	481
3	BEND	.13532E+06	61	47	47	106	105	105	106	105	105	301	301	354	388	442	443
6	BEND	.15288E+06	103	54	54	97	97	97	97	97	97	278	278	333	356	411	412
9	BEND	.12786E+06	98	51	51	121	121	121	121	121	121	328	327	377	414	462	463
16	BEND	.14942E+06	95	49	48	98	97	97	98	97	97	288	288	329	376	412	412
19	BEND	.30191E+06	74	39	39	144	143	143	144	143	143	385	385	414	492	523	524
20	BEND	.34815E+06	72	41	40	177	177	177	177	177	177	453	453	477	573	596	597
21	ST	.13547E+06	47	17	16	115	115	115	115	115	115	332	331	362	428	462	463
22	ST	.89453E+05	53	22	22	100	99	99	100	99	99	297	296	312	386	404	404
32	BEND	.37230E+06	53	35	35	270	269	269	270	269	270	641	640	642	797	800	800
33	BEND	.32032E+06	51	33	32	258	258	258	258	258	258	617	617	621	769	773	773
36	BEND	.29890E+06	97	67	66	226	225	225	226	225	225	544	544	563	686	707	708
39	BEND	.43668E+06	66	46	46	287	287	287	287	287	287	676	676	681	841	847	847
42	BEND	.56516E+06	49	30	30	262	262	262	262	262	262	627	627	628	781	782	782
47	BEND	.76184E+05	73	46	45	200	200	200	200	200	200	496	496	522	626	652	653
54	BEND	.43842E+05	130	88	86	236	234	234	236	234	235	558	557	601	700	741	744
59	ST	.24825E+05	69	32	27	18	12	10	18	10	15	93	84	116	134	161	170
60	ST	.10855E+06	54	20	20	70	70	70	70	70	70	238	237	259	317	344	344
61	BEND	.23595E+06	61	30	30	153	153	153	153	153	153	407	406	433	519	550	550
62	BEND	.28069E+06	53	23	23	133	133	133	133	133	133	368	367	393	471	502	502
70	ST	.54438E+05	105	64	59	135	133	133	135	133	134	352	350	392	451	488	490

41-11

 * RHR511 MODEL *

EARTHQUAKE NO. 14

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.86929E+05	56	50	50	23	23	23	23	23	23	106	105	131	130	157	157
2	ST	.33439E+05	118	85	84	125	124	124	124	124	124	332	331	393	417	469	470
3	BEND	.13670E+06	94	58	58	112	111	111	112	111	111	314	314	373	399	450	451
6	BEND	.10655E+06	89	65	65	90	90	90	90	90	90	263	263	318	334	384	384
9	BEND	.16308E+06	78	44	43	87	86	86	87	86	86	261	260	306	332	371	371
16	BEND	.12669E+06	114	93	83	135	134	134	135	134	134	362	362	419	463	509	509
19	BEND	.31431E+06	95	30	29	150	149	149	150	149	149	399	397	431	499	535	536
20	BEND	.38604E+06	108	27	26	167	167	166	167	166	167	437	437	461	547	575	575
21	ST	.13418E+06	81	16	15	124	123	123	124	123	124	357	356	394	460	491	491
22	ST	.66874E+05	120	52	50	184	183	183	184	183	184	465	464	491	574	606	607
32	BEND	.55691E+06	108	7	7	163	163	163	163	163	163	435	434	437	555	558	558
33	BEND	.46845E+06	106	7	6	160	160	160	160	160	160	429	429	433	548	552	553
36	BEND	.34408E+06	141	50	49	200	199	199	200	199	200	496	495	512	625	649	650
39	BEND	.63800E+06	121	13	13	179	179	179	179	179	179	470	470	474	599	602	602
42	BEND	.82413E+06	108	4	4	162	162	162	162	162	162	437	437	438	558	558	559
47	BEND	.88261E+05	133	38	36	172	171	171	172	171	172	447	446	470	570	591	593
54	BEND	.63090E+05	138	46	45	147	146	145	147	145	147	390	389	426	498	528	531
59	ST	.24851E+05	117	53	48	34	27	25	34	25	32	119	109	148	163	192	203
60	ST	.84985E+05	73	36	35	125	124	124	125	124	124	345	344	380	431	474	475
61	BEND	.25742E+06	91	17	17	140	140	140	140	140	140	388	388	415	497	523	524
62	BEND	.30642E+06	74	9	8	123	122	122	123	122	122	352	351	377	450	478	478
70	ST	.40242E+05	209	116	106	254	250	250	254	250	251	581	577	647	693	766	769

IV-15

 * RHR11 MODEL *

EARTHQUAKE NO. 15

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.10395E+06	150	15	15	4	4	4	4	4	4	71	70	90	92	114	114
2	ST	.43660E+05	168	35	35	93	93	93	93	93	93	268	267	304	322	360	361
3	BEND	.16946E+06	139	24	23	92	92	92	92	92	92	272	271	308	328	368	368
6	BEND	.21739E+06	145	20	20	60	60	60	60	60	60	203	202	235	248	284	285
9	BEND	.18614E+06	137	23	22	95	95	94	95	94	95	274	273	301	324	354	354
16	BEND	.15375E+06	184	42	42	104	104	104	104	104	104	295	294	332	363	399	399
19	BEND	.32921E+06	119	29	28	177	177	177	177	177	177	448	447	473	524	554	555
20	BEND	.44488E+06	90	22	21	185	185	185	185	185	185	466	465	483	541	558	559
21	ST	.15325E+06	68	11	10	143	142	142	143	142	142	382	381	405	451	483	483
22	ST	.75445E+05	144	39	38	181	180	180	181	180	180	455	455	474	537	558	558
32	BEND	.73353E+06	18	4	4	172	171	171	172	171	171	438	438	439	506	507	507
33	BEND	.61389E+06	19	4	3	170	169	169	170	169	170	434	434	437	502	504	505
36	BEND	.44379E+06	100	39	39	197	197	197	197	197	197	485	485	496	566	581	581
39	BEND	.87155E+06	25	7	7	178	178	178	178	178	178	453	453	455	523	527	527
42	BEND	.10881E+07	15	2	2	172	172	172	172	172	172	440	440	441	508	508	509
47	BEND	.11216E+06	75	32	31	183	183	183	183	183	183	460	460	478	536	557	558
54	BEND	.75847E+05	82	40	39	168	167	167	168	167	168	425	424	457	495	523	525
59	ST	.27455E+05	83	44	40	32	27	25	32	25	30	117	109	154	152	188	197
60	ST	.84438E+05	154	31	30	121	120	120	121	120	121	337	336	370	414	454	455
61	BEND	.29777E+06	69	15	15	162	162	162	162	162	162	421	421	439	493	519	519
62	BEND	.31085E+06	82	16	18	171	171	171	171	171	171	439	439	459	514	542	542
70	ST	.56874E+05	167	58	51	165	162	161	165	161	162	413	410	458	487	527	529

 * RHR511 MODEL *

EARTHQUAKE NO. 16

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.51212E+05	136	104	103	117	116	116	117	116	116	281	280	327	322	369	370
2	ST	.34024E+05	101	75	74	205	205	204	205	204	205	494	494	547	579	632	632
3	BEND	.13838E+06	84	60	60	196	195	195	196	195	195	481	481	532	566	619	620
6	BEND	.15057E+06	98	71	71	182	182	182	182	182	182	450	450	504	530	585	585
9	BEND	.14962E+06	73	54	54	197	197	197	197	197	197	480	479	520	557	595	596
16	BEND	.15446E+06	77	50	50	154	154	153	154	153	154	405	405	446	491	528	528
19	BEND	.35945E+06	70	47	46	232	232	231	232	231	232	554	554	583	644	676	676
20	BEND	.45548E+06	67	50	49	262	262	262	262	262	262	613	613	635	706	728	728
21	ST	.12808E+06	76	56	56	265	265	265	265	265	265	627	627	659	733	773	773
22	ST	.73655E+05	119	81	81	284	283	283	284	283	284	656	655	678	761	788	788
32	BEND	.69528E+06	33	31	31	259	259	259	259	259	259	609	609	610	700	701	701
33	BEND	.58210E+06	33	31	30	256	256	256	256	256	256	604	604	606	694	696	696
36	BEND	.40768E+06	120	80	79	306	306	306	306	306	306	703	702	716	810	826	827
39	BEND	.80369E+06	46	41	41	280	280	280	280	280	280	652	652	654	748	751	751
42	BEND	.99360E+06	37	36	36	275	275	275	275	275	275	641	641	642	735	736	736
47	BEND	.11350E+06	78	51	51	250	250	250	250	250	250	591	591	609	683	702	703
54	BEND	.75002E+05	81	55	54	234	233	233	234	233	234	555	554	585	641	668	670
59	ST	.27408E+05	64	35	30	35	30	29	35	29	30	131	125	172	167	207	215
60	ST	.87972E+05	101	60	59	191	191	191	191	191	191	478	478	513	571	616	616
61	BEND	.31095E+06	50	33	33	218	218	218	218	218	218	532	532	552	620	646	646
62	BEND	.36531E+06	39	25	24	196	196	196	196	196	196	488	488	508	569	595	596
70	ST	.62722E+05	123	73	69	223	221	221	223	221	222	525	523	569	605	647	648

IV-17

 * RHRS11 MODEL *

EARTHQUAKE NO. 17

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.48630E+05	103	47	47	40	42	42	43	42	42	155	155	191	187	224	225
2	ST	.29300E+05	145	60	60	190	190	189	190	189	190	471	470	512	542	594	594
3	BEND	.11280E+06	153	59	59	201	201	200	201	200	201	495	495	538	572	628	629
6	BEND	.11364E+06	179	76	76	202	202	202	202	202	202	496	496	544	575	632	632
9	BEND	.14312E+06	78	29	29	159	159	159	159	159	159	409	409	436	463	497	497
16	BEND	.12468E+06	172	51	51	160	160	160	160	160	160	421	421	454	505	540	540
19	BEND	.34551E+06	99	30	30	190	190	190	190	190	190	474	473	496	538	570	570
20	BEND	.46960E+06	70	25	25	198	198	198	198	198	198	488	488	504	548	565	566
21	ST	.12644E+06	111	40	40	221	221	221	221	221	221	539	538	562	612	653	654
22	ST	.62858E+05	181	74	74	271	271	271	271	271	271	633	632	650	720	745	745
32	BEND	.72030E+06	16	15	15	202	202	202	202	202	202	497	497	497	550	551	551
33	BEND	.60979E+06	16	13	13	196	196	196	196	196	196	486	486	487	538	540	540
36	BEND	.44790E+06	65	32	32	213	213	213	213	213	213	518	518	525	578	588	588
39	BEND	.89065E+06	18	14	14	198	198	198	198	198	198	490	490	491	543	546	546
42	BEND	.10913E+07	14	13	13	197	197	197	197	197	197	488	488	488	540	541	541
47	BEND	.12701E+06	30	12	12	168	168	168	168	168	168	430	430	440	480	494	495
54	BEND	.76102E+05	48	30	29	186	185	185	186	185	186	461	460	482	514	536	538
59	ST	.24404E+05	44	21	17	27	23	21	27	21	26	119	113	156	148	188	196
60	ST	.69405E+05	209	64	63	196	196	196	196	196	196	491	490	524	585	634	635
61	BEND	.30237E+06	69	20	20	182	182	182	182	182	182	460	460	475	520	547	547
62	BEND	.34192E+06	69	16	16	171	171	171	171	171	171	438	438	455	497	525	525
70	ST	.46231E+05	171	81	76	246	245	245	246	245	245	574	573	621	649	695	696

81-11

 * RHR511 MODEL *

EARTHQUAKE NO. 18

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.59893E+05	216	165	165	99	98	98	99	98	98	235	235	276	269	312	312
2	ST	.29111E+05	200	151	151	159	159	159	159	159	159	384	383	458	471	539	540
3	BEND	.12244E+06	150	109	109	135	135	134	135	134	134	346	345	419	432	500	501
6	BEND	.14402E+06	175	131	131	126	126	126	126	126	126	319	319	391	393	462	462
9	BEND	.11749E+06	179	132	132	154	153	153	154	153	153	376	376	438	459	516	517
16	BEND	.14530E+06	129	93	93	110	110	110	110	110	110	299	299	354	380	425	426
19	BEND	.29116E+06	86	55	54	148	148	148	148	148	149	389	388	422	491	527	528
20	BEND	.34388E+06	83	50	49	174	173	173	174	173	173	442	441	469	551	578	578
21	ST	.11149E+06	81	48	47	154	154	154	154	154	154	402	402	444	505	556	557
22	ST	.73244E+05	89	57	56	142	141	141	142	141	142	375	374	396	477	503	504
32	BEND	.50623E+06	28	-4	-4	160	160	160	160	160	160	417	417	419	516	518	519
33	BEND	.42552E+06	29	-3	-4	158	157	157	158	157	157	413	412	417	511	516	516
36	BEND	.35445E+06	82	43	43	172	172	172	172	172	172	431	430	450	539	564	565
39	BEND	.62032E+06	32	-1	-1	160	160	160	160	160	160	419	419	424	519	526	526
42	BEND	.71169E+06	33	-1	-1	174	174	174	174	174	174	448	448	449	552	553	553
47	BEND	.10139E+06	43	12	11	122	121	121	122	121	122	334	333	356	420	450	451
54	BEND	.61666E+05	69	37	37	135	134	133	135	133	135	353	351	389	442	479	482
59	ST	.23368E+05	71	50	44	33	26	24	33	24	31	111	100	139	153	184	194
60	ST	.82737E+05	18	68	67	124	123	123	124	123	123	336	335	366	435	476	476
61	BEND	.21916E+06	77	43	43	164	164	164	164	164	164	423	422	453	529	572	572
62	BEND	.25340E+06	71	40	40	151	151	151	151	151	151	397	397	426	500	540	540
70	ST	.56348E+05	106	69	63	132	130	129	132	129	130	342	339	385	437	479	481

61-11

 * RHR511 MCDL *

EARTHQUAKE NO. 19

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.45004E+05	98	76	76	63	63	62	63	62	63	181	180	224	218	265	266
2	ST	.29676E+05	84	53	53	117	117	117	117	117	117	321	321	369	402	453	450
3	BEND	.12569E+06	64	36	35	102	102	102	102	102	102	297	296	341	376	422	422
6	BEND	.13177E+06	78	49	49	102	102	102	102	102	102	292	292	342	369	418	418
9	BEND	.11050E+06	85	52	52	139	139	139	139	139	139	367	366	411	452	494	495
16	BEND	.13790E+06	63	34	34	87	86	86	87	86	87	268	268	304	349	380	381
19	BEND	.28614E+06	72	32	32	148	148	148	148	148	148	393	393	420	487	517	517
20	BEND	.29434E+06	108	57	56	224	224	224	224	224	224	546	545	570	664	689	689
21	ST	.13211E+06	42	9	9	110	110	110	110	110	110	321	321	347	405	435	436
22	ST	.74206E+05	71	31	31	132	131	131	132	131	131	358	358	375	446	468	468
32	BEND	.35894E+06	114	54	53	287	287	287	287	287	287	677	677	678	816	817	818
33	BEND	.31448E+06	105	47	47	268	268	268	268	268	268	638	637	641	770	773	773
36	BEND	.22874E+06	195	113	112	322	321	321	322	321	321	736	736	757	892	918	919
39	BEND	.42173E+06	128	63	63	304	304	304	304	304	304	711	711	716	857	862	863
42	BEND	.52002E+06	118	56	56	298	298	298	298	298	298	699	699	700	842	843	843
47	BEND	.64521E+05	138	75	74	254	253	253	254	253	254	603	602	628	733	761	763
54	BEND	.50250E+05	107	64	62	193	192	192	193	192	193	474	473	509	580	613	616
59	ST	.19580E+05	70	62	55	48	41	39	48	39	45	137	127	170	185	220	231
60	ST	.92303E+05	53	20	20	83	82	82	83	82	82	260	260	284	337	368	368
61	BEND	.23727E+06	61	21	21	144	143	143	144	143	143	388	388	410	482	509	509
62	BEND	.27410E+06	53	16	16	132	132	132	132	132	132	363	363	385	452	480	481
70	ST	.51190E+05	104	60	54	147	145	144	147	144	145	373	371	412	460	498	499

 * RHR11 MODEL *

EARTHQUAKE NO. 20

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.41403E+05	73	40	39	45	44	44	45	44	44	155	154	191	187	226	227
2	ST	.26054E+05	75	52	52	171	170	170	171	170	170	430	430	470	501	550	550
3	BEND	.1229E+06	55	36	36	150	150	150	150	150	150	393	393	430	461	507	508
6	BEND	.11922E+06	63	40	40	139	139	139	139	139	139	369	369	407	435	479	479
9	BEND	.10096E+06	72	53	53	205	205	205	205	205	205	499	498	533	568	608	609
16	BEND	.10359E+06	80	57	57	161	161	160	161	160	161	419	419	453	507	541	541
19	BEND	.24032E+06	76	56	55	240	240	240	240	240	240	572	571	601	653	689	690
20	BEND	.28816E+06	84	68	68	297	297	297	297	297	297	685	685	705	771	794	794
21	ST	.51886E+05	77	67	66	268	268	268	268	268	268	631	631	662	722	768	768
22	ST	.51367E+05	106	75	74	265	265	265	265	265	265	621	621	640	712	735	736
32	BEND	.49881E+06	39	39	39	263	263	263	263	263	263	618	618	619	690	691	691
33	BEND	.42929E+06	35	35	35	251	251	251	251	251	251	593	593	595	663	665	665
36	BEND	.30308E+06	77	59	59	281	281	281	281	281	281	652	651	660	732	743	744
39	BEND	.60195E+06	42	41	41	267	267	267	267	267	267	626	626	628	700	702	702
42	BEND	.71698E+06	43	44	44	277	277	277	277	277	277	645	645	646	720	720	720
47	BEND	.94787E+05	36	26	25	199	199	198	199	199	199	489	489	502	551	566	567
54	BEND	.57419E+05	66	48	47	215	215	215	215	215	215	518	517	546	582	610	612
59	ST	.20410E+05	75	47	37	38	34	32	38	32	36	134	127	175	167	213	218
60	ST	.63677E+05	81	49	48	156	156	156	156	156	156	410	409	442	495	537	538
61	BEND	.21953E+06	48	40	39	223	222	222	223	222	222	540	540	558	614	643	643
62	BEND	.24958E+06	45	34	34	207	206	206	207	206	206	508	508	527	579	610	610
70	ST	.36973E+05	141	91	83	245	242	242	245	242	242	565	561	622	641	696	698

IV-21

 * RHRS11 MODEL *

EARTHQUAKE NO. 21

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.90567E+05	133	28	28	20	20	20	20	20	20	106	106	132	131	157	158
2	ST	.36974E+05	192	74	73	130	130	129	130	129	130	349	348	412	442	497	498
3	BEND	.14522E+06	159	59	58	126	126	125	126	125	125	348	348	411	445	501	501
6	BEND	.18518E+06	159	52	52	93	93	93	93	93	93	276	275	331	351	405	405
9	BEND	.18380E+06	132	35	34	90	89	89	90	89	89	272	271	318	351	391	392
16	BEND	.15214E+06	152	60	59	120	120	120	120	120	120	340	340	393	438	482	483
19	BEND	.27905E+06	161	73	71	219	217	217	219	217	218	543	542	585	682	730	732
20	BEND	.37841E+06	154	61	60	213	213	213	213	213	213	536	536	563	677	711	712
21	ST	.12018E+06	148	59	58	189	188	183	189	188	188	495	494	540	638	676	677
22	ST	.61719E+05	178	92	90	245	244	244	245	244	245	595	594	624	738	773	774
32	BEND	.56372E+06	155	49	48	207	207	207	207	207	207	531	530	533	684	686	686
33	BEND	.48503E+06	147	44	44	197	196	196	197	196	196	510	509	514	658	661	662
36	BEND	.34845E+06	208	93	92	244	244	243	244	243	244	597	596	615	759	782	783
39	BEND	.64977E+06	171	58	58	224	224	224	224	224	224	570	570	574	732	735	735
42	BEND	.78047E+06	171	57	57	228	228	228	228	228	228	578	578	579	742	743	743
47	BEND	.99982E+05	161	59	59	183	182	182	183	182	182	477	476	499	616	633	635
54	BEND	.64847E+05	182	75	74	181	180	179	181	179	180	465	464	501	600	625	627
59	ST	.24175E+05	156	69	64	49	42	40	49	40	47	148	137	179	198	227	239
60	ST	.80459E+05	109	58	57	160	159	159	160	159	160	422	421	464	527	579	580
61	BEND	.21632E+06	179	77	77	232	231	231	232	231	232	583	582	617	745	780	781
62	BEND	.25831E+06	149	60	60	205	205	205	205	205	205	525	525	558	670	708	708
70	ST	.53582E+05	174	84	76	192	189	189	192	189	190	467	463	522	567	629	631

 * RHR511 MODEL *

EARTHQUAKE NO. 22

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.83159E+05	148	85	85	49	48	48	49	48	48	153	153	182	180	210	211
2	ST	.38282E+05	142	85	85	114	113	113	114	113	113	306	305	363	379	427	428
3	BEND	.16458E+06	94	50	50	89	89	89	89	89	89	266	266	319	336	382	382
6	BEND	.18464E+06	127	73	73	88	88	88	88	88	88	255	255	308	318	367	367
9	BEND	.16244E+06	116	66	65	105	104	104	105	104	104	290	289	337	358	398	399
16	BEND	.12570E+06	171	111	110	154	154	153	154	153	154	393	392	456	494	543	544
19	BEND	.31315E+06	83	44	42	162	160	160	162	160	161	419	417	456	521	555	556
20	BEND	.38120E+06	78	40	39	186	186	185	186	185	186	469	469	498	578	603	604
21	ST	.12862E+06	57	30	28	150	149	149	150	149	149	399	398	438	500	539	540
22	ST	.65066E+05	133	74	72	203	202	202	203	202	202	500	499	530	621	649	650
32	BEND	.65987E+06	6	-7	-8	141	140	140	141	140	141	380	380	382	470	472	472
33	BEND	.54890E+06	8	-6	-7	141	141	140	141	140	141	381	380	385	471	474	475
36	BEND	.38945E+06	107	43	42	187	186	186	187	186	187	465	464	483	575	596	598
39	BEND	.76453E+06	18	-2	-2	154	154	154	154	154	154	408	408	412	503	508	508
42	BEND	.94452E+06	7	-7	-7	149	149	149	149	149	149	399	399	401	492	493	494
47	BEND	.10597E+06	73	27	26	150	150	149	150	149	150	393	392	419	487	515	517
54	BEND	.66934E+05	101	60	58	160	158	158	160	158	160	401	399	447	495	536	539
59	ST	.31190E+05	76	49	44	31	24	22	31	22	29	105	95	136	142	170	181
60	ST	.79067E+05	118	64	63	146	145	145	146	145	145	388	387	427	494	535	536
61	BEND	.22432E+06	81	44	43	196	195	195	196	195	196	491	491	524	609	646	646
62	BEND	.28053E+06	59	28	27	159	159	159	159	159	159	418	417	447	520	553	554
70	ST	.51650E+05	173	98	88	187	183	162	187	182	184	452	447	515	557	612	615

 * RHRS11 MODEL *

EARTHQUAKE NO. 23

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.76826E+05	124	39	39	37	37	37	37	37	37	141	141	175	170	206	206
2	ST	.39980E+05	132	57	56	154	154	153	154	153	153	395	395	441	470	520	521
3	BEND	.17350E+06	99	25	35	131	131	131	131	131	131	354	354	397	426	474	474
6	BEND	.18746E+06	122	45	45	122	122	122	122	122	122	332	332	378	400	449	449
9	BEND	.15072E+06	127	60	60	188	187	187	188	187	187	462	461	502	539	581	581
16	BEND	.15485E+06	152	61	61	153	152	152	153	152	152	400	400	442	492	532	532
19	BEND	.40384E+06	84	38	38	187	186	186	187	186	186	466	466	491	550	581	581
20	BEND	.48432E+06	81	47	47	230	230	230	230	230	230	552	551	571	641	662	662
21	ST	.15204E+06	86	41	40	204	203	203	204	203	203	504	504	531	594	635	635
22	ST	.88060E+05	117	59	59	211	210	210	211	210	210	512	512	530	607	631	632
32	BEND	.61981E+06	54	53	53	293	293	293	293	293	293	678	678	679	775	777	777
33	BEND	.53795E+06	49	47	47	276	276	276	276	276	276	645	645	648	738	742	742
36	BEND	.40116E+06	120	85	85	304	304	304	304	304	304	694	694	708	804	825	826
39	BEND	.76977E+06	56	52	52	287	287	287	287	287	287	667	667	670	763	769	769
42	BEND	.92713E+06	52	52	52	292	292	292	292	292	292	676	676	677	773	774	774
47	BEND	.12228E+06	63	42	42	218	218	218	218	218	218	527	527	544	610	636	637
54	BEND	.74592E+05	85	61	59	232	231	231	232	231	232	551	550	581	636	668	671
59	ST	.30946E+05	52	21	17	21	17	15	21	15	20	107	101	141	141	176	184
60	ST	.10084E+06	125	49	49	148	148	148	148	148	148	391	391	421	483	526	527
61	BEND	.31805E+06	73	37	37	205	205	205	205	205	205	506	506	526	592	624	624
62	BEND	.37655E+06	64	28	28	181	181	181	181	181	181	458	458	477	538	568	568
70	ST	.64673E+05	129	71	67	198	197	197	198	197	197	477	475	519	565	607	609

IV-24

 * RHRS11 MODEL *

EARTHQUAKE NO. 24

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.95900E+05	109	90	90	47	46	46	47	46	46	140	140	166	166	194	194
2	ST	.40151E+05	128	104	103	118	117	117	118	117	117	303	303	359	374	425	425
3	BEND	.15970E+06	99	76	76	106	106	106	106	106	106	291	290	347	364	416	416
6	BEND	.19674E+06	109	88	88	90	90	90	90	90	90	248	240	300	308	359	359
8	BEND	.18189E+06	90	70	70	95	94	94	95	94	94	263	263	304	324	362	363
16	BEND	.14188E+06	137	109	109	136	135	135	136	135	136	347	346	405	438	487	487
19	BEND	.35845E+06	65	34	33	137	137	136	137	136	137	367	366	396	458	487	488
20	BEND	.46836E+06	49	22	22	142	142	142	142	142	142	379	379	400	469	487	489
21	ST	.13409E+06	52	28	28	145	145	144	145	144	145	387	386	421	482	522	523
22	ST	.76109E+05	106	59	58	171	170	170	171	170	170	432	431	454	539	565	566
32	BEND	.63136E+06	11	0	0	160	160	159	160	159	160	416	416	418	508	511	511
33	BEND	.52310E+06	14	1	1	161	161	161	161	161	161	419	418	422	511	515	516
36	BEND	.41433E+06	101	44	43	184	183	183	184	183	184	452	451	460	557	580	581
39	BEND	.81918E+06	10	-4	-4	144	144	144	144	144	144	388	388	391	475	480	481
42	BEND	.97358E+06	3	-6	-6	149	149	149	149	149	149	398	398	399	486	487	487
47	BEND	.13202E+06	39	3	3	108	107	107	108	107	108	307	306	326	383	408	409
54	BEND	.72587E+05	83	43	41	144	143	142	144	142	143	372	370	409	458	494	497
59	ST	.28973E+05	82	48	43	29	23	21	29	21	27	105	96	136	144	175	185
60	ST	.86051E+05	107	61	60	136	136	136	136	136	136	362	361	395	464	505	506
61	BEND	.25819E+06	59	31	30	165	165	165	165	165	165	426	426	452	528	562	562
62	BEND	.29247E+06	55	29	29	157	156	156	157	156	156	410	409	435	509	541	541
70	ST	.73714E+05	102	42	36	109	107	107	109	107	108	300	297	337	378	414	415

IV-25

 * RHR511 MODEL *

EARTHQUAKE NO. 25

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.10740E+06	93	20	20	12	12	12	12	12	12	85	85	106	107	131	131
2	ST	.45957E+05	107	36	35	76	76	75	76	75	76	232	231	273	292	334	335
3	BEND	.18157E+06	80	21	20	69	69	69	69	69	69	226	226	266	288	331	331
6	BEND	.22644E+06	86	20	20	49	49	49	49	49	49	181	181	217	231	270	270
9	BEND	.20416E+06	75	15	15	63	63	62	63	62	63	209	208	241	264	296	297
16	BEND	.15838E+06	115	45	44	94	94	93	94	93	94	276	275	317	352	393	393
19	BEND	.31986E+06	74	30	28	158	157	157	158	157	157	408	407	438	502	536	537
20	BEND	.39598E+06	69	27	26	179	178	178	179	178	179	454	453	476	556	580	580
21	ST	.13506E+06	60	18	17	138	137	137	138	137	137	376	375	407	473	505	506
22	ST	.65040E+05	116	59	58	202	202	201	202	201	202	497	496	522	606	637	638
32	BEND	.67589E+06	22	-3	-4	142	142	142	142	142	142	382	382	384	476	478	478
33	BEND	.56731E+06	22	-4	-4	140	140	139	140	139	140	378	378	381	471	474	474
36	BEND	.44492E+06	74	28	28	156	155	155	156	155	156	403	402	415	500	517	518
39	BEND	.79869E+06	27	-2	-2	148	148	148	148	148	148	399	398	401	495	498	498
42	BEND	.10487E+07	13	-11	-11	130	130	130	130	130	130	361	361	363	451	452	452
47	BEND	.10211E+06	79	29	28	161	160	160	161	160	161	418	418	440	521	540	542
54	BEND	.76268E+05	85	31	30	126	125	125	126	125	126	343	342	375	429	457	460
59	ST	.27306E+05	124	54	50	34	28	26	34	26	32	118	109	147	160	190	201
60	ST	.82384E+05	91	40	39	130	129	129	130	129	129	354	352	387	440	483	484
61	BEND	.26500E+06	59	18	18	152	151	151	152	151	151	404	404	427	505	530	531
62	BEND	.29973E+06	51	14	13	143	143	143	143	143	143	387	387	410	482	510	510
70	ST	.62171E+05	127	49	41	136	134	133	136	133	134	352	348	394	426	468	470

IV-26

 * RHR511 MODEL *

EARTHQUAKE NO. 26

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.51697E+05	72	48	48	48	47	47	48	47	47	158	157	195	192	232	233
2	ST	.30692E+05	93	60	60	168	168	168	168	168	168	425	425	468	504	553	554
3	BEND	.13330E+06	72	41	40	146	146	145	146	145	145	384	384	423	459	506	507
6	BEND	.14302E+06	78	47	47	135	135	134	135	134	135	359	359	401	431	477	477
9	BEND	.14152E+06	53	33	33	151	151	150	151	150	151	391	391	422	457	491	491
16	BEND	.13470E+06	86	49	49	137	136	136	137	136	136	370	370	403	457	489	489
19	BEND	.29255E+06	102	56	56	225	225	225	225	225	225	543	543	571	635	669	669
20	BEND	.37651E+06	92	55	55	251	250	250	251	250	250	593	593	612	683	705	705
21	ST	.11910E+06	74	50	50	223	223	223	223	223	223	544	544	571	635	676	677
22	ST	.63321E+05	150	79	79	251	251	251	251	251	251	594	594	613	698	720	721
32	BEND	.61762E+06	29	28	28	230	230	230	230	230	230	554	554	555	630	631	632
33	BEND	.51629E+06	29	28	27	228	228	228	228	228	228	550	550	552	626	629	629
36	BEND	.37816E+06	113	58	57	252	252	252	252	252	252	596	596	606	684	697	697
39	BEND	.77300E+06	52	26	26	222	222	222	222	222	222	539	539	541	614	617	617
42	BEND	.91410E+06	28	28	28	233	233	233	233	233	233	559	559	560	636	637	637
47	BEND	.10696E+06	60	34	33	202	201	201	202	201	202	496	496	512	570	588	589
54	BEND	.63705E+05	97	59	57	224	223	223	224	223	223	535	534	566	613	642	645
59	ST	.22930E+05	92	47	42	40	35	33	40	33	38	138	130	179	175	216	225
60	ST	.80988E+05	119	51	51	148	147	147	148	147	147	392	391	422	485	522	523
61	BEND	.25979E+06	65	39	39	211	211	211	211	211	211	518	518	537	601	630	630
62	BEND	.29555E+06	63	35	35	197	197	197	197	197	197	490	490	510	571	601	601
70	ST	.41389E+05	224	114	108	272	270	270	272	270	270	622	619	675	727	775	777

IV-27

 * RHR511 MODEL *

EARTHQUAKE NO. 27

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.40198E+05	116	61	61	41	41	40	41	40	41	145	144	184	176	218	218
2	ST	.18933E+05	164	99	98	176	175	175	176	175	175	433	432	492	528	597	598
3	BEND	.79944E+05	135	76	76	158	158	158	158	158	158	404	403	461	497	565	566
6	BEND	.93389E+05	134	74	73	131	131	130	131	130	131	346	346	402	426	487	488
9	BEND	.88711E+05	100	55	55	142	142	141	142	141	142	370	369	412	448	495	496
16	BEND	.87048E+05	148	77	77	143	142	142	142	143	142	376	375	420	471	514	514
19	BEND	.17541E+06	119	73	73	224	223	223	224	223	223	539	538	571	653	696	697
20	BEND	.21016E+06	106	74	73	264	264	264	264	264	264	620	620	645	742	770	771
21	ST	.83119E+05	86	42	41	176	176	176	176	176	176	449	448	478	545	593	593
22	ST	.51602E+05	88	49	48	160	160	160	160	160	160	413	413	430	508	532	533
32	BEND	.36130E+06	24	19	19	217	217	217	217	217	217	529	529	530	627	628	629
33	BEND	.30034E+06	26	20	20	217	217	217	217	217	217	530	529	532	628	631	631
36	BEND	.21621E+06	81	61	60	252	252	252	252	252	252	594	594	608	709	728	729
39	BEND	.41619E+06	33	28	28	237	237	237	237	237	237	568	566	571	673	677	677
42	BEND	.52495E+06	24	21	21	225	225	225	225	225	225	545	546	547	646	647	647
47	BEND	.70665E+05	31	18	17	160	160	159	160	159	160	412	412	429	495	517	519
54	BEND	.44323E+05	68	47	44	170	169	168	170	168	169	424	422	457	509	545	548
59	ST	.18711E+05	75	44	38	30	23	21	30	21	27	111	102	138	152	183	194
60	ST	.62028E+05	96	44	43	111	111	111	111	111	111	316	315	341	403	442	443
61	BEND	.17131E+06	68	34	33	176	176	176	176	176	176	448	448	469	542	577	577
62	BEND	.18263E+06	76	40	40	183	183	183	183	183	183	461	461	484	558	598	598
70	ST	.31523E+05	146	101	92	201	198	198	201	198	198	475	471	525	582	631	633

IV-28

 * RHRS:1 MODEL *

EARTHQUAKE NO. 28

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.62171E+05	100	28	28	39	38	38	39	38	38	147	146	182	175	217	218
2	ST	.38657E+05	97	44	44	131	131	131	131	131	131	350	349	388	413	468	468
3	BEND	.16570E+06	76	32	32	115	114	114	115	114	114	320	320	356	382	435	436
6	BEND	.17930E+06	87	35	35	105	105	105	105	105	105	299	299	338	358	410	411
9	BEND	.15467E+06	80	34	33	146	146	146	146	146	146	381	381	413	438	485	485
16	BEND	.18470E+06	76	35	35	94	94	94	94	94	94	280	280	307	347	379	379
19	BEND	.41932E+06	73	25	25	139	138	138	139	138	138	371	371	392	435	471	471
20	BEND	.55852E+06	57	15	14	147	147	147	147	147	147	389	389	403	447	469	470
21	ST	.14669E+06	72	44	44	185	185	185	185	185	185	463	463	488	535	589	589
22	ST	.83942E+05	133	56	56	176	176	176	176	176	176	445	445	459	526	544	544
32	BEND	.79085E+06	15	2	2	173	173	173	173	173	173	441	441	441	493	494	494
33	BEND	.65208E+06	17	4	4	176	175	175	176	175	176	445	445	447	498	501	501
36	BEND	.50203E+06	94	24	24	179	179	179	179	179	179	452	452	460	514	525	525
39	BEND	.97585E+06	21	2	2	171	171	171	171	171	171	436	436	438	488	492	492
42	BEND	.12021E+07	12	0	0	168	168	168	168	168	168	431	431	431	482	482	482
47	BEND	.13234E+06	61	14	13	159	159	159	159	159	159	411	411	426	465	487	488
54	BEND	.95595E+05	52	13	12	129	129	128	129	128	129	348	348	372	395	421	422
59	ST	.28859E+05	66	32	28	24	20	18	24	18	23	108	101	140	138	175	182
60	ST	.10785E+06	107	41	40	98	97	97	98	97	97	290	290	313	368	403	404
61	BEND	.33795E+06	54	22	22	156	156	156	156	156	156	407	407	424	468	505	505
62	BEND	.39471E+06	49	16	15	137	137	137	137	137	137	369	369	385	428	464	464
70	ST	.61304E+05	165	58	52	151	149	149	151	149	149	389	387	431	465	506	507

IV-29

 * RHR11 MODEL *

EARTHQUAKE NO. 29

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.94824E+05	93	40	40	25	25	25	25	25	25	116	115	140	140	165	165
2	ST	.43066E+05	112	51	50	106	105	105	106	105	105	298	298	347	369	410	410
3	BEND	.17207E+06	89	33	33	98	98	98	98	98	98	290	289	337	361	403	403
6	BEND	.21588E+06	86	33	33	71	71	71	71	71	71	230	230	273	287	328	328
9	BEND	.17874E+06	105	41	41	110	109	109	110	109	109	307	306	348	378	411	412
16	BEND	.13786E+06	137	74	74	145	145	144	145	144	145	385	384	439	481	524	524
19	BEND	.26068E+06	167	77	75	259	258	258	259	258	258	616	614	657	745	788	789
20	BEND	.30752E+06	206	92	91	319	318	318	319	318	318	736	736	767	886	917	917
21	ST	.10830E+06	161	72	71	252	251	251	252	251	251	608	607	653	746	790	791
22	ST	.59526E+05	176	88	87	268	267	267	268	267	267	633	632	659	764	796	797
32	BEND	.46372E+06	207	81	81	329	329	329	329	329	329	759	759	762	918	920	920
33	BEND	.40165E+06	195	75	74	312	312	312	312	312	312	725	725	729	877	891	881
36	BEND	.31224E+06	224	112	111	327	326	326	327	326	326	748	747	765	906	928	929
39	BEND	.52966E+06	229	94	94	358	358	358	358	358	358	820	820	824	990	995	995
42	BEND	.63547E+06	232	94	94	365	365	365	365	365	365	834	834	835	1006	1007	1007
47	BEND	.94509E+05	161	67	66	238	238	238	238	238	238	575	575	598	702	726	727
54	BEND	.69200E+05	146	60	58	195	194	194	195	194	195	483	482	516	592	617	620
59	ST	.27361E+05	92	40	35	29	24	22	29	22	27	117	109	151	157	189	199
60	ST	.71003E+05	119	66	65	182	181	181	182	181	181	464	463	509	572	625	626
61	BEND	.24553E+06	137	52	52	223	223	223	223	223	223	550	550	578	674	705	705
62	BEND	.26244E+06	138	53	53	227	227	227	227	227	227	558	557	587	681	715	716
70	ST	.48688E+05	175	90	83	217	214	214	217	214	215	517	513	577	616	675	677

IV-30

 * RHR511 MODEL *

EARTHQUAKE NO. 30

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBER (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.91543E+05	103	27	27	13	13	13	13	13	13	94	93	120	118	146	147
2	ST	.37235E+05	152	69	69	107	106	106	107	106	106	301	300	363	387	442	443
3	BEND	.13447E+06	151	73	73	123	123	122	123	122	122	339	338	408	436	500	500
6	BEND	.17772E+06	134	57	57	84	84	84	84	84	84	255	255	315	330	388	388
9	BEND	.16972E+06	114	38	38	82	81	81	82	81	81	255	255	305	332	376	377
16	BEND	.18708E+06	92	40	40	73	73	73	73	73	73	240	239	280	316	350	351
19	BEND	.33882E+06	105	44	42	130	129	128	130	128	129	363	362	401	470	508	509
20	BEND	.33691E+06	160	70	70	202	201	201	202	201	201	515	515	549	657	691	691
21	ST	.13635E+06	106	44	43	134	133	133	134	133	133	376	375	421	488	532	532
22	ST	.75059E+05	123	59	56	145	145	144	145	144	145	394	394	414	507	529	530
32	BEND	.38994E+06	212	80	80	282	281	281	282	281	282	687	686	690	874	877	877
33	BEND	.33311E+06	205	77	76	272	272	272	272	272	272	667	666	674	849	854	855
36	BEND	.26544E+06	246	111	110	281	280	280	281	280	280	676	675	696	858	880	881
39	BEND	.45053E+06	229	91	90	302	302	302	302	302	302	733	733	738	930	935	935
42	BEND	.57555E+06	210	78	78	283	283	283	283	283	283	693	693	694	881	882	882
47	BEND	.82461E+05	164	61	59	193	192	192	193	192	192	499	499	523	641	662	663
54	BEND	.55818E+05	169	72	70	179	178	177	179	177	178	463	462	497	596	620	623
59	ST	.20438E+05	137	74	68	55	46	44	55	44	52	157	145	187	212	242	255
60	ST	.11132E+06	63	27	27	72	71	71	72	71	71	241	240	268	319	350	351
61	BEND	.27527E+06	102	36	35	133	133	133	133	133	133	376	376	407	489	522	522
62	BEND	.31031E+06	94	33	32	125	125	125	125	125	125	360	360	392	468	504	504
70	ST	.34811E+05	285	169	156	268	262	262	268	262	263	616	609	700	770	845	848

 * RHR511 MODEL *

EARTHQUAKE NO. 31

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.10291E+06	110	54	53	24	24	24	24	24	24	102	102	123	127	150	151
2	ST	.49934E+05	94	43	42	63	62	62	63	62	62	202	202	242	259	296	296
3	BEND	.12568E+06	70	25	25	56	56	56	56	56	56	197	197	237	255	294	294
6	BEND	.25103E+06	74	28	28	37	37	37	37	37	37	152	152	186	198	233	233
9	BEND	.19848E+06	84	36	36	68	68	68	68	68	68	216	215	250	274	305	306
16	BEND	.15326E+06	131	68	67	99	98	98	99	98	98	278	277	324	356	397	397
19	BEND	.32107E+06	78	31	30	149	148	148	149	148	148	392	391	420	491	519	520
20	BEND	.40924E+06	64	25	24	165	164	164	165	164	165	426	425	447	530	549	550
21	ST	.13428E+06	52	15	14	135	134	134	135	134	134	368	367	398	466	496	497
22	ST	.68696E+05	115	55	54	178	177	177	178	177	177	449	448	471	562	585	586
32	BEND	.60549E+06	14	0	0	168	168	168	168	168	168	434	434	436	539	541	542
33	BEND	.52509E+06	11	-2	-3	157	157	157	157	157	157	412	412	415	514	517	517
36	BEND	.36856E+06	100	55	54	208	207	207	208	207	208	505	505	520	630	649	650
39	BEND	.69961E+06	24	6	6	183	183	183	183	183	183	466	466	470	578	582	582
42	BEND	.85860E+06	16	1	1	180	180	180	180	180	180	460	460	461	571	571	572
47	BEND	.11611E+06	42	11	11	130	130	130	130	130	130	356	355	374	449	467	468
54	BEND	.71919E+05	69	31	30	138	137	137	138	137	138	367	365	399	461	489	492
59	ST	.27396E+05	80	36	32	24	18	15	24	15	22	104	95	133	145	174	185
60	ST	.82715E+05	106	45	44	119	118	118	119	118	118	331	330	363	426	462	463
61	BEND	.22716E+06	76	36	35	190	190	190	190	190	190	479	478	504	598	627	627
62	BEND	.28405E+06	57	19	19	152	152	152	152	152	152	404	403	427	507	534	534
70	ST	.75198E+05	80	25	19	88	86	86	88	86	86	263	260	296	335	364	366

 * RHRS11 MODEL *

EARTHQUAKE NO. 32

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.92506E+05	117	66	66	33	33	33	33	33	33	121	120	145	147	173	173
2	ST	.39634E+05	131	78	77	107	107	107	107	107	107	291	290	342	364	409	409
3	BEND	.16606E+06	92	47	47	88	88	88	88	88	88	263	262	311	334	377	378
6	BEND	.19667E+06	111	61	61	76	76	76	76	76	76	230	230	276	291	335	335
9	BEND	.18669E+06	131	79	79	125	124	124	125	124	124	327	326	374	405	447	447
10	BEND	.12084E+06	183	111	111	159	158	158	159	158	159	401	400	462	505	556	556
19	BEND	.29617E+06	92	49	48	185	184	184	185	184	185	464	463	497	575	609	609
20	BEND	.38010E+06	75	41	41	196	196	196	196	196	196	489	489	514	605	629	629
21	ST	.11595E+06	76	35	35	174	173	173	174	173	173	450	449	486	566	603	603
22	ST	.70518E+05	108	61	60	193	192	192	193	192	192	478	477	501	592	618	619
32	BEND	.63351E+06	7	-3	-3	153	153	153	153	153	153	407	407	409	509	511	511
33	BEND	.53316E+06	8	-3	-3	150	150	150	150	150	150	401	401	404	503	506	506
36	BEND	.38132E+06	89	54	54	202	202	201	202	201	202	496	495	512	619	640	641
39	BEND	.75727E+06	14	0	0	159	159	159	159	159	159	421	421	424	526	530	530
42	BEND	.91205E+06	8	-2	-2	161	161	161	161	161	161	424	424	425	530	531	531
47	BEND	.11163E+06	44	20	19	140	139	139	140	139	140	376	375	396	474	495	496
54	BEND	.64463E+05	81	53	52	168	167	167	168	167	168	424	420	463	531	564	567
59	ST	.25276E+05	83	55	50	40	33	31	40	31	37	124	115	159	167	202	213
60	ST	.73718E+05	132	72	71	174	174	173	174	174	173	441	440	478	552	597	598
61	BEND	.21705E+06	85	46	45	207	207	207	207	207	207	516	516	545	644	677	677
62	BEND	.26727E+06	67	32	32	176	176	176	176	176	176	452	452	479	565	596	596
70	ST	.58843E+05	120	73	67	168	166	165	168	165	166	415	412	458	510	552	554

IV-33

 * RHR511 MODEL *

EARTHQUAKE NO. 33

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.89684E+05	138	66	66	37	36	36	37	36	36	128	128	154	155	182	182
2	ST	.41079E+05	137	70	70	118	118	117	118	117	118	315	314	363	386	400	430
3	BEND	.16839E+06	101	45	45	104	104	104	104	104	104	296	295	342	366	409	410
6	BEND	.20277E+06	117	54	54	84	84	84	84	84	84	248	248	292	307	350	350
9	BEND	.17043E+06	115	57	57	120	120	120	120	120	120	322	322	361	391	426	427
16	BEND	.12922E+06	179	96	96	160	160	159	160	159	160	405	405	463	503	550	551
19	BEND	.30483E+06	97	55	54	214	213	213	214	213	213	520	519	551	528	661	662
20	BEND	.40104E+06	73	47	46	226	225	225	226	225	226	545	545	566	655	677	677
21	ST	.13331E+06	62	29	29	180	179	179	180	179	179	458	457	488	559	594	595
22	ST	.66275E+05	134	78	77	243	243	243	243	243	243	577	577	600	698	726	727
32	BEND	.61826E+06	22	20	20	217	217	217	217	217	217	530	530	531	635	637	637
33	BEND	.51890E+06	23	20	19	214	214	214	214	214	214	524	524	526	628	631	631
36	BEND	.40129E+06	93	56	56	233	232	232	233	232	232	553	553	567	668	688	689
39	BEND	.75742E+06	26	20	20	216	216	216	216	216	216	529	529	532	635	639	639
42	BEND	.90116E+06	22	20	20	223	223	223	223	223	223	544	543	545	651	652	652
47	BEND	.12689E+06	35	14	14	149	149	149	149	149	149	392	392	408	478	497	499
54	BEND	.67169E+05	83	55	54	202	201	201	202	201	202	491	490	525	592	624	627
59	ST	.27568E+05	71	39	35	30	25	23	30	23	28	115	106	149	154	189	198
60	ST	.81286E+05	119	57	56	160	159	159	160	159	159	413	412	448	513	557	558
61	BEND	.26850E+06	59	30	30	192	192	192	192	192	192	482	482	505	586	614	614
62	BEND	.31587E+06	51	22	22	172	172	172	172	172	172	441	441	464	537	564	564
70	ST	.68718E+05	98	48	42	143	141	141	143	141	142	368	366	405	448	484	486

IV-34

 * AFWSG1 MODE1 *

EARTHQUAKE NO. 1

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.62883E+05	269	90	87	105	104	100	105	100	100	357	355	396	432	471	475
14	BEND	.23916E+06	345	141	139	160	159	156	160	156	156	487	486	543	582	627	629
18	BEND	.40099E+06	324	140	139	151	150	149	151	149	150	469	469	496	563	582	582
23	BEND	.39804E+06	334	145	145	152	152	152	152	152	152	474	473	485	569	580	580
34	BEND	.28083E+06	264	101	100	115	115	113	115	113	113	387	387	428	467	498	499
44	BEND	.17447E+06	203	74	71	88	87	81	88	81	82	304	302	374	375	441	445
52	BEND	.22636E+06	276	112	111	118	118	117	118	117	117	391	390	428	473	507	508
62	BEND	.22087E+06	362	168	167	179	179	176	179	176	176	531	530	571	636	679	681
71	BEND	.71654E+06	364	167	167	178	177	176	178	176	176	530	529	555	635	660	661
76	BEND	.41848E+06	408	181	178	188	186	180	188	180	182	535	531	576	647	692	700
82	BEND	.79727E+06	369	171	171	180	180	179	180	179	179	536	536	506	642	662	663
86	BEND	.15369E+06	333	146	144	158	158	154	158	154	154	480	479	524	578	621	623
93	BEND	.64856E+06	268	108	107	119	118	116	119	116	116	394	393	425	475	507	508
98	BEND	.28362E+06	325	139	137	157	155	149	157	149	150	462	460	529	557	634	636
101	BEND	.31606E+06	216	89	85	103	102	95	103	95	95	345	343	407	419	474	475
108	BEND	.15548E+06	342	146	139	167	164	151	167	151	152	446	441	561	546	671	674
110	ST	.22759E+06	322	148	146	159	153	152	159	152	152	454	452	556	548	665	667
121	BEND	.26461E+06	111	70	70	49	49	48	49	48	48	140	140	156	180	197	197
132	BEND	.23720E+06	125	82	81	58	58	57	58	57	58	156	156	173	199	216	216
133	BEND	.23180E+06	128	83	83	61	61	60	61	60	60	154	154	174	196	218	218
134	BEND	.18182E+06	136	90	89	63	63	62	63	62	62	159	159	177	207	228	228
157	ST	.54203E+03	333	101	96	124	122	114	124	114	115	391	386	430	473	522	529
158	ST	.12545E+05	110	70	69	49	49	48	49	48	48	143	142	155	181	194	194

 * AFWSG1 MODEL *

EARTHQUAKE NO. 2

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	TEND	.65339E+05	274	115	112	118	117	113	118	113	114	385	383	425	464	510	514
14	BEND	.35516E+06	220	91	90	93	93	90	93	90	91	336	336	375	408	439	440
18	BEND	.57418E+06	233	99	99	95	94	94	95	94	94	342	342	361	415	429	429
23	BEND	.57592E+06	242	102	102	95	95	94	95	94	94	342	342	351	415	425	425
34	BEND	.30915E+06	261	117	116	116	116	114	116	114	114	390	389	428	470	499	500
44	BEND	.13470E+06	361	145	141	156	154	147	156	147	148	451	447	550	546	642	646
52	BEND	.28213E+06	244	98	98	93	92	92	93	92	92	334	334	365	407	436	437
62	BEND	.35127E+06	234	97	97	93	93	91	93	91	91	336	336	363	409	439	440
71	BEND	.10241E+07	272	122	122	116	116	115	116	115	115	390	389	410	471	492	493
76	BEND	.64127E+06	270	106	105	101	100	97	101	97	98	348	345	374	425	456	460
82	BEND	.11798E+07	264	117	117	110	110	110	110	110	110	378	378	392	457	473	473
86	BEND	.22910E+06	228	94	93	91	91	89	91	89	89	329	328	363	402	436	438
93	BEND	.88773E+06	197	78	78	75	75	73	75	73	73	296	295	321	362	388	389
98	BEND	.32021E+06	307	141	139	140	139	135	140	135	135	430	428	494	522	599	600
101	BEND	.50882E+06	111	37	35	40	39	35	40	35	36	205	204	248	257	296	296
108	BEND	.18394E+06	310	132	127	137	134	124	137	124	125	387	383	491	483	600	602
110	ST	.32679E+06	210	93	92	91	91	87	91	87	87	312	311	387	385	474	475
121	BEND	.16063E+06	159	159	159	133	133	133	133	133	133	252	252	269	325	346	347
132	BEND	.11405E+06	265	248	248	213	213	212	213	212	212	374	374	398	474	501	502
133	BEND	.12558E+06	275	219	219	187	187	185	187	185	185	326	325	352	414	450	450
134	BEND	.12233E+06	249	167	167	136	135	135	136	135	135	256	255	280	343	373	373
157	ST	.54938E+03	321	130	124	143	140	131	143	131	133	428	423	470	515	579	586
158	ST	.65813E+04	255	196	196	168	168	167	168	167	167	308	308	332	388	414	415

 * AFWSG1 MODEL *

EARTHQUAKE NO. 3 UNIFORM DAMPING *PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.82243E+05	303	30	25	58	56	50	58	50	51	248	246	281	301	333	336
14	BEND	.38223E+06	170	32	28	62	61	56	62	56	56	262	260	302	317	347	348
18	BEND	.65562E+06	104	20	19	40	40	38	40	38	38	217	216	239	266	280	280
23	BEND	.66660E+06	149	20	20	36	36	35	36	35	35	208	207	218	257	265	265
34	BEND	.41611E+06	105	17	14	41	40	37	41	37	37	215	215	250	264	288	289
44	BEND	.26865E+06	183	11	6	34	32	26	34	26	27	190	187	238	237	281	283
52	BEND	.37060E+06	104	8	8	23	23	22	23	22	22	175	175	203	220	243	244
62	BEND	.41039E+06	128	23	22	41	40	39	41	39	39	215	214	245	266	293	294
71	BEND	.12799E+07	115	30	29	49	48	47	49	47	47	231	231	256	284	304	304
76	BEND	.77351E+06	243	21	29	45	44	41	45	41	42	217	214	245	270	301	305
82	BEND	.14603E+07	111	26	25	43	43	42	43	42	42	220	220	240	271	288	288
86	BEND	.23857E+06	237	57	55	80	78	75	80	75	75	288	286	334	348	391	392
93	BEND	.10372E+07	191	18	17	36	36	33	36	33	33	200	199	228	247	274	275
98	BEND	.45379E+06	352	39	37	63	62	58	63	58	58	245	244	301	304	362	364
101	BEND	.63529E+06	171	25	21	44	43	36	44	38	38	196	195	236	240	278	278
108	BEND	.32793E+06	309	36	31	61	59	52	61	52	53	216	213	281	275	340	341
110	ST	.39708E+06	292	42	40	62	62	57	62	57	57	234	233	302	291	370	371
121	BEND	.51343E+06	97	-19	-20	-24	-24	-24	-24	-24	-24	15	15	20	44	53	53
132	BEND	.38451E+06	152	2	1	-3	-3	-4	-3	-4	-4	47	47	53	85	95	95
133	BEND	.37071E+06	161	6	6	0	0	0	0	0	0	50	50	59	88	102	102
134	BEND	.30927E+06	134	3	2	-1	-1	-1	-1	-1	-1	50	50	61	97	111	111
157	ST	.63014E+03	567	67	56	110	106	93	110	93	94	356	349	388	424	466	473
158	ST	.28523E+05	75	-31	-31	-36	-36	-37	-36	-37	-37	-2	-3	2	18	26	26

IV-37

 * AFWSG1 MODEL *

EARTHQUAKE NO. 4

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.11315E+06	223	47	46	40	39	36	40	36	37	213	211	240	264	290	292
14	BEND	.54028E+06	170	51	50	41	41	39	41	39	39	220	220	251	272	294	295
18	BEND	.92541E+06	144	47	47	31	31	30	31	30	30	199	199	215	249	258	258
23	BEND	.91972E+06	161	50	50	31	31	30	31	30	30	199	198	206	249	254	255
34	BEND	.56909E+06	139	41	40	29	29	28	29	28	28	194	194	220	242	259	260
44	BEND	.27121E+06	239	46	43	50	49	45	50	45	45	230	228	287	287	335	337
52	BEND	.45987E+06	154	44	44	28	28	27	28	27	27	190	190	214	239	258	259
62	BEND	.52804E+06	181	56	56	39	39	36	39	38	38	217	217	249	271	292	293
71	BEND	.18753E+07	139	45	44	28	27	27	28	27	27	191	191	205	240	252	252
76	BEND	.10202E+07	240	54	52	38	37	34	38	34	35	207	205	227	261	284	287
82	BEND	.20493E+07	153	49	49	31	30	30	31	30	30	198	198	209	248	258	259
86	BEND	.33999E+06	204	57	56	43	43	41	43	41	41	221	220	250	276	302	303
93	BEND	.14132E+07	194	34	34	21	21	20	21	20	20	174	174	194	220	240	240
98	BEND	.61315E+06	343	50	49	41	41	38	41	38	38	210	209	251	265	311	312
101	BEND	.84934E+06	110	2	0	0	0	-3	0	-3	-2	117	116	149	153	181	182
108	BEND	.38900E+06	308	32	28	35	34	27	35	27	28	174	172	234	229	292	293
110	ST	.51057E+06	282	47	46	40	39	36	40	36	36	200	199	256	254	321	321
121	BEND	.38443E+06	210	12	11	5	5	4	5	4	4	67	66	75	109	123	123
132	BEND	.47606E+06	137	-13	-13	-18	-18	-19	-18	-19	-19	29	28	35	62	72	72
133	BEND	.46833E+06	150	-10	-11	-16	-16	-17	-16	-17	-17	29	29	38	62	75	75
134	BEND	.33990E+06	106	-2	-3	-6	-6	-6	-6	-6	-6	47	47	57	91	106	106
157	ST	.95594E+03	328	55	51	58	56	50	58	50	51	249	245	274	305	338	343
158	ST	.19726E+05	207	3	3	-4	-4	-5	-4	-5	-5	52	52	61	87	99	99

 * AFWSG1 MODEL *

EARTHQUAKE NO. 5

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.91900E+05	601	36	33	44	42	37	44	37	37	221	219	249	272	296	299
14	BEND	.40855E+06	690	49	17	55	54	49	55	49	49	250	249	287	305	329	330
18	BEND	.69085E+06	661	43	42	38	37	36	38	36	36	215	215	236	267	278	279
23	BEND	.69000E+06	657	43	43	33	33	32	33	32	32	206	206	216	258	264	264
34	BEND	.46535E+06	575	27	26	28	28	25	28	25	25	192	191	221	239	257	257
44	BEND	.21896E+06	682	49	45	66	65	57	66	57	58	262	259	321	321	372	375
52	BEND	.34853E+06	622	40	39	33	33	32	33	32	32	202	201	231	253	275	276
62	BEND	.40815E+06	688	50	49	44	43	41	44	41	42	226	225	257	281	307	308
71	BEND	.13297E+07	701	51	51	45	45	43	45	43	43	228	228	253	283	301	302
76	BEND	.72128E+06	707	65	64	58	56	53	58	53	54	249	246	278	309	339	343
82	BEND	.15063E+07	686	49	49	40	40	40	40	40	40	220	220	239	273	289	289
86	BEND	.24104E+06	819	77	75	79	79	75	79	75	75	293	292	340	356	396	397
93	BEND	.10142E+07	647	44	43	42	41	39	42	39	39	216	215	247	268	294	294
98	BEND	.45194E+06	679	61	60	69	68	64	65	64	64	259	258	318	320	378	380
101	BEND	.47415E+06	799	74	71	93	92	85	93	85	96	302	300	358	360	408	409
108	BEND	.22216E+06	819	103	98	146	144	133	146	133	133	380	376	482	459	562	564
110	ST	.32877E+06	788	90	87	98	97	92	98	92	92	312	310	396	380	472	473
121	BEND	.39580E+06	29	8	8	-3	-3	-3	-3	-3	-3	49	49	56	80	90	90
132	BEND	.28727E+06	72	42	42	27	27	26	27	26	26	96	96	106	138	150	151
133	BEND	.34263E+06	52	18	18	6	6	5	6	5	5	61	60	70	94	107	107
134	BEND	.29496E+06	39	8	8	-1	-1	-1	-1	-1	-1	48	48	60	86	100	100
157	ST	.68561E+03	758	72	65	96	94	81	96	81	83	331	326	360	396	431	437
158	ST	.15039E+05	79	37	37	20	20	20	20	20	20	89	89	100	125	137	137

 * AFWCG1 MODEL *

EARTHQUAKE NO. 6

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELCM TYPE	STRESS (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.37836E+05	138	109	106	142	140	133	142	133	134	422	418	472	507	556	562
14	BEND	.17106E+06	154	115	113	150	149	145	150	145	145	448	446	506	536	585	587
18	BEND	.27885E+06	160	113	113	137	137	135	137	135	136	425	425	456	510	533	533
23	BEND	.28635E+06	157	111	110	128	128	127	128	127	127	405	405	420	488	501	502
34	BEND	.15619E+06	173	128	126	162	161	158	162	158	158	476	475	531	568	614	615
44	BEND	.10373E+06	120	131	127	156	153	144	156	144	146	421	416	502	513	592	598
52	BEND	.16123E+06	124	96	94	109	108	106	109	106	107	353	351	394	429	467	470
62	BEND	.17305E+06	158	120	118	143	142	137	143	137	138	432	430	476	521	566	569
71	BEND	.56809E+06	154	111	110	132	131	129	132	129	129	412	412	441	497	525	527
76	BEND	.35399E+06	153	131	128	146	143	134	146	134	137	421	414	469	514	568	578
82	BEND	.61411E+06	166	120	119	139	139	138	139	138	138	430	430	454	517	542	543
86	BEND	.10938E+06	164	129	127	154	153	146	154	146	147	454	452	508	547	601	604
93	BEND	.48243E+06	116	82	81	105	104	100	105	100	100	348	347	389	421	463	464
98	BEND	.25389E+06	111	92	90	119	117	109	119	109	109	360	356	431	437	516	518
101	BEND	.27214E+06	68	58	54	79	78	69	79	69	69	280	278	338	343	399	401
108	BEND	.12505E+06	155	145	138	172	168	150	172	150	151	434	428	555	532	661	666
110	ST	.19194E+06	121	122	120	140	138	129	140	129	130	387	385	499	471	597	599
121	BEND	.22269E+06	5	94	94	73	73	72	73	72	72	175	175	191	223	240	241
132	BEND	.13471E+06	71	206	206	173	173	171	173	171	171	334	334	359	412	438	439
133	BEND	.12676E+06	90	221	221	189	188	186	189	186	187	347	347	377	425	460	460
134	BEND	.15127E+06	38	119	119	93	92	92	93	92	92	201	201	218	262	284	284
157	ST	.31110E+03	164	151	143	196	192	178	196	178	182	525	516	578	631	692	705
158	ST	.96687E+04	30	110	110	88	88	87	88	87	87	201	201	214	251	265	266

IV-40

 * AFWSG1 MODEL *

EARTHQUAKE NO. 7

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.58996E+05	209	94	91	105	104	98	105	98	98	351	349	396	426	482	485
14	BEND	.26583E+06	185	97	95	112	112	108	112	108	108	377	376	433	457	505	507
18	BEND	.43030E+06	180	100	99	105	105	103	105	103	103	364	364	395	443	466	467
23	BEND	.42210E+06	199	110	105	108	108	107	108	107	107	370	369	384	450	463	468
34	BEND	.26498E+06	173	91	80	104	103	101	104	101	101	360	359	409	438	477	478
44	BEND	.10102E+06	545	157	151	203	201	190	203	190	191	553	548	664	668	772	777
52	BEND	.24872E+06	193	69	68	73	73	72	73	72	72	289	288	323	356	387	388
62	BEND	.24868E+06	230	109	109	115	114	112	115	112	113	384	383	419	468	506	508
71	BEND	.87402E+06	184	95	95	98	98	97	98	97	97	349	348	371	426	450	451
76	BEND	.52797E+08	274	94	92	98	96	93	98	93	94	335	332	367	414	455	460
82	BEND	.92647E+06	202	107	106	108	108	107	108	107	107	372	372	389	454	473	473
86	BEND	.16089E+06	240	114	112	121	121	117	121	117	117	394	392	438	481	528	530
93	BEND	.68352E+06	169	76	76	82	82	80	82	80	80	309	309	342	381	419	420
98	BEND	.32311E+06	224	89	87	99	97	92	99	92	93	331	329	391	410	401	483
101	BEND	.36604E+06	124	56	53	70	69	63	70	63	63	269	268	325	336	387	388
108	BEND	.17231E+06	284	120	113	135	131	119	135	119	119	374	368	476	472	584	587
110	ST	.25671E+06	211	98	96	108	107	102	108	102	102	341	339	432	421	526	528
121	BEND	.16819E+06	202	117	117	103	102	102	103	102	102	218	218	236	271	292	292
132	BEND	.12698E+06	293	174	174	156	156	155	156	155	155	303	303	325	371	397	397
133	BEND	.13205E+06	300	172	171	151	151	149	151	149	149	287	286	313	350	383	383
134	BEND	.15554E+06	181	78	78	70	70	69	70	69	69	170	170	186	220	238	238
157	ST	.51124E+03	282	120	114	138	135	124	138	124	125	412	407	456	493	571	571
158	ST	.72907E+04	281	140	140	119	118	117	119	117	117	245	245	264	303	323	323

17-11

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 * AFWSG1 MODEL *
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EARTHQUAKE NO. 8

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.71374E+05	224	68	63	91	89	80	91	80	81	317	315	360	381	425	428
14	BEND	.28628E+06	208	94	90	121	120	111	121	111	111	389	387	452	465	513	515
18	BEND	.49306E+06	129	75	73	79	78	75	79	75	75	304	303	344	372	398	398
23	BEND	.47569E+06	138	81	80	73	72	71	73	71	71	293	293	314	364	380	381
34	BEND	.33636E+06	131	57	54	74	73	67	74	67	67	287	286	337	349	385	386
44	BEND	.23203E+06	285	26	21	56	55	45	56	45	46	237	234	289	292	338	342
52	BEND	.27792E+06	181	51	50	54	53	51	54	51	52	245	244	287	306	338	340
62	BEND	.33168E+06	232	62	60	64	63	59	64	59	60	266	264	301	332	362	364
71	BEND	.10418E+07	17	68	66	66	66	63	66	63	63	273	272	302	340	362	363
76	BEND	.76576E+06	299	45	42	49	47	43	49	43	44	217	213	249	274	311	316
82	BEND	.10392E+07	219	88	87	84	84	82	84	82	82	313	312	340	387	408	409
86	BEND	.20503E+06	307	91	87	100	99	92	100	92	93	331	28	380	405	448	451
93	BEND	.10158E+07	272	36	34	45	44	40	45	40	40	207	.06	242	259	292	293
98	BEND	.62762E+06	346	23	20	37	36	31	37	31	32	177	174	218	223	268	270
101	BEND	.62472E+06	185	28	23	42	41	33	42	33	34	192	190	230	239	272	273
108	BEND	.27357E+06	440	79	70	96	93	79	96	79	80	285	279	355	356	430	434
110	ST	.55649E+06	258	14	12	26	24	20	26	20	20	152	150	203	195	254	255
121	BEND	.46351E+06	280	1	0	1	1	1	1	1	1	71	71	86	108	125	126
132	BEND	.58020E+06	190	-22	-23	-22	-22	-23	-22	-23	-23	31	30	42	59	72	72
133	BEND	.57988E+06	178	-22	-23	-23	-23	-24	-23	-24	-24	26	26	39	53	67	68
134	BEND	.38610E+06	175	-13	-13	-10	-10	-11	-10	-11	-11	52	51	62	86	99	99
157	ST	.58617E+03	366	109	99	153	150	133	153	133	134	442	436	482	520	576	581
158	ST	.21195E+05	322	7	7	6	6	5	6	5	5	78	78	88	116	126	127

IV-42

 * AFWSG1 MODEL *

EARTHQUAKE NO. 9

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	†	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
					2	3	4	5	6	7	8	9	10	11	12	13	14	
10	BEND	.66443E+05	46	44	39	64	62	56	64	56	56	262	259	300	321	359	362	
14	BEND	.29323E+06	43	48	44	72	71	65	72	65	66	285	284	334	348	387	388	
18	BEND	.50391E+06	30	37	35	44	44	42	44	42	42	228	227	258	285	305	305	
23	BEND	.43684E+06	35	44	43	43	43	42	43	42	42	225	225	243	283	297	297	
34	BEND	.32998E+06	24	26	23	42	42	38	42	38	38	221	220	261	274	305	305	
44	BEND	.13605E+06	88	72	65	116	114	103	116	103	103	363	359	434	441	505	509	
52	BEND	.23995E+06	38	42	41	49	48	47	49	47	47	234	233	272	293	324	325	
62	BEND	.26813E+06	52	57	56	63	62	60	63	60	60	266	266	301	333	364	366	
71	BEND	.88247E+06	51	57	56	61	60	58	61	58	58	264	263	289	329	350	351	
76	BEND	.50035E+06	72	69	68	74	72	68	74	68	69	279	275	314	350	392	397	
82	BEND	.10131E+07	46	52	51	53	53	52	53	52	52	248	248	268	311	328	328	
86	BEND	.18704E+06	65	59	56	68	67	62	68	62	63	270	268	312	336	375	377	
93	BEND	.79474E+06	28	26	25	32	32	29	32	29	29	196	195	226	249	280	281	
98	BEND	.31738E+06	79	68	66	80	78	73	80	73	73	281	278	347	354	425	427	
101	BEND	.45669E+06	37	19	15	35	34	28	35	28	28	188	187	231	237	275	277	
108	BEND	.18703E+06	149	103	95	125	121	109	125	109	110	337	331	435	426	529	531	
110	ST	.22084E+06	118	109	105	122	120	113	122	113	113	358	355	469	443	564	566	
121	BEND	.18231E+06	0	94	94	71	71	70	71	70	70	155	155	167	196	212	213	
132	BEND	.14696E+06	31	143	143	113	113	112	113	112	112	221	220	237	272	293	293	
133	BEND	.16834E+06	47	118	118	91	91	99	91	90	90	182	182	202	227	252	252	
134	BEND	.12254E+06	65	136	136	108	108	107	108	107	108	215	214	241	276	305	305	
157	ST	.52485E+03	97	87	77	122	119	106	122	106	107	381	375	419	457	509	515	
158	ST	.85580E+04	40	111	110	82	82	81	82	81	81	178	177	199	219	241	241	

IV-43

 * AFWSG1 MODEL *

EARTHQUAKE NO. 10

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.32817E+05	83	115	103	182	179	164	182	164	165	491	485	561	578	649	655
14	BEND	.13225E+06	102	127	114	216	214	198	216	198	199	570	566	660	670	752	755
18	BEND	.16938E+06	83	148	142	219	218	210	219	210	211	567	565	655	674	747	748
23	BEND	.12797E+06	101	229	226	280	279	275	280	275	275	677	675	744	808	867	869
34	BEND	.13826E+06	69	96	87	172	171	160	172	160	160	476	474	559	564	638	640
44	BEND	.10802E+06	86	81	71	148	145	131	148	131	133	411	406	483	493	565	570
52	BEND	.11012E+06	50	99	97	146	144	140	146	140	141	403	400	481	485	557	560
62	BEND	.10604E+06	108	151	148	204	202	195	204	195	196	520	517	610	628	712	718
71	BEND	.44591E+06	47	97	94	135	134	128	135	128	129	381	380	441	464	520	522
76	BEND	.19594E+06	178	204	199	241	235	224	241	224	229	571	560	669	693	807	823
82	BEND	.41478E+06	72	127	125	167	166	163	167	163	163	446	445	507	541	597	599
86	BEND	.13721E+06	44	61	57	87	86	79	87	79	80	282	279	343	348	415	418
93	BEND	.41031E+06	73	65	61	98	97	90	98	90	91	305	303	367	375	443	445
98	BEND	.17851E+06	155	116	113	143	141	132	143	132	133	381	377	494	471	591	594
101	BEND	.44883E+06	13	13	9	31	30	24	31	24	24	169	168	211	214	259	260
108	BEND	.17558E+06	67	80	73	93	90	78	93	78	79	274	269	360	345	441	444
110	ST	.17783E+06	105	110	106	127	126	117	127	117	118	338	335	459	416	549	551
121	BEND	.12872E+06	104	184	183	147	147	146	147	146	146	247	247	259	291	306	306
132	BEND	.10118E+06	148	244	243	199	199	198	199	198	198	322	322	335	377	393	393
133	BEND	.10489E+06	130	236	236	195	195	193	195	193	193	308	307	326	359	381	381
134	BEND	.86657E+05	87	225	224	179	179	178	179	178	178	293	293	314	352	375	375
157	ST	.37208E+03	91	118	102	184	180	160	184	160	162	495	487	544	581	638	645
158	ST	.56757E+04	136	204	203	163	163	162	163	162	162	276	276	293	322	340	341

IV-44

 * AFWSG1 MODEL *

EARTHQUAKE NO. 12

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.75191E+05	421	127	125	116	116	112	116	112	112	376	374	413	455	501	503
14	BEND	.30869E+06	463	174	172	160	159	156	160	156	156	476	475	529	572	618	619
18	BEND	.49110E+06	443	191	190	166	166	165	166	165	165	492	492	520	593	614	614
23	BEND	.49932E+06	451	192	191	163	163	162	163	162	162	484	483	495	583	598	598
34	BEND	.30944E+06	424	169	168	152	152	150	152	150	150	461	460	506	555	592	593
44	BEND	.18581E+06	396	99	96	106	105	100	106	100	100	347	345	421	425	496	499
52	BEND	.25143E+06	481	173	173	150	150	149	150	149	149	455	454	489	550	582	583
62	BEND	.29133E+06	461	195	194	169	169	168	169	168	168	498	497	530	601	636	638
71	BEND	.10394E+07	413	172	172	148	148	147	148	147	147	451	451	470	545	566	567
76	BEND	.57307E+06	639	180	179	158	157	154	158	154	155	465	463	494	565	601	605
82	BEND	.10399E+07	465	207	207	178	178	178	178	178	178	519	519	534	625	642	642
86	BEND	.19393E+06	494	182	181	162	161	159	162	159	159	478	477	518	578	621	622
93	BEND	.80980E+06	392	143	142	123	123	122	123	122	122	395	394	424	480	514	515
98	BEND	.34287E+06	505	174	172	158	157	153	158	153	153	460	458	520	560	635	637
101	BEND	.41827E+06	321	99	96	95	95	90	95	90	90	323	322	382	398	450	451
108	BEND	.19162E+06	571	160	154	160	157	146	160	146	147	432	427	539	539	660	662
110	ST	.32159E+06	410	133	131	121	120	117	121	117	117	373	372	452	458	552	553
121	BEND	.34763E+06	175	9	9	-1	-1	-1	-1	-1	-1	53	53	63	83	95	95
132	BEND	.19161E+06	375	89	89	70	70	70	70	70	70	167	167	182	219	238	238
133	BEND	.21484E+06	322	74	74	56	56	54	56	54	54	139	138	156	184	206	206
134	BEND	.19210E+06	233	50	50	38	38	38	38	38	38	119	118	135	167	185	185
157	ST	.68566E+03	542	125	121	124	122	115	124	115	116	386	382	420	456	527	532
158	ST	.13990E+05	236	31	30	15	15	14	15	14	14	81	80	92	115	127	127

IV-45

 * AFWSG1 MODEL *

EARTHQUAKE NO. 13

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.54404E+05	276	143	141	119	119	115	119	115	115	406	405	438	482	512	514
14	BEND	.22801E+06	333	188	186	156	155	153	156	153	153	496	495	537	585	618	618
18	BEND	.37439E+06	346	197	197	155	154	154	155	154	154	498	498	517	588	601	602
23	BEND	.37827E+06	350	199	198	152	152	152	152	152	152	494	493	502	583	590	591
34	BEND	.22525E+06	333	188	188	153	152	151	153	151	151	491	490	526	579	607	607
44	BEND	.15043E+06	266	104	101	96	96	90	96	90	91	334	333	399	404	463	465
52	BEND	.22964E+06	269	136	135	102	102	101	102	101	101	370	370	396	442	465	468
62	BEND	.23469E+06	339	187	187	148	148	145	148	145	146	479	478	508	567	596	527
71	BEND	.74688E+06	346	196	196	153	153	152	153	152	152	493	493	512	583	601	601
76	BEND	.30901E+06	416	221	219	179	178	173	179	173	174	538	536	572	639	676	679
82	BEND	.80073E+06	370	212	212	165	165	164	165	164	164	523	522	538	616	631	632
86	BEND	.13731E+06	374	210	209	172	172	169	172	169	169	531	531	572	628	666	668
93	BEND	.58165E+06	298	164	163	130	130	128	130	128	128	435	435	463	517	545	546
98	BEND	.25314E+06	345	189	188	165	164	159	165	159	160	500	499	564	592	663	665
101	BEND	.34911E+06	165	82	80	72	72	67	72	67	67	287	286	338	347	390	391
108	BEND	.12641E+06	385	194	189	202	201	186	202	186	187	529	527	662	632	767	770
110	ST	.21974E+06	294	165	164	145	144	139	145	139	139	445	444	536	530	630	631
121	BEND	.18173E+06	104	73	73	55	55	54	55	54	55	164	164	184	211	232	232
132	BEND	.13492E+06	182	123	123	100	100	99	100	99	99	241	241	266	302	328	328
133	BEND	.13741E+06	196	120	120	99	99	97	99	97	98	228	228	256	286	316	316
134	BEND	.13635E+06	193	81	80	60	60	59	60	59	59	173	173	192	222	243	243
157	ST	.41777E+03	343	175	169	162	160	151	162	151	152	491	489	530	564	625	629
158	ST	.70523E+04	222	117	117	91	91	89	91	89	89	226	226	244	285	301	302

IV-46

 * AFWSG1 MODEL *

EARTHQUAKE NO. 11

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.10293E+06	215	74	73	60	60	53	60	58	58	253	252	278	312	343	344
14	BEND	.50218E+06	216	76	76	61	61	60	61	60	60	257	257	288	317	345	345
18	BEND	.84375E+06	218	78	78	58	58	58	58	58	58	252	252	266	311	323	324
23	BEND	.85952E+06	218	78	78	56	56	56	56	56	56	247	247	253	306	313	314
34	BEND	.50713E+06	209	73	72	56	56	55	56	55	55	247	247	273	306	328	328
44	BEND	.23746E+06	194	63	61	61	60	57	61	57	57	246	244	302	307	363	365
52	BEND	.42986E+06	202	68	68	50	50	49	50	49	49	232	231	250	288	307	307
62	BEND	.54070E+06	198	67	67	49	49	48	49	48	48	230	229	246	286	304	305
71	BEND	.16699E+07	218	78	78	58	58	57	58	57	57	250	250	261	310	322	322
76	BEND	.97258E+06	214	74	73	56	56	54	56	54	55	241	240	257	302	321	324
82	BEND	.19036E+07	215	77	76	56	56	55	56	55	55	246	246	254	305	313	313
86	BEND	.31555E+06	220	81	80	63	62	61	63	61	61	259	258	280	320	344	345
93	BEND	.12514E+07	193	65	64	48	47	47	48	47	47	227	226	244	282	303	304
98	BEND	.52435E+06	228	86	85	71	71	68	71	68	69	272	271	309	337	383	384
101	BEND	.66710E+06	112	25	24	18	18	15	18	15	15	157	157	191	202	233	234
108	BEND	.28406E+06	189	72	68	69	67	60	69	60	61	247	244	317	312	391	393
110	ST	.43136E+06	208	79	78	66	65	63	66	63	63	255	254	311	317	382	383
121	BEND	.25486E+06	57	50	50	35	35	34	35	34	35	115	115	128	149	163	164
132	BEND	.19217E+06	100	90	90	71	71	70	71	70	70	173	173	189	217	234	235
133	BEND	.18985E+06	107	94	94	75	75	74	75	74	74	173	172	192	215	237	237
134	BEND	.14575E+06	118	98	98	80	80	79	80	79	79	189	188	211	238	262	262
157	ST	.83476E+03	244	87	84	80	79	74	80	74	75	291	288	316	357	402	405
158	ST	.11132E+05	74	65	65	46	46	45	46	45	45	135	134	147	172	185	185

IV-47

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 * AFWSG1 MODEL *
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EARTHQUAKE NO. 14

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.81848E+05	232	85	83	73	72	69	73	69	70	293	292	321	355	379	380
14	BEND	.38614E+06	241	95	93	80	79	77	80	77	77	312	312	345	376	399	399
18	BEND	.67848E+06	227	87	87	66	66	65	66	65	66	284	284	299	344	353	353
23	BEND	.87717E+06	234	91	90	66	66	66	66	66	66	285	284	291	345	350	351
34	BEND	.41940E+06	209	77	76	61	61	59	61	59	60	271	270	297	328	346	346
44	BEND	.16961E+06	302	100	98	101	100	95	101	95	95	348	346	419	420	480	482
52	BEND	.29650E+06	270	107	107	83	83	82	83	82	83	321	321	347	388	409	409
62	BEND	.40793E+06	233	88	88	67	67	66	67	66	66	284	284	304	345	363	364
71	BEND	.12774E+07	245	98	98	75	75	74	75	74	74	302	302	317	366	377	378
76	BEND	.67346E+06	288	112	111	89	89	87	89	87	87	330	329	352	400	424	425
82	BEND	.14066E+07	254	103	103	78	78	77	78	77	78	311	311	322	376	385	385
86	BEND	.23830E+06	260	106	105	86	86	84	86	84	84	323	323	354	391	417	417
93	BEND	.95873E+06	222	83	83	64	64	63	64	63	63	276	276	297	336	355	355
98	BEND	.41729E+06	263	99	99	85	85	82	85	82	82	315	314	361	383	432	433
101	BEND	.53974E+06	132	42	40	37	36	33	37	33	33	201	200	242	248	280	281
108	BEND	.21222E+06	277	106	102	112	111	102	112	102	103	339	337	430	416	507	509
110	ST	.30319E+06	283	119	118	106	106	102	106	102	102	354	353	427	429	511	511
121	BEND	.19688E+06	107	55	55	38	38	37	38	37	37	126	125	139	178	197	197
132	BEND	.17532E+06	120	67	67	48	48	47	48	47	47	144	143	158	200	219	220
133	BEND	.18549E+06	139	62	61	45	45	44	45	44	44	131	130	148	185	208	209
134	BEND	.14396E+06	91	68	68	50	50	50	50	50	50	147	147	167	212	235	235
157	ST	.61577E+03	299	113	108	112	110	103	112	103	104	374	371	404	447	482	485
158	ST	.81620E+04	165	83	83	59	58	57	59	57	57	163	163	181	219	238	239

94-48

 * AFWSG1 MODEL *

EARTHQUAKE NO. 15

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.66748E+05	605	30	26	51	50	44	51	44	44	234	232	268	285	315	317
14	BEND	.31085E+06	624	30	27	52	51	46	52	46	48	241	240	283	293	323	324
18	BEND	.50048E+06	583	25	24	38	38	36	38	36	36	216	215	242	266	282	282
23	BEND	.50770E+06	556	23	22	30	30	29	30	29	29	199	199	212	249	257	257
34	BEND	.31653E+06	575	22	19	40	39	36	40	36	36	217	216	254	265	292	292
44	BEND	.19553E+06	490	20	16	39	38	31	39	31	32	201	199	249	249	291	294
52	BEND	.31547E+06	420	0	0	7	7	6	7	6	6	143	142	169	183	203	204
62	BEND	.32792E+06	523	18	17	28	27	25	28	25	25	190	190	217	239	260	261
71	BEND	.12298E+07	458	3	2	11	11	9	11	9	9	152	152	172	194	208	209
76	BEND	.55486E+06	606	42	40	49	48	44	49	44	45	230	229	262	289	320	323
82	BEND	.11794E+07	542	19	19	27	27	26	27	26	26	190	190	208	239	252	253
86	BEND	.20320E+06	644	36	34	49	49	45	49	45	45	229	228	270	284	318	319
93	BEND	.87656E+06	475	5	4	16	15	13	16	13	13	160	159	186	203	225	226
98	BEND	.43182E+06	474	10	9	24	24	20	24	20	20	168	167	213	216	261	262
101	BEND	.61886E+06	410	-11	-13	1	0	-3	1	-3	-3	113	112	145	146	174	175
108	BEND	.25052E+06	560	30	26	50	49	41	50	41	41	199	197	265	256	322	324
110	ST	.39615E+06	427	4	2	16	16	12	16	12	12	144	143	197	187	245	245
121	BEND	.30898E+06	80	-2	-2	-13	-13	-13	-13	-13	-13	41	41	49	73	80	83
132	BEND	.32653E+06	65	-12	-12	-21	-21	-22	-21	-22	-22	28	28	34	57	65	65
133	BEND	.38453E+06	62	-23	-23	-30	-30	-31	-30	-31	-31	8	8	15	33	43	43
134	BEND	.18792E+06	132	24	24	11	11	11	11	11	11	82	82	94	127	140	141
157	ST	.57685E+03	720	52	44	83	81	69	83	69	70	295	292	326	355	388	392
158	ST	.13650E+05	130	7	7	-6	-6	-7	-6	-7	-7	53	53	61	87	95	95

IV-49

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 * AFWSG1 MODEL *
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EARTHQUAKE NO. 16

UNIFORM DAMPING

*PIPE STRESSES(*NERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.47913E+05	150	63	57	88	86	80	88	80	80	315	312	354	386	425	428
14	BEND	.21427E+06	93	67	63	95	94	90	95	90	90	341	340	388	415	451	452
18	BEND	.36058E+06	58	60	59	77	76	75	77	75	75	305	304	330	373	389	389
23	BEND	.37539E+06	70	56	55	67	66	66	67	66	66	282	281	294	347	358	358
34	BEND	.22026E+06	64	57	55	80	80	77	80	77	77	310	309	350	379	408	408
44	BEND	.13767E+06	184	61	55	84	82	75	84	75	75	293	290	351	364	416	419
52	BEND	.19479E+06	97	53	51	63	63	61	53	61	61	268	268	301	333	359	360
62	BEND	.24431E+06	75	48	47	63	62	59	63	59	60	269	268	298	333	360	361
71	BEND	.86456E+06	39	34	34	46	46	44	46	44	44	234	234	253	292	308	309
76	BEND	.42147E+06	192	82	76	91	89	83	91	83	84	318	314	354	396	436	441
82	BEND	.86677E+06	56	50	49	62	62	61	62	61	61	271	270	288	334	350	351
86	BEND	.13962E+06	134	74	72	93	92	87	93	87	88	333	331	377	410	450	452
93	BEND	.60258E+06	90	37	36	55	55	52	55	52	52	251	250	281	311	341	342
98	BEND	.30839E+06	162	38	37	55	64	59	65	59	59	258	256	313	322	382	383
101	BEND	.39787E+06	51	7	5	25	24	19	25	19	19	172	171	213	222	259	259
108	BEND	.16791E+06	225	67	62	96	95	83	96	83	84	295	292	384	375	466	468
110	ST	.25147E+06	142	45	43	69	68	62	69	62	63	257	256	336	325	411	413
121	BEND	.22384E+06	107	27	27	26	26	25	26	25	25	112	112	123	161	179	179
132	BEND	.21351E+06	106	27	27	26	26	25	26	25	25	113	113	124	163	179	180
133	BEND	.21604E+06	112	29	29	27	27	26	27	26	26	107	107	121	156	176	176
134	BEND	.18401E+06	67	22	22	25	25	25	25	25	25	110	110	121	167	180	190
157	ST	.41546E+03	253	89	76	121	118	105	121	105	107	378	371	416	460	510	515
158	ST	.10385E+05	120	33	33	24	24	23	24	23	23	111	111	121	156	168	168

05-AT

 * AFWSG1 MODEL *

EARTHQUAKE NO. 17

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.42988E+05	117	55	50	80	78	72	80	72	73	288	285	327	353	388	391
14	BEND	.22054E+06	77	39	36	63	62	58	63	58	58	256	255	295	315	346	347
18	BEND	.34563E+06	36	42	41	56	55	54	56	54	54	244	244	267	301	317	317
23	BEND	.34695E+06	25	44	43	51	51	50	51	50	50	234	233	246	290	299	299
34	BEND	.17984E+06	89	64	62	88	88	85	88	85	85	315	314	357	383	416	417
44	BEND	.12349E+06	176	60	56	83	81	73	83	73	74	275	271	331	342	395	399
52	BEND	.18151E+06	74	41	40	50	49	47	50	47	48	225	224	256	281	307	308
62	BEND	.20355E+06	69	55	54	69	68	64	69	64	65	269	268	303	333	364	367
71	BEND	.65361E+06	53	53	52	64	63	61	64	61	61	261	260	286	323	344	345
76	BEND	.41047E+06	156	64	60	73	71	64	73	64	65	266	262	305	334	376	382
82	BEND	.70047E+06	50	60	59	70	70	68	70	68	68	275	275	298	339	359	360
86	BEND	.13934E+06	99	53	51	68	67	61	68	61	62	265	263	306	328	367	369
93	BEND	.59084E+06	50	26	25	41	40	37	41	37	37	206	205	240	258	291	292
98	BEND	.30781E+06	81	34	23	55	55	48	55	48	48	226	224	284	283	343	346
101	BEND	.26829E+06	136	44	41	63	62	53	63	53	53	246	244	303	308	361	363
108	BEND	.11516E+06	239	132	124	160	157	136	160	136	138	414	410	535	514	635	640
110	ST	.26844E+06	78	32	30	46	45	39	46	39	39	200	198	275	254	334	335
121	BEND	.23271E+06	67	48	48	34	34	33	34	33	33	126	126	145	174	196	196
132	BEND	.12343E+06	202	168	167	141	141	139	141	139	139	308	308	341	395	432	433
133	BEND	.12408E+06	194	164	164	140	140	137	140	137	138	294	293	331	376	419	420
134	BEND	.16162E+06	82	60	60	42	41	41	42	41	41	142	142	158	195	213	214
157	ST	.34217E+03	236	93	83	132	128	116	132	116	117	393	385	434	477	522	528
158	ST	.10234E+05	80	65	54	47	47	46	47	46	46	148	148	160	199	212	212

IV-51

 * AFWSG1 MODEL *

EARTHQUAKE NO. 18

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.67683E+05	189	92	90	102	101	98	102	98	99	350	349	380	421	448	449
14	BEND	.33197E+06	194	94	93	103	103	101	103	101	101	355	355	388	426	452	452
18	BEND	.54718E+06	204	99	99	103	103	103	103	103	103	358	356	373	430	441	441
23	BEND	.55108E+06	207	101	101	103	103	103	103	103	103	357	357	364	429	435	435
34	BEND	.32389E+06	199	97	96	104	104	103	104	103	103	358	358	387	430	451	452
44	BEND	.16770E+06	163	81	78	93	92	87	93	87	88	318	316	384	387	447	449
52	BEND	.28587E+06	182	86	85	88	88	88	88	88	88	322	322	345	389	409	410
62	BEND	.31214E+06	222	112	111	116	116	115	116	115	115	385	385	407	462	484	485
71	BEND	.10238E+07	222	111	111	115	115	114	115	114	114	384	384	398	460	473	474
76	BEND	.62645E+06	203	101	99	103	103	100	103	100	101	350	349	372	424	447	449
82	BEND	.11533E+07	223	112	112	115	115	115	115	115	115	384	384	394	460	471	471
86	BEND	.20511E+06	206	104	103	109	109	107	109	107	107	368	367	395	443	468	469
93	BEND	.83915E+06	171	79	79	84	84	83	84	83	83	313	312	332	378	397	398
98	BEND	.33214E+06	223	116	116	127	127	124	127	124	124	401	400	449	481	534	535
101	BEND	.46093E+06	95	35	34	44	44	40	44	40	40	217	216	255	267	299	300
108	BEND	.19670E+06	169	87	84	105	104	96	105	96	97	325	324	410	397	482	484
110	ST	.28273E+06	196	102	101	112	111	108	112	108	108	361	360	430	435	512	512
121	BEND	.14713E+06	49	106	106	86	86	85	86	85	85	212	212	234	270	294	294
132	BEND	.11672E+06	82	149	149	124	124	123	124	123	123	278	277	303	348	375	376
133	BEND	.11784E+06	104	149	148	127	127	125	127	125	125	269	268	296	336	369	369
134	BEND	.84410E+05	129	183	183	157	157	156	157	156	156	335	335	366	418	451	451
157	ST	.51439E+03	225	121	116	138	137	131	138	131	131	425	423	460	510	547	551
158	ST	.54797E+04	105	170	169	135	135	133	135	133	133	296	296	319	369	391	392

IV-52

 * AFWSG1 MODEL *

EARTHQUAKE NO. 19

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.69539E+05	105	5	3	16	15	10	16	10	11	156	154	187	200	232	236
14	BEND	.29320E+06	69	17	15	27	27	23	27	23	23	186	185	224	233	267	269
18	BEND	.50000E+06	25	10	9	10	10	9	10	9	9	151	150	172	193	210	211
23	BEND	.49203E+06	37	13	13	9	9	8	9	8	8	148	147	158	190	201	202
34	BEND	.33764E+06	30	-2	-2	4	4	1	4	1	1	134	134	164	174	198	199
44	BEND	.12778E+06	441	63	60	91	89	80	91	80	81	303	299	377	379	447	454
52	BEND	.26485E+06	126	7	6	6	6	4	6	4	5	136	135	166	178	207	208
62	BEND	.30122E+06	111	17	16	20	19	16	20	16	17	167	166	201	214	248	251
71	BEND	.10038E+07	50	12	11	11	11	9	11	9	9	151	150	174	194	217	219
76	BEND	.53084E+06	302	41	39	46	43	37	46	37	39	210	206	246	270	310	318
82	BEND	.10823E+07	60	16	16	14	14	13	14	13	13	158	158	177	203	221	223
86	BEND	.18273E+06	138	33	31	39	38	33	39	33	34	206	204	247	260	299	302
93	BEND	.81039E+06	95	5	4	12	11	8	12	8	8	144	143	175	185	217	219
98	BEND	.38096E+06	200	30	28	45	44	38	45	38	39	195	193	247	245	302	304
101	BEND	.35949E+06	117	31	29	45	44	36	45	36	37	203	201	255	256	301	303
108	BEND	.16023E+06	297	102	96	124	121	106	124	106	108	324	319	423	400	503	507
110	ST	.37732E+06	137	25	23	31	30	26	31	26	27	147	146	212	189	261	262
121	BEND	.29961E+06	181	82	82	68	68	68	68	68	68	138	137	150	172	184	184
132	BEND	.23343E+06	246	123	122	106	106	105	106	105	105	192	192	207	234	249	249
133	BEND	.23894E+06	224	110	110	95	94	94	95	94	94	173	173	189	213	229	229
134	BEND	.25120E+06	159	71	71	60	60	59	60	59	60	122	122	132	159	171	171
157	ST	.54887E+03	233	32	28	56	53	44	56	44	46	237	231	270	295	339	345
158	ST	.11972E+05	226	106	106	89	89	88	89	88	88	172	172	183	208	218	219

CS-AT
 IV-53

 * AFWSG1 MODEL *

EARTHQUAKE NO. 20

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.26263E+05	730	104	96	181	176	165	181	165	167	506	498	592	601	688	697
14	BEND	.12071E+06	694	94	86	175	172	163	175	163	164	504	499	602	598	688	692
18	BEND	.18246E+06	429	85	82	142	141	137	142	137	137	440	438	513	531	590	592
23	BEND	.18403E+06	208	82	80	119	118	116	119	116	117	390	388	429	478	511	513
34	BEND	.11560E+06	617	86	87	161	159	152	161	152	153	478	474	572	570	653	656
44	BEND	.65509E+05	724	165	157	240	235	219	240	219	223	594	584	734	716	856	868
52	BEND	.10642E+06	357	76	75	114	112	109	114	109	111	364	361	447	446	526	530
62	BEND	.13149E+06	255	74	72	117	115	106	117	106	108	369	366	439	455	523	530
71	BEND	.37533E+06	241	86	84	127	126	121	127	121	122	404	401	462	496	549	554
76	BEND	.27758E+06	378	89	87	125	119	109	125	109	114	368	359	433	458	532	546
82	BEND	.4333CE+06	227	78	77	116	115	112	116	112	112	379	378	425	466	509	512
86	BEND	.85061E+05	388	101	96	131	139	128	141	128	130	418	413	499	513	589	596
93	BEND	.38143E+06	338	51	48	90	89	81	90	81	82	309	306	370	380	441	444
98	BEND	.18424E+06	540	110	107	156	154	142	156	142	144	405	401	502	493	596	601
101	BEND	.28365E+06	296	37	32	58	56	46	58	46	47	221	218	277	277	330	333
108	BEND	.17857E+06	330	60	55	80	78	64	80	64	66	229	225	309	291	373	377
110	ST	.15925E+06	549	153	150	177	175	165	177	165	167	395	391	533	482	633	636
121	BEND	.42163E+06	208	27	27	17	17	17	17	17	17	60	59	66	83	90	90
132	BEND	.28016E+06	343	82	82	69	69	68	69	68	68	130	130	140	163	173	173
133	BEND	.25610E+06	354	93	92	79	79	78	79	78	78	141	141	153	176	189	189
134	BEND	.21835E+06	310	91	91	80	80	80	80	80	80	137	137	148	179	191	191
157	ST	.20545E+03	1179	186	169	300	291	269	300	269	275	753	736	839	884	988	1005
158	ST	.19606E+05	221	25	24	14	14	13	14	13	13	58	58	64	79	84	85

IV-54

 * AFWSG1 MODEL *

EARTHQUAKE NO. 21

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.12286E+06	214	27	26	23	23	20	23	20	20	164	163	188	206	231	232
14	BEND	.61774E+06	191	25	24	19	19	17	19	17	17	157	157	185	198	219	220
18	BEND	.10092E+07	173	28	28	16	16	16	16	16	16	150	150	165	190	201	201
23	BEND	.10302E+07	166	27	27	13	13	13	13	13	13	143	143	149	182	188	188
34	BEND	.59839E+06	183	27	26	19	19	17	19	17	17	156	156	181	197	214	215
44	BEND	.25617E+06	327	43	41	56	55	51	56	51	51	235	233	298	292	343	346
52	BEND	.49043E+06	187	27	27	16	16	15	16	15	15	149	148	171	189	209	210
62	BEND	.69526E+06	143	13	13	3	3	2	3	2	2	121	121	143	158	177	179
71	BEND	.20719E+07	163	24	24	13	12	12	13	12	12	141	141	157	181	194	195
76	BEND	.11946E+07	198	23	22	13	13	11	13	11	12	139	138	159	180	203	205
82	BEND	.22800E+07	163	27	27	14	14	14	14	14	14	145	145	156	184	195	196
86	BEND	.38499E+06	198	32	31	24	24	22	24	22	22	164	163	193	207	233	234
93	BEND	.13712E+07	185	32	32	22	22	21	22	21	21	161	161	187	203	229	230
98	BEND	.61285E+06	205	44	43	41	40	38	41	38	38	190	189	238	239	292	293
101	BEND	.61208E+06	227	37	35	40	40	36	40	36	36	192	191	240	239	278	279
108	BEND	.27608E+06	334	80	76	100	99	91	100	91	92	281	279	380	349	449	451
110	ST	.47642E+06	218	56	55	54	53	50	54	50	50	204	203	278	256	336	337
121	BEND	.23218E+06	144	135	135	117	117	117	117	117	117	200	200	215	256	275	275
132	BEND	.19077E+06	196	173	173	154	154	153	154	153	153	251	250	270	317	341	342
133	BEND	.18984E+06	228	168	167	149	146	147	149	147	147	242	242	268	307	338	338
134	BEND	.20849E+06	155	107	107	98	98	98	98	98	98	169	169	202	231	270	270
157	ST	.10269E+04	294	34	31	41	39	34	41	34	35	250	198	225	248	282	285
158	ST	.10418E+05	219	142	142	121	121	120	121	120	120	210	210	235	262	291	291

IV-55

 * AFWSG1 MODEL *

EARTHQUAKE NO. 22

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.70822E+05	353	73	71	71	70	66	71	66	66	271	269	313	329	373	376
14	BEND	.37037E+06	308	62	60	57	56	53	57	53	53	243	242	288	296	333	334
16	BEND	.59595E+06	269	67	67	52	52	51	52	51	51	234	234	259	287	305	305
23	BEND	.60257E+06	251	68	67	48	48	48	48	48	48	226	225	237	277	288	289
34	BEND	.33083E+06	326	78	76	68	68	65	68	65	66	270	269	313	327	360	361
44	BEND	.18335E+06	352	57	54	68	67	60	68	60	61	258	255	335	320	392	396
52	BEND	.30957E+06	263	57	56	42	42	41	42	41	41	211	210	245	261	293	294
62	BEND	.37793E+06	242	61	60	46	46	44	46	44	45	219	218	254	271	306	308
71	BEND	.12708E+07	233	57	57	41	41	40	41	40	40	209	209	233	255	280	282
76	BEND	.74948E+06	283	55	54	44	43	40	44	40	41	208	206	239	262	297	302
82	BEND	.13896E+07	235	61	61	44	44	43	44	43	43	215	215	234	266	283	284
86	BEND	.23450E+06	281	70	69	59	59	56	59	56	56	244	243	287	301	340	343
93	BEND	.88578E+06	243	59	58	47	47	45	47	45	45	220	220	257	272	308	310
98	BEND	.37364E+06	291	88	87	85	84	80	85	80	80	283	282	354	348	423	426
101	BEND	.58796E+06	175	16	14	18	17	13	18	13	13	146	145	190	186	224	225
108	BEND	.20940E+06	329	98	93	112	110	100	112	100	101	307	304	412	381	489	492
110	ST	.32562E+06	266	90	88	86	85	81	86	81	81	265	263	360	326	429	430
121	BEND	.24331E+06	63	126	126	108	108	107	108	107	107	185	185	199	229	244	244
132	BEND	.15459E+06	142	236	235	209	209	208	209	208	208	324	324	345	390	413	413
133	BEND	.16230E+06	152	210	210	185	185	184	185	184	184	290	290	313	351	377	378
134	BEND	.14633E+06	95	191	191	172	172	172	172	172	172	265	265	291	332	361	362
157	ST	.66473E+03	416	67	62	80	78	69	80	69	70	285	281	321	345	395	401
158	ST	.85390E+04	138	191	191	165	164	163	165	163	164	271	271	291	325	245	346

95-11

 * AFWSG1 MODEL *

EARTHQUAKE NO. 23

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.60848E+05	254	57	55	69	68	63	69	63	64	266	264	308	329	373	377
14	BEND	.30575E+06	236	50	49	60	60	57	60	57	57	251	250	296	310	350	352
18	BEND	.50330E+06	225	51	51	53	53	52	53	52	52	236	236	260	294	313	313
23	BEND	.51471E+06	218	50	50	48	48	47	48	47	47	225	225	236	282	293	293
34	BEND	.29219E+06	239	54	53	61	61	59	61	59	59	254	253	294	314	348	349
44	BEND	.18100E+06	253	36	33	53	52	46	53	46	47	224	222	290	285	348	352
52	BEND	.28741E+06	194	32	31	32	32	31	32	31	31	188	188	219	239	270	271
62	BEND	.33038E+06	212	44	43	46	46	43	46	43	44	219	218	254	275	311	314
71	BEND	.10789E+07	204	42	41	42	42	41	42	41	41	212	212	231	266	290	291
76	BEND	.65540E+06	231	47	45	50	49	44	50	44	46	217	214	249	276	313	319
82	BEND	.11498E+07	220	50	50	49	49	48	49	48	48	227	227	246	284	303	304
9	BEND	.18786E+06	262	66	65	71	71	67	71	67	68	272	270	315	337	380	383
	BEND	.79493E+06	206	40	39	45	44	42	45	42	42	214	213	248	267	304	305
	BEND	.35703E+06	253	68	65	81	80	74	81	74	75	272	270	335	335	404	407
101	BEND	.45518E+06	156	21	18	30	29	23	30	23	24	171	169	219	217	261	263
108	BEND	.19321E+06	251	93	86	111	109	96	111	96	98	302	298	401	375	477	481
110	ST	.34275E+06	188	59	57	64	63	58	64	58	59	217	216	299	270	360	362
121	BEND	.29627E+06	80	97	97	74	74	74	74	74	74	152	152	168	176	202	202
132	BEND	.28018E+06	82	99	99	76	76	75	76	75	75	154	154	171	189	205	206
133	BEND	.28155E+06	77	90	90	69	69	68	69	68	68	142	142	160	176	193	194
134	BEND	.26545E+06	40	68	68	51	51	51	51	51	51	112	112	126	143	157	158
157	ST	.50361E+03	320	76	71	100	98	89	100	89	91	330	325	372	406	461	469
158	ST	.11783E+05	126	129	129	100	100	99	100	99	99	196	196	211	236	250	250

 * AFWSG1 MODEL *

EARTHQUAKE NO. 24

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.79504E+05	193	11	8	25	24	18	25	18	19	170	168	203	214	250	253
14	BEND	.36751E+06	177	11	9	21	24	19	24	19	20	174	173	212	219	251	252
18	BEND	.61200E+06	90	7	6	9	9	8	9	8	8	144	143	166	185	201	202
23	BEND	.63145E+06	55	5	5	2	2	2	2	2	2	128	128	139	168	179	179
34	BEND	.34978E+06	151	12	11	22	22	19	22	19	19	171	171	207	216	244	244
44	BEND	.20050E+06	242	15	11	36	35	28	36	28	29	191	188	247	243	295	299
52	BEND	.34907E+06	91	-5	-6	-4	-4	-6	-4	-6	-5	109	109	137	147	172	173
62	BEND	.42623E+06	56	-3	-4	-1	-2	-4	-1	-4	-3	115	115	143	154	181	183
71	BEND	.12970E+07	64	2	2	3	2	1	3	1	1	128	127	149	168	187	188
76	BEND	.72818E+06	163	15	13	18	16	13	18	13	14	152	149	182	200	234	240
82	BEND	.14119E+07	51	5	4	4	4	3	4	3	3	131	131	148	171	187	188
86	BEND	.24664E+06	130	15	14	21	21	17	21	17	18	163	162	200	210	243	245
93	BEND	.10416E+07	64	-6	-7	-1	-1	-4	-1	-4	-3	114	114	142	151	178	179
98	BEND	.41323E+06	116	29	28	43	41	37	43	37	38	191	189	247	243	302	305
101	BEND	.59984E+06	116	-	-9	4	3	0	4	0	0	116	115	152	152	183	184
108	BEND	.25277E+06	194	43	39	63	62	53	62	53	53	208	206	284	267	345	347
110	ST	.34776E+06	128	46	45	54	53	49	54	49	49	194	193	274	247	334	335
121	BEND	.20312E+06	58	168	168	147	147	146	147	146	146	241	241	258	293	313	313
132	BEND	.15080E+06	105	245	245	218	217	216	218	216	217	339	339	361	408	432	433
133	BEND	.16671E+06	109	203	203	170	178	177	179	177	177	284	283	306	344	371	371
134	BEND	.12573E+06	100	245	245	220	220	219	220	219	219	337	337	362	421	450	450
157	ST	.70648E+03	302	25	19	49	47	37	49	37	39	217	212	247	268	311	316
158	ST	.75030E+04	124	228	228	200	200	198	200	198	199	321	320	342	378	401	401

IV-58

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 * AFWSG1 MODEL *

EARTHQUAKE NO. 25

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.16652E+06	241	28	27	27	27	25	27	25	25	191	190	208	237	252	253
14	BEND	.85282E+06	235	24	24	23	22	21	23	21	21	182	182	203	227	243	243
18	BEND	.14740E+07	227	22	21	17	17	16	17	16	16	170	170	179	213	220	220
23	BEND	.14740E+07	230	23	23	17	17	17	17	17	17	171	171	174	215	217	217
34	BEND	.88096E+06	220	19	18	16	16	15	16	15	15	168	168	185	211	223	223
44	BEND	.38632E+06	243	22	21	29	28	26	29	26	26	186	185	224	232	268	269
52	BEND	.70657E+06	227	22	22	17	17	16	17	16	17	170	170	182	213	223	224
62	BEND	.88526E+06	228	22	22	17	17	16	17	16	16	169	169	179	213	224	224
71	BEND	.28634E+07	233	24	24	18	18	18	18	18	18	174	174	180	218	224	224
76	BEND	.16311E+07	224	22	22	17	17	16	17	16	16	169	168	178	213	224	226
82	BEND	.32349E+07	232	24	24	18	18	17	18	17	17	173	173	177	217	221	221
86	BEND	.54600E+06	233	25	24	20	20	19	20	19	19	177	176	190	221	234	235
93	BEND	.22177E+07	197	11	11	6	6	6	6	6	6	146	146	155	185	196	196
98	BEND	.98980E+06	207	17	17	15	15	14	15	14	14	161	160	183	204	232	232
101	BEND	.94339E+06	187	8	7	8	8	5	8	5	5	144	143	172	183	208	208
108	BEND	.43194E+06	227	36	34	44	43	38	44	38	38	203	201	261	257	320	321
110	ST	.74641E+06	215	23	22	21	21	19	21	19	19	172	171	207	217	262	262
121	BEND	.32488E+06	19	25	24	20	20	20	20	20	20	87	87	97	135	148	148
132	BEND	.26165E+06	44	48	48	43	43	42	43	42	42	124	124	136	180	195	196
133	BEND	.27808E+06	44	43	43	38	38	37	38	37	37	111	111	126	162	181	181
134	BEND	.20973E+06	52	45	45	42	42	41	42	41	41	132	132	148	186	210	210
157	ST	.13761E+04	255	33	31	39	38	34	39	34	35	213	211	228	262	281	284
158	ST	.14626E+05	43	41	41	31	31	30	31	30	30	101	101	114	152	166	167

IV-59

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 * AFWSG1 MODEL *

EARTHQUAKE NO. 26

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.48161E+05	81	128	124	173	170	165	173	165	166	461	457	506	549	594	598
14	BEND	.26470E+06	35	97	95	137	136	133	137	133	133	390	388	437	466	506	507
18	BEND	.42411E+06	25	99	99	129	129	127	129	127	128	374	374	401	449	467	468
23	BEND	.43132E+06	26	98	97	121	121	120	121	120	120	358	357	369	430	440	440
34	BEND	.25101E+06	32	101	100	138	138	136	138	136	136	394	393	438	472	507	507
44	BEND	.15722E+06	119	90	87	131	129	123	131	123	124	357	353	414	433	490	494
52	BEND	.24630E+06	42	71	70	94	93	92	94	92	92	298	297	326	362	385	387
62	BEND	.28541E+06	41	82	81	109	108	106	109	106	106	330	329	358	401	430	432
71	BEND	.91305E+06	24	84	84	108	108	106	108	106	106	331	330	350	401	419	419
76	BEND	.54571E+06	97	87	85	111	109	105	111	105	107	332	328	369	407	449	455
82	BEND	.99345E+06	31	89	89	113	113	112	113	112	113	343	342	359	414	430	431
86	BEND	.15758E+06	68	103	101	131	130	126	131	126	127	380	378	424	459	503	505
93	BEND	.67867E+06	54	74	73	105	104	101	105	101	102	324	323	364	393	436	437
98	BEND	.29532E+06	131	100	98	147	146	139	147	139	140	403	401	489	490	589	591
101	BEND	.38113E+06	34	49	47	76	75	68	76	68	63	264	263	321	327	383	384
108	BEND	.16750E+06	136	119	115	155	153	139	155	139	140	399	395	524	499	630	634
110	ST	.31019E+06	65	60	59	95	94	89	95	89	89	289	288	381	361	467	468
121	BEND	.24261E+06	72	53	53	80	80	79	80	79	79	194	194	213	274	297	297
132	BEND	.20249E+06	99	76	75	106	106	105	106	105	105	239	238	259	330	356	356
133	BEND	.19546E+06	101	88	88	115	115	114	115	114	114	243	243	271	333	367	367
134	BEND	.15912E+06	89	86	86	120	120	119	120	119	119	268	268	286	364	389	389
157	ST	.43623E+03	124	143	135	198	194	183	198	183	185	510	502	553	607	660	668
158	ST	.11078E+05	94	64	63	82	82	81	82	81	81	193	193	211	274	292	292

09-11

 * AFWSG1 MODEL *

EARTHQUAKE NO. 27

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.27657E+05	162	252	248	344	341	333	344	333	335	743	738	814	870	938	944
14	BEND	.13841E+06	95	233	232	325	324	319	325	319	319	707	704	785	825	895	896
18	BEND	.22012E+06	73	238	237	314	314	312	314	312	312	683	682	727	797	831	831
23	BEND	.22078E+06	80	240	239	305	305	304	305	304	304	664	663	683	775	791	792
34	BEND	.12554E+06	97	254	253	347	347	343	347	343	343	749	748	826	873	940	941
44	BEND	.58643E+05	401	375	372	486	482	469	486	469	472	971	963	1103	1141	1280	1288
52	BEND	.12220E+06	155	206	205	267	266	265	267	265	265	589	587	638	692	736	738
62	BEND	.14854E+06	132	213	212	275	275	271	275	271	272	606	605	654	715	766	769
71	BEND	.44024E+06	98	237	236	304	303	301	304	301	301	663	662	698	777	810	812
76	BEND	.26659E+06	280	242	240	299	296	288	299	288	292	650	644	715	774	847	858
82	BEND	.47262E+06	119	251	251	319	319	318	319	318	318	693	692	722	810	840	841
86	BEND	.92291E+05	160	228	226	288	287	281	288	281	282	640	637	706	756	821	825
93	BEND	.39768E+06	133	166	166	220	220	216	220	216	216	510	510	566	605	663	665
98	BEND	.20412E+06	216	169	167	218	217	208	218	208	209	506	504	615	609	729	733
101	BEND	.20907E+06	104	146	144	187	186	176	187	176	176	455	453	543	545	634	637
108	BEND	.10075E+06	236	244	238	283	280	258	283	258	259	608	602	707	743	941	947
110	ST	.20446E+06	129	129	128	162	161	153	162	153	154	390	388	513	474	611	614
121	BEND	.21243E+06	87	104	104	83	83	82	83	82	82	171	171	186	240	256	257
132	BEND	.17944E+06	112	131	131	107	107	106	107	106	106	207	207	224	285	303	304
133	BEND	.18171E+06	99	128	128	108	108	107	108	107	107	200	200	223	271	295	296
134	BEND	.18956E+06	30	70	70	49	49	49	49	49	49	125	125	139	175	192	193
157	ST	.29975E+03	183	214	207	303	299	287	303	287	290	667	658	723	786	848	858
158	ST	.83787E+04	143	156	156	128	128	127	128	127	127	236	236	252	324	340	340

19-Δ1

 * AFWSG1 MODEL *

EARTHQUAKE NO. 28

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.61217E+05	122	76	72	115	113	108	115	108	109	338	335	375	408	445	448
14	BEND	.28985E+06	50	74	73	116	115	111	116	111	112	343	341	387	412	450	451
18	BEND	.49112E+06	9	66	65	96	96	95	96	95	95	303	303	327	366	383	383
23	BEND	.48742E+06	26	69	68	94	94	93	94	93	94	298	298	309	361	370	370
34	BEND	.30171E+06	24	62	61	97	97	95	97	95	95	306	305	344	370	400	401
44	BEND	.14757E+06	350	102	98	147	145	138	147	138	139	387	383	447	470	531	535
52	BEND	.24049E+06	133	70	69	97	97	96	97	96	96	302	301	332	367	392	393
62	BEND	.33180E+06	73	52	51	78	77	75	78	75	76	263	262	287	323	348	350
71	BEND	.95236E+06	41	71	70	98	98	96	98	96	96	307	306	326	372	391	392
76	BEND	.56534E+06	219	78	75	102	100	96	102	96	98	310	306	344	382	422	428
82	BEND	.10757E+07	46	69	69	95	95	94	95	94	94	301	301	317	366	381	382
86	BEND	.18005E+06	131	86	84	114	113	109	114	109	110	341	340	382	415	456	458
93	BEND	.75895E+06	88	52	52	79	79	77	79	77	77	270	270	302	331	365	366
98	BEND	.34285E+06	219	74	72	107	106	100	107	100	101	320	319	391	395	476	478
101	BEND	.43942E+06	64	31	30	52	51	46	52	46	46	216	215	265	271	321	322
108	BEND	.20937E+06	235	85	82	110	108	96	110	96	97	306	302	408	388	496	499
110	ST	.29967E+06	163	66	64	96	95	90	96	90	91	294	293	384	366	473	475
121	BEND	.22788E+06	208	70	70	81	80	80	81	80	80	194	194	211	272	295	296
132	BEND	.21814E+06	204	70	70	80	80	79	80	79	80	195	195	212	273	296	296
133	BEND	.21914E+06	222	81	81	90	90	89	90	89	89	202	202	223	278	308	308
134	BEND	.18109E+06	119	62	62	78	78	77	78	77	77	203	203	216	278	300	300
157	ST	.48572E+03	249	117	109	169	165	155	169	155	157	449	440	487	538	587	594
158	ST	.11249E+05	222	73	73	73	73	72	73	72	72	174	174	189	248	266	266

IV-62

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 * AFWSG1 MODEL *
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EARTHQUAKE NO. 29

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.76696E+05	233	103	101	111	110	106	111	106	107	378	376	411	456	486	488
14	BEND	.39166E+06	188	95	94	100	100	98	100	98	98	359	358	399	434	463	463
18	BEND	.67099E+06	176	90	89	86	85	85	86	85	85	329	328	348	400	412	412
23	BEND	.66890E+06	188	93	92	84	84	84	84	84	84	326	326	334	398	403	404
34	BEND	.38698E+06	182	94	93	96	95	93	96	93	94	349	349	384	423	448	448
44	BEND	.15356E+06	321	145	142	180	179	173	180	173	174	518	515	595	623	689	692
52	BEND	.29255E+06	213	111	111	107	107	106	107	106	106	374	374	402	454	475	476
62	BEND	.38814E+06	196	99	99	94	94	93	94	93	93	347	346	369	422	444	445
71	BEND	.13106E+07	181	93	93	86	86	85	86	85	85	330	330	345	402	415	415
76	BEND	.70222E+06	219	107	106	101	100	97	101	97	98	354	353	377	434	461	465
82	BEND	.14210E+07	192	100	100	92	92	91	92	91	91	344	344	354	419	429	429
86	BEND	.23772E+06	219	108	107	104	104	101	104	101	102	368	367	400	447	476	477
93	BEND	.88756E+06	204	99	98	94	94	92	94	92	92	346	346	371	422	447	448
98	BEND	.38737E+06	296	119	118	117	116	112	117	112	113	388	387	443	474	540	541
101	BEND	.43283E+06	181	81	79	87	86	80	87	80	81	319	317	375	390	440	440
108	BEND	.17863E+06	475	162	158	173	171	158	173	158	159	473	470	599	584	719	721
110	ST	.28450E+06	310	141	140	141	141	136	141	136	136	433	432	522	528	636	637
121	BEND	.27990E+06	83	47	47	38	38	37	38	37	37	109	109	120	162	176	176
132	BEND	.19427E+06	141	103	103	90	90	89	90	89	89	190	190	205	263	282	283
133	BEND	.20143E+06	212	99	99	88	88	87	88	87	87	180	180	200	247	273	273
134	BEND	.14636E+06	143	110	110	100	100	99	100	99	99	218	218	240	294	329	330
157	ST	.62003E+03	319	126	121	150	147	139	150	139	141	455	451	487	547	586	591
158	ST	.13570E+05	74	52	52	39	39	38	39	38	38	108	108	120	161	176	176

IV-63

 * AFWSG1 MODEL *

EARTHQUAKE NO. 30

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.10590E+06	1275	74	72	76	77	75	78	75	75	310	308	337	373	397	398
14	BEND	.52088E+06	1301	75	74	77	77	75	77	75	75	311	310	346	374	399	400
18	BEND	.90637E+06	1165	69	68	64	64	63	64	63	63	282	282	299	342	352	352
23	BEND	.88786E+06	1169	74	74	66	66	66	66	66	66	288	288	294	349	354	354
34	BEND	.56704E+06	1127	58	58	58	58	58	58	56	57	267	267	295	324	343	343
44	BEND	.26041E+06	1863	65	63	85	84	81	85	81	81	317	315	370	382	428	430
52	BEND	.39617E+06	1313	86	86	81	81	80	81	80	80	320	320	344	386	404	405
62	BEND	.48509E+06	1380	91	90	84	84	83	84	83	83	329	329	348	398	416	417
71	BEND	.16503E+07	1262	84	83	76	76	75	76	75	75	311	311	323	377	387	387
76	BEND	.90507E+06	1241	90	90	83	83	81	83	81	81	321	320	338	390	411	413
82	BEND	.18512E+07	1245	85	84	76	76	76	76	76	76	312	311	320	377	385	385
86	BEND	.30858E+06	1333	91	90	86	86	84	86	84	84	330	329	355	399	422	423
93	BEND	.12133E+07	1196	75	74	69	69	67	69	67	68	292	292	311	355	374	375
98	BEND	.67090E+06	957	51	50	51	51	48	51	48	49	240	240	275	297	338	339
101	BEND	.51215E+06	1333	79	77	83	82	77	83	77	77	313	312	365	378	423	424
108	BEND	.30291E+06	1092	81	77	109	98	90	100	90	90	310	307	396	382	474	476
110	ST	.48675E+06	1051	67	65	67	66	63	67	63	63	271	270	327	332	401	401
121	BEND	.45580E+06	70	-5	-5	-13	-13	-13	-13	-13	-13	32	32	40	68	76	76
132	BEND	.50773E+06	50	-18	-10	-25	-25	-25	-25	-25	-25	14	14	20	44	52	52
133	BEND	.58029E+06	38	-27	-27	-33	-33	-33	-33	-33	-33	0	0	7	25	34	34
134	BEND	.32335E+06	100	0	0	-9	-9	-10	-9	-10	-10	43	43	54	76	91	92
157	ST	.80693E+03	1628	102	97	119	117	111	119	111	112	396	393	423	472	506	510
158	ST	.22567E+05	94	-2	-2	-12	-12	-13	-12	-13	-13	32	32	40	68	77	77

IV-64

 * AFWSG1 MODEL *

EARTHQUAKE NO. 31

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.72774E+05	376	164	163	164	164	161	164	161	161	500	499	535	596	630	632
14	BEND	.35454E+06	323	170	169	169	168	166	169	166	166	514	514	554	611	643	644
18	BEND	.59369E+06	322	174	174	166	166	166	166	166	166	512	512	529	609	622	622
23	BEND	.59751E+06	341	177	177	166	166	166	166	166	166	511	511	518	609	616	616
34	BEND	.34823E+06	318	173	172	169	169	167	169	167	167	516	515	550	613	640	641
44	BEND	.15371E+06	381	173	170	184	184	178	184	178	179	53*	530	622	635	719	722
52	BEND	.30223E+06	307	159	159	151	151	150	151	150	151	475	475	500	567	590	591
62	BEND	.36975E+06	312	165	165	157	157	156	157	156	156	489	489	516	584	612	614
71	BEND	.10983E+07	350	194	194	184	184	183	184	183	183	552	552	571	656	675	676
76	BEND	.71595E+06	330	155	154	147	147	145	147	145	145	460	459	487	552	582	584
82	BEND	.12835E+07	335	184	184	174	174	174	174	174	174	529	529	543	630	645	645
86	BEND	.20905E+06	373	196	195	189	189	187	189	187	187	558	558	596	664	701	703
93	BEND	.86209E+06	317	159	158	152	152	151	152	151	151	477	476	508	569	601	602
98	BEND	.32401E+06	515	228	227	225	224	221	225	221	221	626	625	703	745	833	835
101	BEND	.53273E+06	173	72	71	75	75	71	75	71	71	289	289	338	351	394	395
108	BEND	.23165E+06	448	134	129	143	141	132	143	132	133	405	402	515	493	608	610
110	ST	.35044E+06	334	146	145	143	142	139	143	139	140	429	428	515	515	614	615
121	BEND	.30665E+06	184	87	87	69	69	68	69	68	68	132	132	144	164	176	176
132	BEND	.22414E+06	270	144	144	120	120	119	120	119	119	203	202	219	245	262	262
133	BEND	.23437E+06	256	133	132	110	110	109	110	109	109	186	186	205	225	247	247
134	BEND	.23988E+06	163	76	76	58	58	56	58	58	58	118	118	139	157	181	181
157	ST	.55270E+03	539	197	193	209	208	200	209	200	201	593	591	631	704	752	757
158	ST	.13075E+05	217	109	109	88	88	88	88	88	88	162	162	179	195	212	213

IV-65

 * AFWSG1 MODEL *

EARTHQUAKE NO. 32

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	.96443E+05	244	93	92	78	77	75	78	75	75	309	309	334	376	400	401
14	BEND	.56218E+06	196	85	84	68	68	66	68	66	66	290	290	317	354	375	375
18	BEND	.80853E+06	209	95	95	72	72	71	72	71	71	302	302	314	368	377	377
23	BEND	.82751E+06	215	93	93	68	68	68	68	68	68	294	294	299	359	364	364
34	BEND	.44183E+06	228	108	108	87	87	86	87	86	86	336	335	361	407	427	427
44	BEND	.22248E+06	212	84	82	81	80	76	81	76	76	303	301	362	371	423	425
52	BEND	.43432E+06	180	75	75	54	54	53	54	53	54	258	258	276	318	333	333
62	BEND	.49974E+06	202	90	90	68	68	67	68	67	67	291	290	311	356	376	377
71	BEND	.16494E+07	199	90	90	66	66	66	66	66	66	289	288	302	353	365	366
76	BEND	.96070E+06	208	84	84	64	63	61	64	61	62	276	275	296	340	361	363
82	BEND	.18302E+07	204	93	93	69	69	68	69	68	68	294	294	305	360	370	370
86	BEND	.30242E+06	221	99	98	78	78	76	78	76	76	310	310	338	379	404	405
93	BEND	.11137E+07	216	95	94	73	73	72	73	72	72	302	302	327	368	393	393
98	BEND	.42650E+06	345	147	146	126	125	122	126	122	123	409	408	470	495	562	564
101	BEND	.59808E+06	136	52	51	44	43	40	44	40	40	220	219	264	273	311	312
108	BEND	.28217E+06	311	90	87	86	84	76	86	76	77	285	283	374	355	448	450
110	ST	.39062E+06	267	116	115	99	98	95	99	95	95	333	332	411	406	493	494
121	BEND	.32567E+06	127	77	77	59	59	59	59	59	59	121	121	132	152	163	164
132	BEND	.22096E+06	217	149	148	124	123	123	124	123	123	210	210	227	256	272	272
133	BEND	.22008E+06	228	149	149	124	124	123	124	123	123	207	207	228	251	273	273
134	BEND	.26180E+06	109	62	62	45	45	45	45	45	45	100	100	118	136	157	157
157	ST	.79346E+03	313	101	98	95	94	89	95	89	89	342	340	367	414	445	449
158	ST	.14465E+05	139	90	90	71	71	70	71	70	70	139	139	154	171	186	186

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 * AFWSG1 MODEL *

EARTHQUAKE NO. 33

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS VALUE	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	BEND	97083E+06	242	97	96	79	78	76	79	76	76	312	311	337	380	404	406
14	BEND	49417E+06	209	93	92	73	73	71	73	71	71	302	302	330	369	390	390
18	BEND	80201E+06	220	102	102	76	76	75	76	75	75	311	311	324	380	389	389
23	BEND	81831E+06	228	102	102	73	73	73	73	73	73	306	306	311	374	378	379
34	BEND	42773E+06	250	121	121	96	96	95	96	95	95	357	356	383	432	453	453
44	BEND	20278E+06	261	107	105	100	99	95	100	95	95	346	345	411	422	481	483
52	BEND	40383E+06	211	93	93	68	68	67	68	67	68	291	291	310	357	373	374
62	BEND	49187E+06	218	99	99	73	73	72	73	72	72	303	302	323	370	391	392
71	BEND	16451E+07	209	96	95	69	69	69	69	69	69	295	295	309	361	374	374
76	BEND	94148E+06	227	93	92	69	69	67	69	67	67	289	288	309	355	377	379
82	BEND	17852E+07	223	104	104	75	75	75	75	75	75	310	310	321	379	390	390
86	BEND	29862E+06	235	107	106	82	82	80	82	80	80	321	320	348	391	417	419
93	BEND	11319E+07	225	96	96	72	72	71	72	71	71	300	300	324	367	391	391
98	BEND	46673E+06	317	128	127	105	104	101	105	101	102	362	361	416	441	501	503
101	BEND	57663E+06	153	60	59	49	49	45	49	45	45	233	233	279	289	329	329
108	BEND	23389E+06	369	132	128	124	123	114	124	114	115	367	364	474	452	566	568
110	ST	48541E+06	203	77	77	61	60	58	61	58	58	251	250	314	311	381	381
121	BEND	35035E+06	108	67	67	48	48	48	48	48	48	104	104	115	132	143	144
132	BEND	25839E+06	169	115	115	91	91	90	91	90	90	164	164	179	200	216	216
133	BEND	26506E+06	168	109	109	86	86	85	86	85	85	155	154	172	189	209	209
134	BEND	26163E+06	90	63	63	45	45	44	45	44	44	99	99	117	134	155	155
157	ST	79259E+03	301	106	104	98	97	91	98	91	92	348	346	374	422	453	457
158	ST	16701E+05	113	66	66	48	48	47	48	47	47	106	106	119	132	145	145

IV-67

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 * ZBEND MODEL *

EARTHQUAKE NO. 1

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.25880E+02	46	46	45	45	44	45	44	44	111	111	112	117	118	118
2	ST	.28931E+03	29	29	34	34	34	34	34	34	104	104	105	105	106	106
3	ST	.33021E+03	30	30	35	35	35	35	35	35	105	105	105	106	107	107
4	ST	.40442E+03	26	26	32	32	32	32	32	32	102	102	103	102	103	103
5	ST	.47698E+03	26	26	32	32	32	32	32	32	102	102	103	103	103	103
6	ST	.43553E+04	22	22	28	28	28	28	28	28	98	98	98	98	98	98
7	ST	.74662E+04	20	20	25	25	25	25	25	25	92	92	93	92	93	93
8	ST	.24837E+04	19	19	24	24	24	24	24	24	92	92	93	92	93	93
9	ST	.29352E+04	19	19	24	24	24	24	24	24	92	92	93	92	93	93
10	ST	.25198E+04	21	21	27	27	27	27	27	27	96	96	96	96	97	97
11	ST	.31187E+04	21	21	27	27	27	27	27	27	96	96	96	96	96	96
12	ST	.62218E+04	22	22	28	28	28	28	28	28	98	98	98	98	98	98
13	ST	.31109E+04	29	29	39	39	39	39	39	39	113	113	114	113	114	114
14	ST	.34220E+04	28	28	38	38	38	38	38	38	111	111	112	111	112	112
15	ST	.22429E+03	26	26	34	34	34	34	34	34	106	106	107	106	107	107
16	ST	.59107E+04	23	23	28	28	28	28	28	28	98	98	98	98	98	98
17	BEND	.16667E+05	21	21	25	25	25	25	25	25	93	93	93	93	93	93
18	ST	.68440E+04	22	22	24	24	24	24	24	24	92	92	92	92	92	92
19	ST	.37957E+03	21	21	23	23	23	23	23	23	92	92	92	92	92	92
20	ST	.71551E+04	22	22	23	23	23	23	23	23	92	92	92	92	92	92
21	ST	.71551E+04	22	22	25	25	25	25	25	25	93	93	94	94	94	94
22	ST	.39683E+03	22	22	25	25	25	25	25	25	94	94	95	95	95	95
23	ST	.71551E+04	22	22	25	25	25	25	25	25	94	94	95	95	95	95
24	BEND	.15909E+05	22	22	26	26	26	26	26	26	94	94	95	94	95	95
25	ST	.55996E+04	22	22	28	28	28	28	28	28	97	97	97	97	97	97
26	ST	.49774E+04	24	24	31	31	31	31	31	31	102	102	102	102	102	102
27	ST	.25680E+03	26	26	35	35	35	35	35	35	106	106	107	107	107	107
28	ST	.29865E+04	28	28	37	37	37	37	37	37	109	109	110	109	110	110
29	ST	.83994E+03	37	37	50	50	50	50	50	50	118	118	119	121	123	123
30	ST	.10457E+04	49	49	60	60	60	60	60	60	123	123	125	130	132	132
31	ST	.83994E+03	47	47	59	59	59	59	59	59	123	123	124	129	131	131
32	ST	.10457E+04	51	51	61	61	61	61	61	61	123	123	125	131	133	133
33	ST	.14665E+03	50	50	60	60	60	60	60	60	123	123	125	131	132	132
34	ST	.25880E+03	53	53	62	62	62	62	62	62	123	123	125	132	133	133
35	ST	.37957E+03	25	25	32	32	32	32	32	32	103	103	103	103	103	103
36	ST	.39683E+03	21	21	23	23	23	23	23	23	92	92	92	92	92	92
37	ST	.24155E+03	22	22	25	25	25	25	25	25	94	94	95	94	95	95
38	ST	.71551E+04	29	29	39	39	39	39	39	39	111	111	112	111	112	112
39	ST	.71551E+04	22	22	28	28	28	28	28	28	97	97	97	97	97	97
			22	22	24	24	24	24	24	24	93	93	93	93	93	93

 * BM1 MODEL *

EARTHQUAKE NO. 1

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.29755E+03	68	28	27	12	11	11	12	11	12	92	91	112	105	119	121
2	BEND	.19038E+03	106	49	45	35	34	31	35	31	34	124	121	139	142	149	154
3	ST	.81193E+02	72	33	31	16	15	13	16	13	15	98	96	113	111	123	127
4	BEND	.11183E+04	64	27	26	11	10	9	11	9	10	91	89	109	103	116	119
5	ST	.24891E+03	79	25	22	45	42	39	45	39	43	144	137	164	167	174	184
6	ST	.20895E+03	106	41	36	97	91	86	97	86	94	233	222	253	267	268	284
7	ST	.33094E+03	77	29	26	73	68	65	73	65	71	196	188	212	224	226	238
8	ST	.17520E+03	106	39	37	96	93	90	96	90	95	235	229	270	267	281	290
9	BEND	.66574E+03	142	77	71	122	116	112	122	112	119	276	265	297	315	318	335
10	TEE	.30370E+03	200	124	116	130	126	123	130	123	126	273	269	312	314	337	345
11	TEE	.94036E+03	123	56	50	62	59	57	62	57	59	158	155	190	186	204	209
12	TEE	.70578E+03	110	51	48	62	60	59	62	59	61	168	166	203	194	215	220
13	BEND	.91857E+03	108	49	47	62	60	59	62	59	61	169	167	205	194	215	221
14	ST	.26334E+03	276	193	180	153	148	145	153	145	147	275	270	311	335	356	362
15	ST	.14132E+03	274	190	177	156	151	148	156	148	150	285	279	329	343	371	376
16	ST	.96587E+02	281	195	183	162	156	154	162	154	156	287	281	321	350	370	376
17	ST	.35648E+02	273	172	163	202	196	193	202	193	198	405	397	463	454	482	494
18	ST	.37644E+02	269	175	167	181	175	172	181	172	177	363	356	418	410	439	449
19	BEND	.14143E+03	264	173	165	172	167	164	172	164	168	345	338	399	391	421	430
20	ST	.57386E-12	324	166	156	315	310	304	315	304	310	591	582	665	667	702	717
21	TEE	.27960E+04	244	135	133	259	254	252	259	252	257	531	523	579	583	602	614
22	ST	.11910E+04	207	143	142	218	214	212	218	212	216	449	442	481	495	507	517
23	ST	.75759E+03	284	203	201	249	245	242	249	242	246	518	512	554	556	575	584
24	ST	.18723E+04	220	142	140	202	198	195	202	195	200	436	428	457	476	480	492
25	ST	.24887E+04	191	115	113	187	183	179	187	179	185	406	398	427	449	450	463
26	ST	.23491E+04	166	90	88	183	179	175	183	175	182	395	386	416	442	443	456
27	ST	.16850E+04	144	67	64	193	188	185	193	185	192	402	392	422	458	456	470
28	ST	.12202E+04	239	169	168	248	245	240	248	240	244	493	487	529	544	560	569
29	ST	.30994E+04	193	125	123	190	186	183	190	183	188	407	400	436	449	458	468
30	BEND	.10882E+04	311	234	233	303	301	296	303	296	299	589	586	636	640	670	676
31	ST	.18713E+04	162	100	99	176	175	174	176	174	176	378	374	410	422	437	442
32	ST	.32275E+04	96	30	29	136	131	132	136	132	135	303	298	316	351	351	358
33	ST	.7289E+04	89	10	8	143	140	137	143	137	142	314	307	317	367	361	370
34	ST	.84932E+03	385	275	273	345	341	339	345	339	344	701	694	735	753	766	777
35	ST	.25858E+04	215	154	154	184	184	183	184	183	184	403	402	431	435	452	454
36	ST	.20625E+04	119	62	61	154	151	150	154	150	153	331	326	348	380	384	391
37	ST	.17213E+04	154	82	80	189	185	182	189	182	188	396	388	419	450	452	464
38	ST	.16343E+04	247	166	165	224	221	217	224	217	222	474	467	502	516	525	536
39	ST	.17364E+04	227	152	151	181	179	177	181	177	179	402	399	422	429	440	446
40	BEND	.37772E+04	219	145	145	169	168	165	169	165	167	381	379	398	405	416	420
41	ST	.89911E+03	331	245	244	254	252	250	254	250	252	548	545	565	575	584	589
42	ST	.16848E+04	362	269	268	282	281	280	282	280	281	603	601	625	632	643	647

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 * BM1 MODEL *
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EARTHQUAKE NO. 1

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
43	BEND	.48709E+04	366	272	272	283	282	281	283	281	283	605	603	626	634	645	649
44	ST	.18990E+04	311	234	233	232	231	230	232	230	232	511	508	526	533	541	545
45	ST	.14258E+04	276	196	196	220	218	216	220	216	219	477	474	496	505	513	519
46	ST	.13263E+04	211	125	124	192	189	187	197	187	191	417	412	441	452	461	469
47	BEND	.27633E+04	224	138	137	203	200	198	203	198	202	437	431	463	474	482	493
48	ST	.64423E+03	258	177	176	226	222	215	226	215	220	468	462	498	507	520	530
49	ST	.19039E+04	174	85	85	168	167	164	168	164	166	366	364	390	401	415	420
50	BEND	.49066E+04	174	86	85	168	166	163	168	163	165	366	364	389	401	414	419
51	ST	.55488E+03	337	255	254	263	260	256	263	256	260	553	548	572	584	594	604
52	ST	.12153E+04	258	168	166	222	219	215	222	215	219	470	466	490	505	515	523
53	BEND	.91170E+03	102	43	41	57	56	55	57	55	57	163	161	199	187	208	212
54	BEND	.52507E+03	257	160	158	267	262	258	267	258	265	543	533	584	596	609	624
55	ST	.25181E+03	98	41	37	100	94	90	100	90	97	241	231	259	275	275	291

 * BM2 MODEL *

EARTHQUAKE NO. 1

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.32688E+03	303	303	256	256	255	256	255	256	419	418	448	428	452	454
2	BEND	.47835E+03	112	112	90	89	89	90	89	89	177	176	185	183	188	190
3	ST	.90761E+02	189	188	157	156	155	157	155	157	264	263	292	271	296	299
4	BEND	.97430E+03	378	378	322	321	320	322	320	321	513	511	550	523	555	557
5	ST	.36747E+03	246	245	210	209	208	210	208	209	355	355	373	364	377	379
6	ST	.32019E+03	288	287	251	250	249	251	249	250	421	420	433	432	439	442
7	ST	.34621E+03	284	284	250	249	248	250	248	249	420	418	442	431	447	450
8	ST	.37993E+03	361	361	312	312	312	312	312	312	517	517	530	528	537	538
9	BEND	.11384E+04	432	431	377	377	376	377	376	377	612	611	625	625	634	637
10	TEE	.66487E+03	143	141	137	134	133	137	133	136	243	239	257	253	270	275
11	TEE	.16805E+04	131	130	135	132	131	135	131	134	235	231	250	244	255	260
12	TEE	.10876E+04	366	365	319	319	318	319	318	318	518	518	545	530	555	557
13	BEND	.14334E+04	367	367	320	320	319	320	319	319	520	520	547	532	556	558
14	ST	.36684E+03	297	292	312	299	298	312	298	306	467	450	483	483	500	514
15	ST	.17885E+03	414	409	417	403	402	417	402	410	628	612	658	647	684	698
16	ST	.14054E+03	303	298	318	305	304	318	304	312	480	464	494	496	510	523
17	ST	.11317E+03	402	402	351	350	350	351	350	350	571	570	582	584	593	595
18	ST	.10393E+03	400	399	351	349	349	351	349	350	568	566	579	580	592	594
19	BEND	.36654E+03	399	398	350	349	348	350	348	349	567	564	578	579	591	594
20	ST	.15169E-11	490	490	484	483	483	484	483	484	654	653	665	716	724	726
21	TEE	.12323E+05	426	426	368	368	368	368	368	368	604	604	607	616	618	618
22	ST	.58243E+04	418	418	361	361	361	361	361	361	593	593	594	605	605	605
23	ST	.30030E+04	406	406	350	350	350	350	350	350	577	577	579	589	590	590
24	ST	.62904E+03	258	256	267	264	259	267	259	264	451	447	506	494	522	532
25	ST	.22471E+04	434	433	378	378	377	378	377	378	620	620	633	635	643	644
26	ST	.42142E+04	433	433	375	375	375	375	375	375	615	615	619	628	630	630
27	ST	.57600E+04	427	427	369	369	369	369	369	369	606	605	607	618	619	619
28	ST	.67337E+04	419	419	362	362	362	362	362	362	595	595	595	607	607	607
29	ST	.87064E+04	423	423	366	366	366	366	366	366	600	600	602	613	613	614
30	BEND	.78350E+04	417	417	361	361	361	361	361	361	592	592	593	604	605	605
31	ST	.51186E+04	402	402	347	346	346	347	346	346	571	571	573	583	584	584
32	ST	.42832E+04	375	375	324	324	324	324	324	324	538	538	543	550	553	553
33	ST	.14415E+04	291	291	261	260	259	261	259	260	445	444	468	462	470	482
34	ST	.25109E+04	427	427	369	369	369	369	369	369	606	606	611	618	621	622
35	ST	.64584E+04	406	406	351	351	351	351	351	351	578	577	579	589	590	590
36	ST	.53186E+04	396	396	342	342	342	342	342	342	564	564	565	576	576	576
37	ST	.40732E+04	386	386	333	333	333	333	333	333	551	551	554	563	564	564
38	ST	.26601E+04	385	385	333	333	332	333	332	332	551	551	557	563	567	567
39	ST	.12131E+04	388	388	337	337	337	337	337	337	559	559	581	576	589	590
40	BEND	.24131E+04	368	368	320	320	319	320	319	320	533	533	563	552	569	570
41	ST	.13242E+04	378	377	326	326	326	326	326	326	542	542	558	555	565	565
42	ST	.24678E+04	330	330	284	284	284	284	284	284	479	479	495	490	501	502

IV-71

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 * BM2 MODEL *

EARTHQUAKE NO. 1

UNIFORM DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
43	BEND	.68981E+04	322	322	278	278	278	278	278	278	469	469	485	481	491	491
44	ST	.18744E+04	87	287	248	248	247	248	247	248	424	424	443	436	448	449
45	ST	.99557E+03	339	339	296	296	295	296	295	296	497	497	523	513	529	530
46	ST	.12915E+04	427	427	371	371	371	371	371	371	609	609	616	624	627	627
47	BEND	.36238E+04	430	430	373	373	372	373	372	373	611	611	617	625	627	628
48	ST	.14657E+04	415	415	358	358	358	358	358	358	589	589	595	603	606	606
49	ST	.17077E+04	371	371	321	321	321	321	321	321	535	535	550	551	560	561
50	BEND	.42755E+04	370	370	321	321	320	321	320	320	534	534	549	550	559	560
51	ST	.12543E+04	403	403	348	348	348	348	348	348	573	573	579	586	589	589
52	ST	.11981E+04	350	349	304	303	302	304	302	303	508	507	525	524	534	535
53	BEND	.14161E+04	371	371	323	323	322	323	322	323	526	526	552	538	560	562
54	BEND	.21528E+04	424	424	366	366	366	366	366	366	601	601	603	613	614	614
55	ST	.32301E+03	293	292	258	257	256	258	256	257	434	432	449	445	455	459

 * BM3 MODEL *

EARTHQUAKE NO. 1

UNIFORM DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.80320E+03	64	61	95	93	93	95	93	95	134	132	135	136	137	139	
2	BEND	.16099E+04	48	46	84	82	82	84	82	84	121	119	122	122	123	125	
3	ST	.20515E+04	51	45	49	44	44	49	44	49	71	66	72	73	75	80	
4	ST	.12867E+04	95	89	89	83	83	89	83	89	125	120	125	128	128	134	
5	BEND	.25545E+04	115	106	107	98	98	107	98	107	140	132	138	144	143	153	
6	ST	.30581E+04	78	71	90	83	83	90	83	90	121	115	118	125	123	129	
7	BEND	.54598E+04	77	70	91	85	85	91	85	91	123	117	120	126	124	130	
8	ST	.36629E+04	101	89	88	76	76	88	76	88	110	99	107	115	112	124	
9	ST	.36393E+04	137	133	108	104	104	108	104	108	158	154	158	161	161	166	
10	ST	.45408E+04	103	93	93	82	82	93	82	92	118	108	114	122	119	130	
11	ST	.30926E+04	101	97	148	145	145	148	145	148	200	197	201	202	202	205	
12	ST	.63050E+04	64	64	119	119	119	119	119	119	170	170	171	171	171	172	
13	BEND	.10432E+05	75	74	129	128	128	129	128	129	182	182	184	184	184	184	
14	ST	.84295E+04	20	20	58	57	57	58	57	57	95	94	96	96	97	97	
15	ST	.28332E+04	133	132	145	144	144	145	144	144	207	206	210	210	212	213	
16	BEND	.58030E+04	116	115	111	111	110	111	110	111	167	166	171	170	173	174	
17	ST	.29939E+04	166	166	166	166	166	166	166	166	166	166	166	166	166	166	
18	ST	.29191E+04	89	89	112	111	111	112	111	111	164	163	167	166	169	170	
19	BEND	.50961E+04	96	95	101	100	100	101	100	101	152	151	156	155	158	159	
20	TEE	.14881E+05	79	79	144	144	143	144	143	144	202	201	204	203	205	205	
21	TEE	.38428E+04	107	105	153	151	150	153	150	151	201	199	206	209	234	235	
22	ST	.11290E+04	150	147	215	212	211	215	211	212	280	278	284	286	314	316	
23	BEND	.31769E+04	155	152	221	218	217	221	217	218	287	285	292	294	320	321	
24	ST	.88177E+03	153	150	219	216	214	219	214	215	285	283	289	292	310	311	
25	ST	.29266E+03	354	342	336	319	310	336	310	314	364	350	368	408	423	428	
26	BEND	.96118E+03	281	270	271	257	250	271	250	253	299	288	304	335	356	360	
27	ST	.58530E+03	74	70	79	74	72	79	72	73	99	95	101	114	136	137	
28	ST	.87700E+03	18	17	37	36	36	37	36	36	60	59	64	67	86	86	
29	BEND	.25401E+04	21	20	42	41	40	42	40	41	65	64	70	72	92	92	
30	ST	.20736E+04	170	165	162	155	151	162	151	152	177	172	174	201	215	217	
31	TEE	.20415E+04	153	150	221	218	216	221	216	218	291	288	296	301	307	310	
32	ST	.71176E+03	158	155	223	219	217	223	217	219	293	289	298	304	311	314	
33	ST	.66371E+03	168	164	229	225	223	229	223	225	301	297	305	314	320	323	
34	ST	.62524E+03	91	90	169	168	168	169	168	168	230	230	232	232	237	237	
35	BEND	.27678E+04	96	95	171	171	170	171	170	171	234	233	236	236	241	242	
36	ST	.42712E+03	85	76	102	94	93	102	93	101	122	114	121	126	164	173	
37	ST	.60900E+03	73	66	102	97	96	102	96	102	132	127	133	135	170	178	

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 * RHRS11 MODEL *

EARTHQUAKE NO. 1

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.47895E+05	150	82	82	62	62	62	62	62	62	177	176	213	209	248	248
2	ST	.21313E+05	190	104	103	155	155	154	155	154	154	385	384	450	473	538	538
3	BEND	.87532E+05	180	78	77	139	138	138	139	138	138	361	360	424	449	513	514
6	BEND	.10270E+06	62	85	84	122	122	121	122	121	122	320	320	381	395	457	457
9	BEND	.98920E+05	192	62	61	120	120	119	120	119	120	320	319	367	394	439	440
16	BEND	.86584E+05	642	89	88	144	143	143	144	143	143	375	375	432	473	524	524
19	BEND	.23366E+06	101	27	26	138	138	138	138	138	138	371	370	399	459	489	490
20	BEND	.27290E+06	88	31	30	170	170	170	170	170	170	435	435	458	533	556	556
21	ST	.88303E+05	87	25	24	137	137	137	137	137	137	376	376	410	472	508	508
22	ST	.52561E+05	122	49	48	160	160	160	160	160	160	414	414	439	511	540	541
32	BEND	.36347E+06	38	11	10	185	185	185	185	185	185	470	470	472	575	577	577
33	BEND	.30903E+06	27	10	9	179	179	179	179	179	179	458	458	462	561	565	565
36	BEND	.25702E+06	109	60	60	192	192	192	192	192	192	480	479	499	591	612	614
39	BEND	.42492E+06	41	20	20	199	199	199	199	199	199	500	500	505	611	616	616
42	BEND	.53679E+06	32	9	9	187	187	187	187	187	187	474	474	476	580	582	582
47	BEND	.80271E+05	122	21	20	119	118	118	119	118	119	334	333	358	418	439	441
54	BEND	.51265E+05	346	49	47	127	125	125	127	125	126	338	336	379	421	459	463
59	ST	.21196E+05	118	59	54	35	29	26	35	26	33	117	106	143	158	185	197
60	ST	.63501E+05	122	41	40	116	115	115	116	115	115	327	326	358	413	452	453
61	BEND	.17627E+06	92	26	25	149	149	149	149	149	149	400	399	425	498	526	526
62	BEND	.21411E+06	45	14	14	127	127	127	127	127	127	353	353	377	441	470	470
70	ST	.44710E+05	140	63	55	138	135	134	138	134	135	353	349	397	434	475	477

IV-74

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 * RHRS11 MODEL *
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EARTHQUAKE NO. 2

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.67873E+05	62	37	37	35	34	34	35	34	34	127	127	152	152	178	178
2	ST	.26610E+05	107	70	69	142	141	141	142	141	141	359	358	412	430	481	482
3	BEND	.11536E+06	87	38	37	113	112	112	113	112	112	311	310	358	377	423	424
6	BEND	.13036E+06	10	51	51	104	104	104	104	104	104	287	287	332	346	392	392
9	BEND	.13180E+06	104	31	30	104	103	103	104	103	103	288	287	324	348	360	380
16	BEND	.10193E+06	517	59	53	133	133	132	133	133	133	355	354	404	435	478	478
19	BEND	.25358E+06	72	23	21	166	165	165	166	165	165	424	422	455	504	534	534
20	BEND	.31905E+06	54	21	21	188	187	187	188	187	188	468	467	491	554	574	575
21	ST	.10380E+06	54	12	11	152	151	151	152	151	151	402	401	432	486	515	515
22	ST	.53549E+05	99	48	46	200	199	199	200	199	200	492	491	518	583	610	611
32	BEND	.49136E+06	28	3	2	179	179	179	179	179	179	452	452	454	537	539	539
33	BEND	.41124E+06	18	3	2	177	177	177	177	177	177	449	448	452	533	536	537
36	BEND	.29605E+06	113	49	48	217	217	216	217	216	217	524	523	539	623	641	642
39	BEND	.59381E+06	26	4	3	182	182	182	182	182	182	459	459	462	546	549	549
42	BEND	.72089E+06	23	1	1	182	182	182	182	182	182	460	460	462	546	547	547
44	BEND	.87977E+05	152	24	23	154	154	153	154	153	154	401	400	426	481	503	505
58	BEND	.58832E+05	434	50	48	149	148	148	149	148	149	382	380	427	458	498	501
59	ST	.28815E+05	118	36	32	14	10	8	14	8	13	85	78	115	118	145	154
60	ST	.60540E+05	97	40	38	147	146	146	147	146	146	389	388	428	471	512	513
61	BEND	.21398E+06	53	10	9	157	156	156	157	156	156	411	411	433	494	516	517
62	BEND	.23844E+06	16	7	7	152	152	152	152	152	152	401	401	424	481	505	506
70	ST	.50044E+05	126	56	46	146	143	142	146	142	143	369	365	420	437	484	486

IV-75

 * RHR511 MODEL *

EARTHQUAKE NO. 3

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.60375E+05	55	28	28	48	48	48	48	48	48	159	158	191	185	220	220
2	ST	.29227E+05	83	49	48	149	148	148	149	148	148	386	385	439	463	516	517
3	BEND	.12682E+06	65	27	26	125	125	125	125	125	125	345	345	393	418	467	467
6	BEND	.13750E+06	16	34	34	119	119	119	119	119	119	328	328	378	396	447	447
9	BEND	.12306E+06	105	33	32	137	136	136	137	136	136	361	360	407	437	480	481
16	BEND	.10987E+06	649	51	51	159	158	158	159	158	159	423	423	474	515	562	562
19	BEND	.29632E+06	81	29	28	181	180	180	181	180	181	456	455	490	537	577	577
20	BEND	.39863E+06	58	18	17	172	172	172	172	172	172	439	438	462	521	550	551
21	ST	.12507E+06	39	7	6	130	129	129	130	129	129	367	366	402	457	486	486
22	ST	.81756E+05	54	23	22	155	155	155	155	155	155	404	403	431	472	501	501
32	BEND	.56930E+06	45	-2	-3	148	148	148	148	148	148	396	396	398	491	492	493
33	BEND	.47258E+06	36	-1	-2	149	148	148	149	148	148	397	397	402	493	496	496
36	BEND	.34965E+06	89	47	46	195	195	195	195	195	195	487	487	507	588	609	611
35	BEND	.66440E+06	47	3	3	160	160	160	160	160	160	422	422	426	528	525	525
42	BEND	.84027E+06	42	-3	-3	149	149	149	149	149	149	400	400	402	496	497	497
47	BEND	.95197E+05	200	38	37	150	149	149	150	149	150	395	394	426	487	510	513
54	BEND	.88702E+05	279	25	24	83	82	81	83	81	82	250	248	290	312	345	348
59	ST	.39461E+05	68	29	27	9	4	3	9	3	7	69	62	97	96	120	127
60	ST	.88762E+05	49	23	22	138	138	138	138	138	138	375	374	411	437	477	478
61	BEND	.21408E+06	80	28	27	183	183	183	183	183	183	472	472	503	577	606	607
62	BEND	.26106E+06	27	17	17	165	165	165	165	165	165	432	432	462	523	555	555
70	ST	.64636E+05	99	55	47	160	157	156	160	156	157	397	394	448	451	502	504

IV-76

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 * RHRS11 MODEL *
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EARTHQUAKE NO. 4

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.55731E+05	94	42	42	72	72	71	72	71	72	200	199	239	231	276	277
2	ST	.25444E+05	142	87	86	196	195	195	196	195	195	474	472	542	580	651	651
3	BEND	.98224E+05	144	82	81	199	198	198	199	198	198	487	486	556	601	674	675
6	BEND	.12404E+06	45	62	62	152	152	152	152	152	152	389	388	451	479	546	546
9	BEND	.13630E+06	112	29	28	124	123	123	124	123	123	336	335	381	418	463	463
16	BEND	.15682E+06	453	22	21	88	88	88	88	88	88	274	274	314	352	390	390
19	BEND	.25821E+06	125	61	60	219	218	218	219	218	218	533	532	576	651	697	698
20	BEND	.32237E+06	114	57	56	238	238	238	238	238	238	573	573	604	700	734	735
21	ST	.11688E+06	75	35	34	163	162	162	163	162	162	432	431	472	546	583	584
22	ST	.66969E+05	107	62	61	202	201	201	202	201	201	497	496	530	603	640	641
32	BEND	.39685E+06	135	55	55	285	284	284	285	284	284	674	673	676	834	836	837
33	BEND	.33561E+06	117	54	54	278	278	278	278	278	278	661	661	669	819	824	824
36	BEND	.27303E+06	177	104	103	295	294	294	295	294	295	689	688	716	846	873	875
39	BEND	.50658E+06	118	51	51	268	268	268	268	268	268	644	644	649	798	802	802
42	BEND	.61555E+06	119	47	47	268	268	268	268	268	268	643	643	646	797	798	798
47	BEND	.99335E+05	238	48	46	158	157	157	158	157	158	413	412	447	518	542	545
54	BEND	.83358E+05	481	50	48	108	107	106	108	106	108	301	299	348	380	417	420
59	ST	.4124E+05	124	34	31	4	4	3	8	3	7	72	66	98	100	123	130
60	ST	.94794E+05	55	28	27	112	111	111	112	111	111	319	319	356	396	437	438
61	BEND	.23458E+06	87	34	33	173	173	173	173	173	173	451	451	482	566	597	597
62	BEND	.24266E+06	56	43	42	194	194	194	194	194	194	491	490	525	610	647	648
70	ST	.56605E+05	184	84	73	179	175	174	179	174	175	435	431	502	518	579	582

IV-77

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 * RHR511 MODEL *

EARTHQUAKE NO. 5

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.54317E+05	88	47	47	31	30	30	31	30	31	120	119	151	148	183	184
2	ST	.24790E+05	121	76	75	108	107	107	108	107	107	295	294	358	380	440	441
3	BEND	.98092E+05	118	63	63	103	102	102	103	102	102	291	291	354	378	441	442
6	BEND	.12720E+06	18	47	47	69	69	69	69	69	69	220	220	275	286	343	343
9	BEND	.12193E+06	113	30	30	69	68	68	69	68	68	220	224	270	295	339	339
16	BEND	.11273E+06	465	54	53	84	83	83	84	83	84	254	253	300	333	376	376
19	BEND	.26341E+06	69	22	21	94	93	93	94	93	94	288	287	318	378	411	411
20	BEND	.30941E+06	69	21	21	117	117	117	117	117	117	340	340	363	443	467	467
21	ST	.11310E+06	41	13	12	83	83	83	83	83	83	270	269	304	357	392	393
22	ST	.58828E+05	75	37	36	107	107	106	107	106	107	313	312	331	408	430	431
32	BEND	.47655E+06	42	-6	-6	108	107	107	108	107	107	325	325	327	427	430	430
33	BEND	.40413E+06	29	-7	-7	104	103	103	104	103	104	317	317	321	417	421	422
36	BEND	.30129E+06	78	24	23	127	126	126	127	126	126	355	354	368	463	479	481
39	BEND	.54053E+06	46	0	0	122	122	122	122	122	122	358	358	361	468	471	471
42	BEND	.70631E+06	36	-8	-8	107	107	107	107	107	107	326	326	328	429	430	430
47	BEND	.76274E+05	196	26	24	117	116	116	117	116	117	334	333	357	438	459	461
54	BEND	.56863E+05	289	47	43	100	98	97	100	97	100	283	281	318	373	404	409
59	ST	.23832E+05	87	66	59	43	35	33	43	33	41	115	103	135	160	182	194
60	ST	.75121E+05	54	27	26	65	64	64	65	64	65	223	222	250	297	330	331
61	BEND	.22711E+06	47	7	7	85	85	85	85	85	85	275	275	300	364	392	392
62	BEND	.26282E+06	11	2	2	74	74	74	74	74	74	253	252	277	336	364	365
70	ST	.41980E+05	131	81	69	124	119	118	124	118	119	318	312	362	412	455	458

IV-78

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 * R:RS11 MODEL *

EARTHQUAKE NO. 6

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.45040E+05	72	42	42	28	27	27	28	27	27	119	118	151	146	181	182
2	ST	.23956E+05	84	49	49	104	103	103	104	103	103	291	290	337	362	412	413
3	BEND	.10330E+06	69	28	28	85	85	84	85	84	84	259	259	301	326	375	375
6	BEND	.11731E+06	8	30	30	71	70	70	71	70	70	228	227	270	286	332	332
9	BEND	.10306E+06	92	27	26	95	95	94	95	94	95	277	276	312	340	378	378
16	BEND	.12862E+06	293	9	9	48	48	48	48	48	48	190	190	219	248	276	276
19	BEND	.23938E+06	53	16	15	119	118	118	119	118	119	332	332	355	410	438	438
20	BEND	.23450E+06	76	43	42	203	202	202	203	202	203	499	499	521	602	625	625
21	ST	.99988E+05	30	6	6	110	109	109	110	109	109	317	317	341	392	425	426
22	ST	.52487E+05	69	35	34	138	137	137	138	137	137	369	368	386	456	477	478
32	BEND	.28921E+06	53	38	38	268	268	268	268	268	268	630	630	632	748	750	750
33	BEND	.24242E+06	42	39	38	265	265	265	265	265	265	624	624	628	742	746	746
36	BEND	.19897E+06	99	75	74	261	261	260	261	260	261	613	612	628	735	754	755
39	BEND	.35540E+06	47	40	39	266	266	266	266	266	266	627	627	631	746	750	750
42	BEND	.43934E+06	43	34	34	260	260	260	260	260	260	616	616	617	732	733	733
47	BEND	.56577E+05	166	48	46	206	205	205	206	205	205	502	501	525	604	628	631
54	BEND	.46194E+05	244	45	42	146	145	144	146	144	146	375	373	410	456	492	496
59	ST	.19035E+05	70	54	47	37	29	27	37	27	34	117	106	144	160	190	202
60	ST	.73339E+05	45	11	10	63	62	62	63	62	63	221	221	243	288	318	318
61	BEND	.22263E+06	20	-5	-5	95	95	95	95	95	95	288	288	304	357	379	380
62	BEND	.23381E+06	4	0	0	103	103	103	103	103	103	303	303	321	374	400	401
70	ST	.30904E+05	155	107	96	197	194	193	197	193	194	467	463	518	573	619	622

IV-79

 * RHR511 MODEL *

EARTHQUAKE NO. 7 PVRC DAMPING *PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.49849E+05	95	80	79	92	92	92	92	92	92	233	232	269	265	304	304
2	ST	.23045E+05	118	96	95	194	193	193	194	193	193	461	460	527	545	608	608
3	BEND	.96000E+05	105	68	68	171	171	170	171	170	170	425	425	486	507	568	569
6	BEND	.11508E+06	17	71	70	146	145	145	146	145	145	368	368	426	437	495	495
9	BEND	.10963E+06	120	55	54	153	152	152	153	152	152	384	384	431	453	496	497
16	BEND	.10080E+06	520	65	65	152	152	152	152	152	152	396	395	449	482	529	530
19	BEND	.22659E+06	88	49	47	217	216	216	217	216	217	524	524	560	617	652	653
20	BEND	.30909E+06	53	35	35	212	212	212	212	212	212	515	515	540	604	627	627
21	ST	.10106E+06	48	19	19	164	163	163	164	163	163	428	427	460	514	547	548
22	ST	.55378E+05	89	58	57	217	216	216	217	216	217	524	523	551	617	647	648
32	BEND	.50449E+06	16	0	0	172	172	172	172	172	172	438	438	439	517	518	518
33	BEND	.41953E+06	8	0	0	172	172	172	172	172	172	438	438	442	517	520	520
36	BEND	.30115E+06	101	54	53	221	220	220	221	220	220	532	531	549	629	650	651
39	BEND	.60508E+06	16	3	3	178	178	178	178	178	178	451	451	454	532	536	536
42	BEND	.73669E+06	12	0	0	177	177	177	177	177	177	449	449	451	529	530	530
47	BEND	.81829E+05	150	34	33	177	176	176	177	176	176	445	444	471	529	555	557
54	BEND	.63619E+05	290	33	31	132	131	131	132	131	132	350	348	387	419	454	457
59	ST	.29003E+05	69	22	18	8	2	0	8	0	6	75	67	101	107	133	141
60	ST	.63740E+05	83	50	49	166	165	165	166	165	165	426	426	464	513	555	556
61	BEND	.19719E+06	58	26	25	186	186	186	186	186	186	469	469	494	560	587	587
62	BEND	.21897E+06	21	25	25	186	186	186	186	186	186	468	468	495	556	585	586
70	ST	.54291E+05	99	52	45	150	148	148	150	148	148	378	376	422	446	488	490

08-ΔI

 * RHR511 MODEL *

EARTHQUAKE NO. 8

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.79493E+05	49	37	37	66	65	65	66	65	66	188	187	218	213	245	246
2	ST	.33422E+05	109	62	62	148	147	147	148	147	147	372	371	432	448	507	508
3	BEND	.13890E+06	102	40	39	126	125	125	126	125	125	338	337	395	413	470	470
6	BEND	.16776E+06	29	42	42	110	110	110	110	110	110	300	299	353	362	418	418
9	BEND	.17479E+06	72	16	15	89	88	88	89	88	88	260	259	301	318	358	359
16	BEND	.15863E+06	400	31	30	101	100	100	101	100	100	295	295	341	369	411	412
19	BEND	.30180E+06	102	35	33	178	177	177	178	177	177	449	447	487	542	582	583
20	BEND	.44092E+06	51	10	9	148	147	147	148	147	147	390	389	414	475	501	502
21	ST	.14073E+06	61	5	4	113	112	112	113	112	112	331	329	365	420	448	449
22	ST	.94930E+05	62	15	13	120	119	119	120	119	119	335	334	359	405	431	432
32	BEND	.57715E+06	7	-5	-6	152	152	152	152	152	152	403	402	405	504	506	506
33	BEND	.49777E+06	-1	-7	-8	144	143	143	144	143	143	386	385	391	483	487	487
36	BEND	.39211E+06	74	50	49	177	176	176	177	176	176	451	450	471	554	575	577
39	BEND	.66150E+06	12	3	3	170	170	169	170	169	170	440	440	445	549	552	552
42	BEND	.82815E+06	5	-5	-5	160	160	160	160	160	160	421	421	423	526	527	527
47	BEND	.11925E+06	92	25	24	113	112	112	113	112	113	319	318	348	401	423	426
54	BEND	.96515E+05	256	30	29	81	80	79	81	79	81	239	237	281	302	338	341
59	ST	.38590E+05	78	52	49	34	33	26	34	26	32	96	87	130	123	155	164
60	ST	.10694E+06	78	15	15	98	97	97	98	97	98	295	294	325	360	394	395
61	BEND	.23385E+06	93	27	26	168	168	168	168	168	168	440	440	470	548	576	576
62	BEND	.27752E+06	51	17	16	154	154	154	154	154	154	409	409	437	506	536	537
70	ST	.76528E+05	81	50	42	122	118	118	122	118	119	326	323	376	384	431	434

18-AT

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 * RHRS11 MODEL *

EARTHQUAKE NO. 9

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.72366E+05	45	27	27	9	8	8	9	8	8	84	83	106	105	128	129
2	ST	.30122E+05	64	44	43	75	74	74	75	74	74	234	233	282	299	340	341
3	BEND	.10940E+06	78	38	38	84	83	83	84	83	83	258	257	310	332	377	377
6	BEND	.14421E+06	-17	32	32	53	53	53	53	53	53	193	192	237	248	289	289
9	BEND	.13356E+06	85	22	21	56	56	55	56	55	56	199	198	238	258	292	292
16	BEND	.10172E+06	359	55	54	105	104	104	105	104	104	305	304	354	391	431	432
19	BEND	.20107E+06	67	35	33	161	159	159	161	159	160	420	419	458	526	563	564
20	BEND	.22698E+06	62	40	39	199	198	198	199	198	198	500	499	530	625	656	657
21	ST	.90856E+05	30	12	10	121	120	120	121	120	121	350	349	390	452	482	483
22	ST	.47359E+05	70	45	43	170	169	168	170	168	169	438	436	468	544	575	576
32	BEND	.39151E+06	8	-3	-4	142	142	142	142	142	142	389	388	391	500	503	503
33	BEND	.32263E+06	2	-2	-2	145	144	144	145	144	144	394	393	399	506	511	512
36	BEND	.24735E+06	67	42	41	177	176	176	177	176	177	446	445	464	566	590	592
39	BEND	.43084E+06	14	4	4	167	167	167	167	167	167	443	443	447	567	570	571
42	BEND	.56935E+06	3	-6	-7	145	145	145	145	145	145	398	398	400	512	513	513
47	BEND	.72661E+05	105	23	21	122	120	120	122	120	121	338	336	363	437	459	462
54	BEND	.46987E+05	355	65	62	133	131	130	133	130	132	345	342	390	443	483	488
59	ST	.26203E+05	65	43	37	22	15	13	22	13	19	86	76	107	122	144	154
60	ST	.58648E+05	60	33	31	124	123	123	124	123	123	348	347	386	438	476	477
61	BEND	.18168E+06	31	8	7	125	125	125	125	125	125	357	357	386	461	485	485
62	BEND	.19529E+06	9	10	9	131	131	131	131	131	131	369	369	395	472	500	500
70	ST	.32628E+05	151	114	100	207	202	201	207	201	202	481	474	546	584	650	654

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 * RHRS11 MODEL *
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EARTHQUAKE NO. 10

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.32144E+05	78	38	38	48	47	47	48	47	47	159	158	192	189	221	222
2	ST	.13470E+05	131	92	92	240	239	239	240	239	239	559	558	616	658	715	716
3	BEND	.52128E+05	132	83	82	244	243	242	244	242	243	571	570	626	674	732	733
6	BEND	.66516E+05	31	61	61	175	175	175	175	175	175	433	433	482	513	562	563
9	BEND	.77054E+05	94	29	29	161	161	161	161	161	161	409	408	441	481	512	512
16	BEND	.80272E+05	401	17	17	104	104	104	104	104	104	301	301	336	368	399	399
19	BEND	.15156E+06	77	41	40	239	238	238	239	238	238	567	566	594	664	693	693
20	BEND	.16774E+06	96	65	67	336	336	336	336	336	336	759	759	779	881	900	901
21	ST	.69097E+05	40	25	25	210	210	210	210	210	210	514	514	538	606	634	634
22	ST	.37968E+05	61	40	39	209	208	209	209	208	208	508	507	526	598	617	618
32	BEND	.27789E+06	67	48	48	325	325	325	325	325	325	738	738	739	856	857	857
33	BEND	.24047E+06	50	43	42	308	308	308	308	308	308	705	704	708	818	820	820
36	BEND	.17747E+06	98	76	75	326	326	326	326	326	326	740	740	752	862	874	875
39	BEND	.35995E+06	53	40	40	300	300	300	300	300	300	691	690	693	802	804	804
42	BEND	.41229E+06	63	48	48	327	327	327	327	327	327	743	743	744	861	861	862
47	BEND	.65456E+05	140	27	26	187	186	186	187	186	187	462	461	481	543	559	561
54	BEND	.52731E+05	229	28	27	133	132	132	133	132	133	349	347	384	413	443	446
59	ST	.26437E+05	30	12	9	1	-3	-4	1	-4	0	61	54	88	86	112	119
60	ST	.41914E+05	52	28	26	127	127	127	127	127	127	350	349	385	426	465	466
61	BEND	.14388E+06	44	23	23	215	214	214	215	214	214	522	522	538	614	633	634
62	BEND	.15274E+06	16	24	24	218	218	218	218	218	218	529	528	546	621	643	643
70	ST	.27645E+05	129	90	77	202	198	198	202	198	199	481	476	540	567	618	621

IV-83

 * RHRS11 MODEL *

EARTHQUAKE NO. 11

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.89592E+05	57	29	28	0	0	0	0	0	0	64	64	83	82	103	103
2	ST	.36903E+05	81	43	43	49	49	49	49	49	49	176	176	218	226	265	266
3	BEND	.12907E+06	105	42	41	61	60	60	61	60	60	204	203	251	262	308	309
6	BEND	.17170E+06	-3	37	37	36	36	36	36	36	36	150	150	190	195	235	235
9	BEND	.13492E+06	145	46	46	62	62	62	62	62	62	203	202	240	255	291	291
16	BEND	.11738E+06	426	64	63	81	81	80	81	80	81	243	242	290	314	354	355
19	BEND	.22073E+06	103	40	39	137	136	135	137	135	136	366	365	398	459	492	493
20	BEND	.28078E+06	77	29	29	144	144	144	144	144	144	385	384	409	478	501	501
21	ST	.83602E+05	88	35	34	141	140	140	141	140	140	379	378	418	477	520	521
22	ST	.43975E+05	145	78	77	190	189	189	190	189	189	469	468	497	587	618	620
32	BEND	.43206E+06	23	-8	-8	125	125	125	125	125	125	350	350	352	433	435	435
33	BEND	.35942E+06	15	-7	-7	126	125	125	126	125	125	350	350	354	433	438	438
36	BEND	.25189E+06	101	51	50	182	181	181	182	181	181	449	448	467	558	583	584
39	BEND	.49239E+06	27	-1	-1	141	141	141	141	141	141	384	384	388	474	479	480
42	BEND	.58834E+06	27	-3	-3	144	144	144	144	144	144	391	391	392	481	482	482
47	BEND	.69192E+05	165	28	27	139	138	138	139	138	139	368	367	394	460	491	493
54	BEND	.49942E+05	332	43	41	118	117	116	118	116	118	320	317	358	400	439	443
59	ST	.21042E+05	108	53	48	31	24	22	31	22	29	110	99	134	152	177	188
60	ST	.50518E+05	154	80	79	155	154	154	155	154	155	399	397	437	511	558	559
61	BEND	.16223E+06	97	35	35	156	156	156	156	156	156	409	409	439	512	548	548
62	BEND	.18534E+06	58	32	32	146	146	146	146	146	146	390	390	418	489	524	524
70	ST	.41958E+05	140	71	63	135	131	131	135	131	132	344	340	390	434	477	480

IV-84

 * RHRS11 MODEL *

EARTHQUAKE NO. 12

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	UPS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.68703E+05	85	55	55	52	52	52	52	52	52	158	157	185	186	214	215
2	ST	.29064E+05	117	76	75	145	145	144	145	144	145	365	364	418	434	485	486
3	BEND	.12173E+06	103	47	47	123	123	122	123	122	123	331	330	379	397	445	446
6	BEND	.14077E+06	12	58	58	111	111	111	111	111	111	299	298	345	357	404	404
9	BEND	.14112E+06	116	37	35	107	106	106	107	106	107	294	293	331	350	385	386
16	BEND	.10776E+06	526	67	66	144	144	144	144	144	144	378	377	429	458	503	504
19	BEND	.24902E+06	89	40	38	200	199	199	200	199	200	491	490	525	577	609	610
20	BEND	.32088E+06	62	36	35	213	213	213	213	213	213	517	490	525	577	609	610
21	ST	.11839E+06	43	6	5	133	133	132	133	132	133	367	366	396	444	471	471
22	ST	.68516E+05	71	32	31	166	166	166	166	166	166	424	423	448	501	525	526
32	BEND	.51232E+06	19	6	5	180	179	179	180	179	179	454	453	455	538	539	549
33	BEND	.42482E+06	11	7	6	180	180	180	180	180	180	455	455	459	540	543	543
36	BEND	.30284E+06	110	63	62	228	227	227	228	227	228	547	546	565	649	670	671
39	BEND	.59263E+06	23	13	13	196	196	196	196	196	196	487	487	491	577	581	581
42	BEND	.74700E+06	14	5	5	185	185	185	185	185	185	465	465	467	551	552	552
47	BEND	.90482E+05	140	35	34	162	162	162	162	162	162	418	417	445	500	524	526
54	BEND	.66731E+05	349	45	44	135	133	133	135	133	134	353	351	396	423	462	465
59	ST	.33825E+05	78	25	22	7	2	1	7	1	5	71	64	98	99	125	133
60	ST	.72770E+05	84	33	31	140	140	139	140	139	140	376	375	411	450	486	487
61	BEND	.20531E+06	68	26	25	185	185	185	185	185	185	469	468	494	560	585	585
62	BEND	.22898E+06	31	23	23	184	183	183	184	183	183	464	464	491	552	578	579
70	ST	.52153E+05	142	69	61	174	171	171	174	171	172	424	421	476	496	544	546

IV-85

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 * QHRS11 MODEL *

EARTHQUAKE NO. 13

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.48086E+05	130	70	70	57	57	56	57	56	57	166	165	202	198	239	239
2	ST	.21963E+05	152	93	92	137	137	136	137	136	136	348	347	411	434	499	500
3	BEND	.93060E+05	134	64	64	115	114	114	115	114	114	313	312	372	397	460	460
6	BEND	.10747E+06	30	70	70	104	103	103	104	103	103	284	284	343	357	418	419
9	BEND	.95048E+05	179	61	61	117	116	116	117	116	116	313	312	362	388	438	439
16	BEND	.99008E+05	428	64	64	109	109	109	109	109	109	306	305	354	393	437	437
19	BEND	.20170E+06	91	45	43	153	152	152	153	152	152	401	399	433	504	538	539
20	BEND	.25816E+06	65	32	31	160	159	159	160	159	159	416	416	440	519	542	542
21	ST	.92301E+05	49	20	19	119	118	118	119	118	118	337	336	370	428	465	466
22	ST	.61929E+05	50	22	21	100	99	99	100	99	99	295	294	313	379	399	400
32	BEND	.27470E+06	65	33	32	251	251	251	251	251	251	600	599	602	733	736	736
33	BEND	.23095E+06	53	34	33	248	247	247	248	247	247	593	593	599	726	731	732
36	BEND	.21366E+06	102	68	67	223	222	222	223	222	222	533	532	553	661	686	687
39	BEND	.35494E+06	50	29	28	233	233	233	233	233	233	565	565	570	692	699	699
42	BEND	.42227E+06	51	25	25	238	238	238	238	238	238	577	577	579	706	708	708
47	BEND	.62502E+05	152	35	34	160	159	159	160	159	150	411	410	438	514	543	546
54	BEND	.41437E+05	386	68	65	160	158	157	160	157	159	399	396	442	498	543	548
59	ST	.23983E+05	73	34	29	14	8	6	14	6	12	82	73	101	121	142	152
60	ST	.76639E+05	46	16	16	65	64	64	65	64	64	225	225	249	300	329	329
61	BEND	.16623E+06	67	29	28	149	149	149	149	149	149	397	396	424	499	532	532
62	BEND	.18911E+06	35	26	25	139	139	139	139	139	139	378	377	404	476	510	510
70	ST	.38589E+05	132	83	73	145	141	141	145	141	141	360	355	406	456	500	503

1V-86

 * RHR511 MODEL *

EARTHQUAKE NO. 14

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.72461E+05	53	45	45	18	18	18	18	18	18	98	97	121	120	144	145
2	ST	.27345E+05	112	79	73	100	99	99	100	99	99	278	277	338	351	403	404
3	BEND	.10588E+06	114	60	60	95	95	94	95	94	95	277	276	338	354	408	408
6	BEND	.12836E+06	27	69	69	79	79	79	79	79	79	237	237	290	300	353	353
9	BEND	.11852E+06	141	55	55	84	83	82	84	82	83	249	248	298	317	360	361
16	BEND	.99732E+05	651	79	78	113	112	112	113	112	112	312	311	371	401	449	450
19	BEND	.21320E+06	136	40	39	153	151	151	153	151	152	404	402	481	505	547	548
20	BEND	.26859E+06	130	32	31	160	159	159	160	159	159	423	422	450	531	563	564
21	ST	.87335E+05	106	30	28	133	132	132	133	132	132	375	374	420	464	520	521
22	ST	.57024E+05	94	31	30	131	130	130	131	130	130	359	357	384	443	479	480
32	BEND	.40645E+06	117	4	4	138	137	137	138	137	138	386	385	388	498	501	502
33	BEND	.33711E+06	102	6	5	139	138	138	139	138	138	388	387	392	500	505	506
36	BEND	.26698E+06	134	44	43	164	163	163	164	163	163	423	422	441	539	563	565
39	BEND	.44452E+06	133	15	14	163	163	163	163	163	163	442	442	447	568	572	572
42	BEND	.59958E+06	111	0	0	137	137	137	137	137	137	388	388	390	501	502	502
47	BEND	.65842E+05	346	45	43	148	147	147	148	147	148	397	396	426	512	536	539
54	BEND	.52168E+05	413	54	51	112	110	109	112	109	111	312	309	353	404	440	444
59	ST	.26034E+05	100	44	39	21	14	12	21	12	19	92	82	113	130	150	161
60	ST	.62542E+05	82	36	35	115	114	114	115	114	114	324	323	361	407	452	454
61	BEND	.17239E+06	123	27	26	141	140	140	141	140	141	391	390	422	503	532	533
62	BEND	.20245E+06	61	18	18	127	127	127	127	127	127	361	361	391	463	495	496
70	ST	.31460E+05	224	130	116	233	228	227	233	227	228	534	526	604	642	717	721

IV-87

 * RHR511 MODEL *

EARTHQUAKE NO. 15

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.81888E+05	101	8	8	0	-1	-1	0	-1	-1	65	64	85	85	106	107
2	ST	.29873E+05	156	48	48	100	99	99	100	99	99	278	277	321	337	384	384
3	BEND	.10716E+06	182	47	47	113	113	113	113	113	113	310	310	358	377	430	431
6	BEND	.14581E+06	28	32	32	69	69	68	69	68	68	217	217	257	267	311	312
9	BEND	.15720E+06	143	6	6	59	59	59	59	59	59	204	203	232	248	277	278
16	BEND	.12862E+06	469	28	28	73	73	73	73	73	73	233	232	270	293	329	329
19	BEND	.22804E+06	127	36	34	174	173	173	174	173	173	441	439	471	523	558	559
20	BEND	.29207E+06	96	31	30	193	193	193	193	193	193	482	481	504	567	589	589
21	ST	.10707E+06	65	15	14	134	134	134	134	134	134	365	365	393	439	475	476
22	ST	.56697E+05	119	37	36	159	158	158	159	158	158	411	410	433	492	516	517
32	BEND	.51968E+06	18	-1	-2	153	153	153	153	153	153	403	403	405	473	475	475
33	BEND	.43292E+06	10	-1	-1	153	152	152	153	152	152	402	402	405	472	475	476
36	BEND	.31679E+06	89	35	35	179	179	179	179	179	179	451	451	464	535	551	552
39	BEND	.63553E+06	14	-1	-1	152	152	152	152	152	152	403	403	406	474	477	477
42	BEND	.77058E+06	12	-3	-3	153	153	153	153	153	153	405	405	406	475	476	476
47	BEND	.87713E+05	139	22	21	144	143	143	144	143	143	381	380	402	452	475	477
54	BEND	.62279E+05	283	38	36	126	124	124	126	124	125	336	334	374	401	434	438
59	ST	.27970E+05	69	35	31	17	11	9	17	9	15	85	77	114	118	145	154
60	ST	.67340E+05	116	27	26	100	99	99	100	99	99	292	291	325	365	405	406
61	BEND	.21427E+06	70	14	13	145	144	144	145	144	144	386	386	407	461	490	490
62	BEND	.22318E+06	47	18	17	155	154	154	155	154	154	406	406	429	484	515	516
70	ST	.42921E+05	159	74	63	157	153	153	157	153	154	392	387	443	469	516	518

IV-88

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 * RHRS11 MODEL *

EARTHQUAKE NO. 16

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.46844E+05	101	74	74	83	83	82	83	82	83	218	217	256	252	291	292
2	ST	.2269CE+05	118	91	90	198	197	197	198	197	197	473	472	534	560	621	622
3	BEND	.98232E+05	98	61	60	167	167	167	167	167	167	421	421	476	507	560	561
6	BEND	.10865E+06	25	73	73	157	157	157	157	157	157	395	395	452	470	528	529
9	BEND	.10044E+06	134	63	62	180	180	179	180	179	180	441	440	487	517	562	562
16	BEND	.11843E+06	442	39	39	117	116	116	117	116	116	327	327	369	404	441	442
19	BEND	.23002E+06	87	50	49	221	221	221	221	221	221	533	532	566	625	661	661
20	BEND	.31354E+06	56	37	37	220	220	220	220	220	220	531	531	554	619	642	642
21	ST	.89327E+05	64	44	43	218	217	217	218	217	217	534	534	569	634	674	674
22	ST	.62814E+05	66	42	41	183	183	183	183	183	183	457	457	475	540	565	566
32	BEND	.49587E+06	24	11	11	204	204	204	204	204	204	501	501	502	583	584	584
33	BEND	.40571E+06	15	12	12	203	202	202	203	202	203	498	498	502	581	583	583
36	BEND	.29576E+06	95	62	61	241	241	241	241	241	241	574	574	592	672	690	691
39	BEND	.59739E+06	20	13	13	203	203	203	203	203	203	499	499	502	582	585	585
42	BEND	.72535E+06	18	10	10	203	203	203	203	203	203	500	500	501	582	583	583
47	BEND	.84927E+05	142	36	35	183	182	182	183	182	183	458	457	481	539	561	563
54	BEND	.62426E+05	256	40	38	151	149	149	151	149	150	386	384	423	455	489	492
59	ST	.27723E+05	58	29	24	14	9	7	14	7	12	85	77	116	117	147	155
60	ST	.66330E+05	74	46	45	153	153	153	153	153	153	402	401	436	487	528	529
61	BEND	.20806E+06	51	26	26	187	187	187	187	187	187	472	471	494	558	585	585
62	BEND	.22708E+06	18	27	27	190	190	190	190	190	190	475	475	499	561	591	591
70	ST	.43586E+05	133	86	78	206	203	203	206	203	204	488	485	542	570	620	622

68-11

 * RHRS11 MODEL *

EARTHQUAKE NO. 17

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.42873E+05	97	38	38	35	35	34	35	34	35	136	135	169	165	199	200
2	ST	.20283E+05	171	71	71	176	176	176	176	176	176	440	439	492	520	577	578
3	BEND	.83656E+05	165	55	55	165	165	164	165	164	165	422	422	472	502	559	560
6	BEND	.90456E+05	131	64	64	153	153	153	153	153	153	395	394	446	470	526	526
9	BEND	.94820E+05	138	39	39	150	149	149	150	149	149	388	387	424	452	492	492
16	BEND	.95556E+05	597	43	43	127	127	127	127	127	127	354	353	390	436	470	471
19	BEND	.22482E+06	127	33	32	183	182	182	183	182	183	460	459	488	536	569	570
20	BEND	.27406E+06	108	38	38	218	218	218	218	218	218	528	528	549	607	629	629
21	ST	.82667E+05	129	41	40	204	204	204	204	204	204	508	508	539	590	637	637
22	ST	.50206E+05	149	49	48	200	199	199	200	199	200	493	493	513	577	601	602
32	BEND	.46332E+06	19	9	9	183	183	183	183	183	183	461	461	462	526	527	527
33	BEND	.39000E+06	10	8	8	180	179	179	180	179	180	454	454	456	518	521	521
36	BEND	.28106E+06	80	39	38	208	208	208	208	208	208	509	509	520	585	599	600
39	BEND	.55116E+06	19	13	13	191	191	191	191	191	191	477	477	479	544	547	547
42	BEND	.68624E+06	15	9	9	185	185	185	185	185	185	465	465	466	530	531	531
47	BEND	.89005E+06	111	8	7	135	135	135	135	135	135	364	363	379	421	437	439
54	BEND	.59321E+05	197	24	22	130	129	128	130	128	129	346	345	376	401	431	434
59	ST	.23000E+05	43	21	17	11	6	4	11	4	10	81	74	111	110	140	149
60	ST	.57575E+05	170	40	39	143	143	143	143	143	143	385	385	417	469	510	511
61	BEND	.19671E+06	92	19	19	168	167	167	168	167	168	433	433	453	505	530	532
62	BEND	.21655E+06	63	19	19	166	166	166	166	166	166	430	430	451	501	531	531
70	ST	.33930E+05	177	88	80	219	217	216	219	216	217	518	515	573	599	650	652

06-ΔI

 * RHR511 MODEL *

EARTHQUAKE NO. 18

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.62575E+05	97	69	68	32	32	32	32	32	32	123	122	151	147	177	178
2	ST	.28596E+05	104	74	74	84	83	83	84	83	83	242	241	297	306	357	358
3	BEND	.12360E+06	85	42	42	61	61	60	61	60	60	205	205	257	266	316	316
6	BEND	.13647E+06	3	63	63	64	64	64	64	64	64	204	203	257	258	311	311
9	BEND	.96952E+05	198	90	89	112	112	111	112	111	112	298	297	353	371	422	423
16	BEND	.10280E+06	416	85	85	104	104	104	104	104	104	287	287	342	367	414	415
19	BEND	.22492E+05	71	38	36	120	119	119	120	119	119	332	331	364	424	458	459
20	BEND	.24732E+06	71	42	41	158	156	158	158	158	158	413	412	441	520	547	548
21	ST	.88241E+05	52	31	30	121	120	120	121	120	120	336	336	376	429	473	474
22	ST	.53303E+05	73	49	47	127	126	126	127	126	126	345	344	368	442	469	470
32	BEND	.36966E+06	24	-6	-6	143	142	142	143	142	142	385	385	387	484	487	437
33	BEND	.30539E+06	17	-3	-4	145	144	144	145	144	144	389	389	394	489	495	495
36	BEND	.24853E+06	75	44	43	166	165	165	166	165	165	417	416	437	528	553	555
39	BEND	.43321E+06	24	0	-1	153	153	153	153	153	153	408	408	413	512	518	519
42	BEND	.50682E+06	27	-2	-2	161	161	161	161	161	161	425	425	427	533	534	534
47	BEND	.68873E+05	131	26	24	126	125	124	126	124	125	340	338	367	432	464	466
54	BEND	.49055E+05	297	49	46	113	111	110	113	110	112	303	300	345	387	428	433
59	ST	.24470E+05	62	42	36	21	14	12	21	12	18	86	76	107	125	146	157
60	ST	.68604E+05	58	39	38	84	84	83	84	83	84	258	257	286	340	375	376
61	BEND	.18548E+06	47	18	18	113	113	113	113	113	113	322	322	350	412	446	447
62	BEND	.21176E+06	17	16	16	104	104	104	104	104	104	306	306	332	393	426	426
70	ST	.45294E+05	98	64	54	108	104	104	108	104	105	288	283	330	372	413	416

16-VI

 * RHRS11 MODEL *

EARTHQUAKE NO. 19

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.44151E+05	71	55	54	38	37	37	38	37	37	136	135	169	165	201	201
2	ST	.22504E+05	85	63	62	115	114	114	115	114	114	311	310	362	389	439	440
3	BEND	.95700E+05	70	39	39	96	96	95	96	95	96	280	280	328	355	403	404
6	BEND	.10096E+06	16	54	54	96	96	96	96	96	96	276	275	327	346	397	397
9	BEND	.96980E+05	100	39	38	104	104	103	104	103	104	294	293	334	365	403	404
16	BEND	.10422E+06	402	33	33	79	78	78	79	78	78	249	248	287	322	356	357
19	BEND	.21530E+06	66	25	24	137	136	136	137	136	136	369	368	396	457	487	487
20	BEND	.20446E+06	104	60	59	237	236	236	237	236	237	570	569	596	693	719	719
21	ST	.10336E+06	20	0	0	95	95	95	95	95	95	290	290	316	367	396	396
22	ST	.60805E+05	39	13	12	100	100	100	100	100	100	296	295	312	372	391	392
32	BEND	.25166E+06	108	59	58	308	308	308	308	308	308	715	714	717	862	864	864
33	BEND	.21463E+06	89	56	56	298	297	297	298	297	298	695	694	699	838	843	843
36	BEND	.19056E+06	138	83	82	270	269	269	270	269	269	630	629	648	767	790	791
39	BEND	.29231E+06	113	69	69	329	329	329	329	329	329	759	759	764	915	921	921
42	BEND	.36319E+06	106	61	61	320	320	320	320	320	320	741	741	743	892	894	894
47	BEND	.52100E+05	237	64	62	224	223	223	224	223	224	540	539	567	659	687	690
54	BEND	.48376E+05	241	44	41	131	130	129	131	129	131	345	343	381	428	463	466
59	ST	.19803E+05	65	58	52	39	31	29	39	29	36	116	105	142	161	189	200
60	ST	.72307E+05	31	8	7	62	61	61	62	61	61	219	218	242	286	315	316
61	BEND	.18752E+06	42	9	9	124	124	124	124	124	124	348	347	368	434	458	459
62	BEND	.20950E+06	10	7	7	119	119	119	119	119	119	337	337	358	421	447	447
70	ST	.40838E+05	93	61	52	127	124	124	127	124	124	329	325	370	410	449	451

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 * RHRS11 MODEL *
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EARTHQUAKE NO. 20

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.40705E+05	57	23	23	22	21	21	22	21	21	110	109	139	136	168	168
2	ST	.20687E+05	74	47	47	128	128	127	128	127	128	340	340	381	403	454	454
3	BEND	.88912E+05	58	28	28	109	108	108	109	100	108	307	306	344	367	415	416
6	BEND	.93868E+05	10	36	36	104	104	103	104	103	104	294	293	333	352	399	399
9	BEND	.77676E+05	113	47	46	158	158	158	159	158	158	401	400	437	463	506	506
16	BEND	.72876E+05	516	65	65	148	147	147	148	147	147	386	385	426	472	513	514
19	BEND	.19118E+06	63	34	32	175	174	174	175	174	174	441	440	468	511	545	546
20	BEND	.19583E+06	86	63	62	270	270	270	270	270	270	630	630	654	716	742	742
21	ST	.63261E+05	76	62	61	238	237	237	238	237	237	569	568	602	658	707	708
22	ST	.41161E+05	80	53	52	198	197	197	198	197	197	485	484	506	565	590	591
32	BEND	.37072E+06	24	16	16	203	203	203	203	203	203	498	498	499	561	563	563
33	BEND	.31823E+06	12	13	13	193	193	193	193	193	193	479	479	482	541	544	544
36	BEND	.22926E+06	68	41	41	220	219	219	220	219	219	528	528	539	601	614	615
39	BEND	.43766E+06	24	20	20	213	213	213	213	213	213	519	519	521	585	588	588
42	BEND	.53110E+06	24	19	19	215	214	214	215	214	215	522	522	523	588	589	589
47	BEND	.73948E+05	113	11	11	142	141	141	142	141	141	375	374	392	428	447	448
54	BEND	.52563E+05	236	26	24	123	122	121	123	121	122	330	329	363	379	411	414
59	ST	.20921E+05	69	35	32	20	15	13	20	13	18	93	85	125	124	155	163
60	ST	.53453E+05	56	30	29	108	107	107	108	107	107	309	308	338	382	420	421
61	BEND	.15818E+06	48	28	27	182	181	181	182	181	181	457	457	477	527	557	558
62	BEND	.18335E+06	12	20	20	164	163	163	164	163	163	422	421	441	487	519	519
70	ST	.27244E+05	162	112	99	227	222	222	227	222	223	521	515	586	602	664	667

IV-93

 * RHR511 MODEL *

EARTHQUAKE NO. 21

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.72675E+05	126	30	30	22	22	21	22	21	22	110	109	137	134	162	162
2	ST	.29803E+05	160	60	59	99	98	98	99	98	98	284	283	343	362	414	415
3	BEND	.11915E+06	153	42	42	90	89	89	90	89	89	273	272	331	352	405	405
6	BEND	.14019E+06	36	47	47	78	78	78	78	78	78	242	242	298	310	362	363
9	BEND	.14212E+06	180	26	26	67	66	66	67	66	66	224	223	269	291	330	331
16	BEND	.12231E+06	572	45	44	90	89	89	90	89	89	276	276	327	360	402	402
19	BEND	.22679E+06	144	47	45	159	157	157	159	157	158	421	420	460	535	577	578
20	BEND	.29530E+06	130	39	38	161	160	160	161	160	161	430	430	457	549	579	579
21	ST	.98183E+05	106	34	33	133	132	132	133	132	132	379	378	422	494	530	530
22	ST	.52990E+05	127	57	55	168	167	166	168	166	167	438	437	466	552	582	584
32	BEND	.38796E+06	156	39	38	185	185	185	185	185	185	486	486	489	628	631	631
33	BEND	.33437E+06	129	35	34	175	175	175	175	175	175	466	466	472	603	607	608
36	BEND	.25184E+06	194	80	79	212	211	211	212	211	212	530	529	550	678	701	703
39	BEND	.44126E+06	164	50	50	206	206	206	206	206	206	532	532	536	684	688	689
42	BEND	.55037E+06	159	43	43	197	197	197	197	197	197	514	514	516	663	664	664
47	BEND	.65744E+05	403	71	70	183	182	182	183	182	183	473	472	504	611	635	638
54	BEND	.52153E+05	471	72	70	139	136	136	139	136	138	370	367	411	479	512	516
59	ST	.24989E+05	133	56	52	32	25	22	32	22	30	112	101	133	154	175	187
60	ST	.68846E+05	77	33	32	107	107	106	107	106	107	315	314	352	403	444	446
61	BEND	.16552E+06	159	57	56	184	183	183	184	183	183	483	482	518	622	656	656
62	BEND	.18855E+06	90	49	48	173	173	173	173	173	173	459	459	494	590	627	628
70	ST	.40856E+05	188	91	80	169	164	164	169	164	165	413	407	471	510	571	574

IV-94

 * RHRSi1 MODEL *

EARTHQUAKE NO. 22

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.73082E+05	86	44	43	21	20	20	21	20	20	106	105	130	129	154	155
2	ST	.30022E+05	108	65	64	90	89	89	90	89	88	259	258	313	327	373	375
3	BEND	.12580E+06	95	38	37	71	71	70	71	70	71	230	229	281	296	341	342
6	BEND	.14770E+06	0	48	48	62	62	62	62	62	62	206	205	253	261	307	307
9	BEND	.14072E+06	123	32	31	63	62	62	63	62	62	209	208	249	266	300	301
16	BEND	.10513E+06	471	75	75	110	109	109	110	109	109	306	305	361	391	435	436
19	BEND	.23655E+06	77	32	30	132	130	130	132	130	131	361	359	396	456	487	489
20	BEND	.29950E+06	50	22	21	142	142	142	142	142	142	384	384	410	483	504	505
21	ST	.92412E+05	52	29	28	137	136	136	137	135	136	374	373	415	474	512	513
22	ST	.55974E+05	85	42	40	135	134	134	135	134	134	368	366	394	465	489	491
32	BEND	.45809E+06	5	-7	-8	133	132	132	133	132	132	367	366	369	461	463	463
33	BEND	.37894E+06	0	-6	-6	134	134	134	134	134	134	370	369	375	464	469	469
36	BEND	.26779E+06	100	49	47	181	180	180	181	180	181	456	455	475	572	592	594
39	BEND	.50953E+06	12	1	1	155	155	155	155	155	155	414	414	418	518	522	522
42	BEND	.64792E+06	4	-6	-6	143	143	143	143	143	143	390	390	392	489	490	490
47	BEND	.82045E+05	115	30	28	123	121	121	123	121	123	337	335	365	426	452	455
54	BEND	.64192E+05	314	46	43	97	94	93	97	93	96	269	266	313	343	381	386
59	ST	.32468E+05	64	40	35	19	12	10	19	10	17	83	73	105	116	136	147
60	ST	.68196E+05	75	34	32	92	91	90	92	90	91	280	279	314	365	399	400
61	BEND	.17498E+06	66	31	30	156	155	155	156	155	156	413	413	444	522	553	554
62	BEND	.23347E+06	11	7	6	109	108	108	109	108	108	319	318	344	407	434	434
70	ST	.41561E+05	161	97	83	152	146	145	152	145	147	377	370	438	473	525	530

IV-95

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 * FHRS11 MODEL *

EARTHQUAKE NO. 23

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.68464E+05	104	34	34	24	23	23	24	23	23	114	114	143	139	169	169
2	ST	.29603E+05	140	62	62	124	124	123	124	123	124	331	331	383	404	456	456
3	BEND	.12833E+06	120	36	36	101	101	101	101	101	101	292	292	339	361	410	411
6	BEND	.14663E+06	33	43	43	88	88	88	88	88	88	261	260	308	322	370	370
9	BEND	.12931E+06	159	39	39	111	110	110	111	110	110	307	307	346	371	409	410
16	BEND	.12787E+06	486	45	44	102	102	101	102	101	102	296	296	339	375	412	413
19	BEND	.28313E+06	92	30	29	152	151	151	152	151	151	397	396	424	481	511	512
20	BEND	.35342E+06	70	28	27	172	171	171	172	171	171	437	437	458	522	543	543
21	ST	.10822E+06	77	28	27	156	155	155	156	155	155	410	410	441	499	538	538
22	ST	.67572E+05	98	39	38	154	154	154	154	154	154	401	401	421	488	513	514
32	BEND	.43070E+06	38	27	27	226	226	226	226	226	226	547	547	549	644	646	646
33	BEND	.37376E+06	24	23	23	212	212	212	212	212	212	520	520	524	613	617	617
36	BEND	.28471E+06	112	68	67	240	240	240	240	240	240	569	569	586	678	701	702
39	BEND	.53344E+06	34	27	27	222	222	222	222	222	222	540	540	544	637	642	642
42	BEND	.64089E+06	32	26	26	226	226	226	226	226	226	548	548	549	644	646	646
47	BEND	.86061E+05	141	33	32	168	167	167	168	167	167	427	426	449	510	538	540
54	BEND	.54487E+05	324	61	59	176	175	174	176	174	176	434	432	477	519	560	564
59	ST	.30839E+05	48	18	14	6	0	-1	6	-1	4	71	63	96	102	127	136
60	ST	.94930E+05	70	11	10	75	75	75	75	75	75	246	245	270	315	346	347
61	BEND	.23658E+06	66	17	16	144	144	144	144	144	144	386	386	407	468	496	496
62	BEND	.26118E+06	38	17	17	143	143	143	143	143	143	383	383	405	465	494	495
70	ST	.41815E+05	174	99	90	207	204	203	207	203	204	488	484	543	587	638	641

96-ΔI

 * RHR511 MODEL *

EARTHQUAKE NO. 24

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.72737E+05	82	63	63	32	32	31	32	31	32	119	119	144	143	171	171
2	ST	.30431E+05	106	81	80	99	98	97	99	97	98	269	268	322	334	385	385
3	BEND	.11958E+06	105	60	60	90	90	90	90	90	90	261	260	315	329	382	382
6	BEND	.15177E+06	-2	60	60	68	68	68	62	68	68	210	210	258	264	311	312
9	BEND	.14874E+06	109	38	38	62	61	61	62	61	61	202	201	239	253	282	288
16	BEND	.11294E+06	460	76	76	105	104	104	105	104	104	290	289	341	369	414	415
19	BEND	.25990E+06	69	27	26	124	123	123	124	123	123	341	339	371	424	455	456
20	BEND	.32364E+06	44	20	20	136	136	136	136	136	136	368	367	391	454	476	476
21	ST	.88402E+05	65	37	36	151	150	150	151	150	150	399	398	439	498	541	542
22	ST	.58475E+05	86	44	42	144	143	143	144	143	143	378	377	402	471	499	500
32	BEND	.38187E+06	31	13	13	183	183	183	183	183	183	463	463	465	564	567	567
33	BEND	.32606E+06	20	12	11	176	176	176	176	176	176	449	449	455	548	553	554
36	BEND	.27076E+06	115	53	52	190	190	189	190	189	190	465	464	484	572	598	600
39	BEND	.49808E+06	19	6	6	165	164	164	165	164	165	429	429	433	525	530	530
42	BEND	.62440E+06	11	0	0	155	155	155	155	155	155	411	411	413	503	504	505
47	BEND	.98440E+05	81	5	3	87	87	86	87	86	87	265	264	288	334	359	362
54	BEND	.58845E+05	335	51	48	112	110	110	112	110	111	301	298	345	375	418	422
59	ST	.28037E+05	85	52	46	26	20	17	26	17	24	95	86	119	132	156	167
60	ST	.65437E+05	90	48	46	119	118	118	119	118	118	328	327	362	419	460	461
61	BEND	.17568E+06	72	34	33	161	161	161	161	161	161	419	419	449	520	555	555
62	BEND	.20808E+06	27	25	25	143	143	143	143	143	143	383	383	411	477	510	510
70	ST	.51807E+05	122	59	49	118	114	114	118	114	115	310	305	353	387	428	430

IV-97

 * RHR511 MODEL *

EARTHQUAKE NO. 25

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.91877E+05	58	7	7	-4	-4	-4	-4	-4	-4	57	56	76	76	97	98
2	ST	.36173E+05	96	37	32	57	56	55	57	56	56	193	192	234	249	291	291
3	BEND	.13408E+06	106	25	25	59	59	58	59	58	58	204	203	247	265	310	310
6	BEND	.17639E+06	-3	16	16	33	33	33	33	33	33	148	148	184	195	233	233
9	BEND	.15503E+06	127	15	14	48	47	47	48	47	47	178	177	211	231	263	264
16	BEND	.12361E+06	453	37	37	72	72	72	72	72	72	232	231	273	302	341	342
19	BEND	.21336E+06	127	39	37	156	155	155	156	155	155	407	405	442	510	546	547
20	BEND	.30529E+06	83	17	16	138	138	138	138	138	138	376	375	398	472	494	494
21	ST	.11052E+06	59	4	3	95	95	95	95	95	95	293	292	322	378	407	407
22	ST	.51308E+05	118	44	42	154	153	153	154	153	153	404	402	429	505	533	534
32	BEND	.48581E+06	53	-4	-4	123	123	123	123	123	123	347	347	349	440	443	443
33	BEND	.41029E+06	40	-5	-5	120	119	119	120	119	119	340	340	344	432	437	437
36	BEND	.30621E+06	101	33	32	149	148	148	149	148	149	390	388	403	492	510	512
39	BEND	.52584E+06	64	5	5	149	149	149	149	149	149	404	404	408	510	513	513
42	BEND	.70590E+06	48	-6	-6	125	125	125	125	125	125	356	356	358	451	452	453
47	BEND	.73710E+05	243	37	35	145	144	143	145	143	144	385	384	411	488	511	514
54	BEND	.60310E+05	388	44	42	102	100	99	102	99	101	288	286	326	369	403	407
59	ST	.27024E+05	122	53	49	28	22	19	28	19	26	103	93	124	142	164	175
60	ST	.65452E+05	90	26	25	94	93	93	94	93	93	283	281	316	363	401	402
61	BEND	.17184E+06	110	31	30	159	159	159	159	159	159	421	421	449	533	562	562
62	BEND	.20392E+06	55	19	18	137	137	137	137	137	137	378	377	404	479	508	508
70	ST	.48725E+05	155	55	44	111	107	106	111	106	107	296	290	339	371	412	415

86-VI

 * RHR511 MODEL *

EARTHQUAKE NO. 26

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.48167E+05	51	37	37	34	33	33	34	33	33	130	129	161	158	192	192
2	ST	.23426E+05	86	60	59	144	144	143	144	143	143	372	371	419	447	497	498
3	BEND	.10100E+06	70	37	37	122	122	121	122	121	122	334	333	377	405	453	454
6	BEND	.11220E+06	17	43	43	108	108	108	108	108	108	303	303	346	368	414	414
9	BEND	.11522E+06	68	23	22	110	109	109	110	109	110	307	307	339	365	399	399
16	BEND	.10828E+06	472	35	35	102	102	102	102	102	102	299	298	334	374	406	407
19	BEND	.23129E+06	80	33	32	173	173	173	173	173	173	439	439	466	522	551	552
20	BEND	.27142E+06	74	42	41	220	220	220	220	220	220	533	533	554	623	643	643
21	ST	.85476E+05	64	40	39	198	197	197	198	197	197	492	492	522	584	623	623
22	ST	.52359E+05	96	48	47	184	183	183	184	183	183	460	459	480	549	571	571
32	BEND	.44996E+06	22	13	12	196	196	196	196	196	196	486	486	487	563	564	564
33	BEND	.37774E+06	13	12	12	193	193	193	193	193	193	480	480	483	556	559	559
36	BEND	.27382E+06	97	48	48	223	222	222	223	222	223	536	535	548	626	640	641
39	BEND	.56094E+06	18	11	11	190	190	190	190	190	190	475	475	477	551	554	554
42	BEND	.65655E+06	20	14	14	202	202	202	202	202	202	499	499	500	577	578	578
47	BEND	.83685E+05	126	21	19	156	155	155	156	155	156	403	403	422	473	493	495
54	BEND	.60442E+05	255	30	28	131	129	129	131	129	130	347	345	380	409	440	443
59	ST	.23292E+05	82	41	36	23	18	16	23	16	21	100	91	131	134	165	175
60	ST	.67259E+05	73	26	25	103	102	102	103	102	102	302	301	330	379	412	413
61	BEND	.20203E+06	50	19	18	163	163	163	163	163	163	423	423	442	501	526	526
62	BEND	.22832E+06	15	15	15	153	153	153	153	153	153	403	403	423	478	505	505
70	ST	.35736E+05	167	92	81	201	197	197	201	197	198	476	472	529	566	614	616

66-ΔI

 * RHR511 MODEL *

EARTHQUAKE NO. 27

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.39835E+05	92	52	52	29	29	28	29	28	29	121	120	154	148	184	185
2	ST	.19777E+05	103	65	64	100	100	99	100	99	99	282	281	336	358	412	413
3	BEND	.82636E+05	90	44	44	87	86	86	87	86	86	260	260	312	335	390	390
6	BEND	.97328E+05	7	43	43	69	69	69	69	69	69	222	221	272	284	334	335
9	BEND	.96980E+05	92	21	20	61	61	61	61	61	61	210	209	247	269	306	306
16	BEND	.87308E+05	332	40	45	83	83	83	83	83	83	256	256	298	332	369	370
19	BEND	.15655E+06	84	49	48	157	157	156	157	156	157	409	408	441	515	550	551
20	BEND	.15688E+06	102	73	72	237	236	236	237	236	236	569	568	599	706	735	735
21	ST	.65469E+05	60	34	34	143	143	143	143	143	143	385	385	421	486	528	529
22	ST	.45834E+05	52	31	30	113	112	112	113	112	112	319	319	338	409	431	432
32	BEND	.27423E+06	21	3	3	175	175	175	175	175	175	450	449	451	559	561	561
33	BEND	.23579E+06	9	1	1	166	166	166	166	166	166	432	432	436	538	542	542
36	BEND	.16927E+06	78	55	54	211	210	210	211	210	211	511	511	530	637	660	662
39	BEND	.34498E+06	11	1	1	167	167	167	167	167	167	435	435	439	542	547	547
42	BEND	.39176E+06	18	5	5	186	186	186	186	186	186	473	473	474	587	588	588
47	BEND	.63123E+05	84	1	0	99	98	98	99	98	99	291	290	310	370	391	394
54	BEND	.38856E+05	303	44	41	118	116	115	118	115	117	316	314	354	401	440	445
59	ST	.18252E+05	79	47	41	20	19	16	26	16	23	99	89	119	141	163	175
60	ST	.59519E+05	43	20	19	68	67	67	68	67	68	230	229	253	304	334	335
61	BEND	.13401E+06	56	26	25	142	142	142	142	142	142	383	383	408	483	515	516
62	BEND	.14518E+06	34	31	30	146	146	146	146	146	146	390	390	416	492	527	527
70	ST	.25454E+05	168	119	106	190	186	185	190	185	186	446	440	501	563	614	617

001-Δ1

 * RHR511 MODEL *

EARTHQUAKE NO. 28

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.51811E+05	80	35	34	33	33	32	33	32	33	132	132	166	160	198	199
2	ST	.26222E+05	94	53	52	120	119	119	120	119	119	323	323	367	389	445	446
3	BEND	.12170E+06	79	35	34	101	100	100	101	100	100	290	290	331	353	409	409
6	BEND	.13811E+06	22	35	35	86	86	85	86	85	85	257	257	299	314	366	366
9	BEND	.11854E+03	105	33	32	118	117	117	118	117	117	322	321	357	379	424	424
16	BEND	.13678E+06	492	35	34	83	82	82	83	82	82	255	255	286	321	354	354
19	BEND	.29735E+06	81	24	24	125	124	124	125	124	125	343	343	367	411	446	447
20	BEND	.38026E+06	59	16	15	139	139	139	139	139	139	373	373	389	438	460	461
21	ST	.10762E+06	60	36	35	157	156	156	157	156	157	408	407	435	481	532	532
22	ST	.71605E+05	86	30	29	119	118	118	119	118	118	331	331	346	402	426	420
32	BEND	.50753E+06	28	3	3	175	175	175	175	175	175	444	444	445	507	508	508
33	BEND	.43597E+06	16	1	0	166	166	166	166	166	166	427	427	430	488	492	492
36	BEND	.32121E+06	103	33	33	187	186	186	187	186	186	465	465	477	539	553	554
39	BEND	.65184E+06	21	0	0	161	161	161	161	161	161	418	418	421	478	483	483
42	BEND	.75123E+06	25	3	2	177	177	176	177	176	177	448	448	449	511	512	512
47	BEND	.93398E+05	140	15	14	141	140	140	141	140	141	373	373	393	432	458	460
54	BEND	.66465E+05	263	30	28	122	121	120	122	120	121	328	326	363	381	417	420
59	ST	.30677E+05	53	21	17	5	1	0	5	0	4	68	61	96	96	122	130
60	ST	.80220E+05	89	37	36	86	86	86	86	86	86	266	266	291	342	377	377
61	BEND	.23621E+06	60	19	19	141	141	141	141	141	141	377	377	396	443	479	479
62	BEND	.28565E+06	17	9	9	116	116	116	116	116	116	327	327	345	388	423	423
70	ST	.41227E+05	187	88	78	165	162	161	165	161	162	410	406	464	498	548	550

IV-101

 * RHRS11 MODEL *

EARTHQUAKE NO. 29

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.69691E+05	85	27	27	21	20	20	21	20	21	109	108	134	133	158	159
2	ST	.27074E+05	139	65	64	123	123	122	123	122	123	331	330	387	411	461	462
3	BEND	.94212E+05	168	69	68	146	146	145	146	145	146	382	381	446	476	534	534
6	BEND	.12482E+06	39	55	55	102	101	101	102	101	101	287	287	342	358	410	410
9	BEND	.13406E+06	142	26	25	87	86	86	87	86	86	262	261	301	328	362	363
16	BEND	.10361E+06	660	60	60	123	123	122	123	122	123	341	340	393	432	475	475
19	BEND	.21539E+06	143	47	45	188	187	187	188	187	187	475	474	512	586	624	625
20	BEND	.23020E+06	183	71	70	266	265	265	266	265	266	633	652	663	774	803	803
21	ST	.94266E+05	99	34	33	165	164	164	165	164	165	436	435	475	546	583	583
22	ST	.50426E+05	126	57	55	191	190	190	191	190	190	480	479	506	591	619	620
32	BEND	.39360E+06	138	34	34	225	224	224	225	224	224	552	552	554	681	683	684
33	BEND	.33035E+06	119	34	33	222	221	221	222	221	221	546	546	551	674	678	678
36	BEND	.24089E+06	178	82	80	260	259	259	260	259	259	617	616	634	760	780	782
39	BEND	.44223E+06	151	46	46	252	252	252	252	252	252	610	610	614	751	755	755
42	BEND	.57227E+06	137	35	35	231	231	231	231	231	231	567	567	569	700	701	701
47	BEND	.83945E+05	271	30	29	149	148	148	149	148	149	396	395	418	496	515	517
54	BEND	.60360E+05	330	43	41	128	126	126	128	126	127	344	342	381	432	462	465
59	ST	.28021E+05	79	33	28	15	9	7	15	7	13	85	76	111	120	144	154
60	ST	.60298E+05	91	43	41	130	129	129	130	129	129	359	358	398	452	494	496
61	BEND	.19834E+06	104	26	25	161	161	161	161	161	161	427	426	453	534	561	561
62	BEND	.21384E+06	59	26	25	163	163	163	163	163	163	430	429	456	536	566	566
70	ST	.39706E+05	164	87	75	175	170	170	175	170	171	428	423	488	521	576	579

IV-102

 * RHRS11 MODEL *

EARTHQUAKE NO. 30

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.74133E+05	80	20	20	7	7	6	7	6	7	83	82	108	105	131	132
2	ST	.29716E+05	126	56	56	89	88	88	89	88	88	263	262	320	339	389	390
3	BEND	.10129E+06	160	67	66	113	113	112	113	112	112	316	315	382	407	468	468
6	BEND	.14004E+06	27	44	44	68	68	68	68	68	68	222	222	276	288	339	340
9	BEND	.14373E+06	128	20	19	57	56	56	57	56	56	204	203	246	268	305	306
16	BEND	.14766E+06	399	24	23	53	52	52	53	52	53	199	198	237	265	298	298
19	BEND	.26354E+06	96	28	27	111	110	109	111	109	110	323	322	358	420	453	454
20	BEND	.26412E+06	131	51	50	178	177	177	178	177	177	463	462	493	591	619	619
21	ST	.10460E+06	78	27	26	116	115	115	116	115	115	338	337	378	440	478	479
22	ST	.59438E+05	98	42	40	121	120	120	121	120	121	344	343	365	446	466	487
32	BEND	.31887E+06	152	51	50	240	240	240	240	240	240	596	595	599	757	760	761
33	BEND	.26484E+06	134	53	52	241	241	241	241	241	241	597	597	604	759	764	765
36	BEND	.22415E+06	180	80	78	231	230	230	231	230	230	569	567	588	724	742	744
39	BEND	.38910E+06	142	51	51	240	240	240	240	240	240	597	597	602	759	763	763
42	BEND	.51510E+06	123	36	36	212	212	212	212	212	212	540	540	542	689	690	690
47	BEND	.55663E+05	380	77	75	220	219	219	220	219	220	547	547	579	699	723	726
54	BEND	.47005E+05	404	68	65	151	149	149	151	149	151	396	394	436	511	541	546
59	ST	.21120E+05	121	64	58	41	33	30	41	30	38	128	116	152	177	200	214
60	ST	.88740E+05	47	10	9	50	49	49	50	49	49	197	196	222	266	293	293
61	BEND	.19818E+06	96	28	28	131	131	131	131	131	131	371	370	400	481	511	511
62	BEND	.23390E+06	45	20	19	113	113	113	113	113	113	333	333	361	434	465	465
70	ST	.34507E+05	213	125	111	186	180	179	186	179	180	444	437	512	664	620	624

IV-103

 * PHRS11 MODEL *

EARTHQUAKE NO. 31

PVRC DAMPING

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.74666E+05	95	48	48	26	26	25	26	25	26	106	105	128	130	155	156
2	ST	.32651E+05	106	55	55	73	73	72	73	72	73	219	218	266	280	325	326
3	BEND	.12660E+06	108	38	38	67	66	66	67	66	66	215	214	262	277	325	325
6	BEND	.16028E+06	-3	40	40	49	49	49	49	49	49	172	172	213	222	266	266
9	BEND	.14665E+06	131	29	29	54	53	53	54	53	54	186	185	221	239	274	274
16	BEND	.11974E+06	405	51	51	77	77	76	77	76	77	236	235	280	306	347	348
19	BEND	.23238E+06	83	26	24	127	126	125	127	125	126	348	346	379	440	470	472
20	BEND	.28758E+06	63	20	20	142	141	141	142	141	142	382	381	405	480	503	503
21	ST	.96267E+05	51	12	11	111	110	110	111	110	110	323	322	356	415	447	447
22	ST	.55239E+05	85	35	33	131	130	130	131	130	130	357	355	380	451	476	477
32	BEND	.38236E+06	38	4	3	162	162	162	162	162	162	425	425	427	535	538	538
33	BEND	.32471E+06	27	3	2	157	156	156	157	156	157	415	414	420	523	527	528
36	BEND	.26355E+06	96	46	45	174	173	173	174	173	173	438	437	455	553	574	576
39	BEND	.42335E+06	47	15	14	188	188	188	188	188	188	481	481	485	603	607	607
42	BEND	.55592E+06	34	2	2	166	166	166	166	166	166	436	436	438	549	550	550
47	BEND	.81081E+05	130	15	13	109	103	108	109	108	109	313	312	336	401	422	425
54	BEND	.59298E+05	305	32	30	92	90	89	92	89	91	269	266	306	347	380	384
59	ST	.28185E+05	73	31	26	13	6	4	13	4	10	80	70	99	116	135	146
60	ST	.71440E+05	65	19	17	77	76	76	77	76	77	249	248	278	324	357	358
61	BEND	.16965E+06	77	24	24	147	147	147	147	147	147	396	395	424	503	532	532
62	BEND	.19911E+06	35	16	16	131	131	131	131	131	131	363	363	389	462	491	491
70	ST	.48744E+05	119	53	43	108	104	103	108	103	105	294	289	337	372	411	413

IV-104

 * RHR511 MODEL *

EARTHQUAKE NO. 32

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.74162E+05	78	40	39	16	15	15	16	15	15	92	91	114	115	139	139
2	ST	.28710E+05	117	70	69	97	96	96	97	96	96	270	269	322	340	388	389
3	BEND	.11883E+06	106	43	42	80	80	80	80	80	80	246	245	295	315	361	362
6	BEND	.14168E+06	6	51	51	67	67	66	67	66	67	211	211	257	269	314	315
9	BEND	.12811E+06	142	42	42	78	77	77	78	77	77	236	236	276	300	336	337
10	BEND	.10212E+06	485	71	70	109	109	108	109	108	109	304	303	355	388	433	434
19	BEND	.20573E+06	105	47	46	174	173	173	174	173	173	443	441	478	552	587	588
20	BEND	.26268E+06	78	39	38	185	185	185	185	185	185	468	467	494	582	607	608
21	ST	.92180E+05	59	20	19	133	132	132	133	132	132	368	367	403	469	502	503
22	ST	.56058E+05	81	38	37	145	144	144	145	144	144	384	383	407	481	506	507
32	BEND	.44415E+06	20	-2	-3	142	141	141	142	141	141	385	385	387	426	488	488
33	BEND	.37355E+06	11	-3	-3	139	139	139	139	139	139	380	380	384	480	483	484
36	BEND	.26631E+06	98	49	48	188	187	187	188	187	188	468	467	485	587	609	610
39	BEND	.49756E+06	27	6	6	163	163	163	163	163	163	431	430	434	541	545	545
42	BEND	.62818E+06	20	-1	-1	153	153	153	153	153	153	410	410	411	516	517	517
47	BEND	.83269E+05	124	18	17	117	116	116	117	116	117	329	328	352	420	442	444
54	BEND	.56569E+05	296	46	44	116	114	113	116	113	115	312	310	354	398	435	439
59	ST	.27077E+05	66	42	38	23	17	15	23	15	21	92	82	116	128	153	163
60	ST	.62836E+05	87	38	36	115	114	114	115	114	114	323	322	357	411	450	451
61	BEND	.15230E+06	99	44	44	194	193	193	194	193	193	489	489	520	615	648	648
62	BEND	.20034E+06	35	21	20	146	145	145	146	145	145	393	392	419	496	526	526
70	ST	.40037E+05	152	98	85	174	169	168	174	168	170	417	411	469	515	564	567

IV-105

 * RHR511 MODEL *

EARTHQUAKE NO. 33

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.73887E+05	90	38	38	22	21	21	22	21	21	103	102	126	127	151	152
2	ST	.31336E+05	109	55	55	93	92	92	93	92	92	264	263	311	320	373	374
3	BEND	.12206E+06	111	40	39	88	88	87	88	87	88	261	260	308	329	375	376
6	BEND	.15418E+06	0	38	38	63	63	63	63	63	63	206	206	247	260	302	302
9	BEND	.12711E+06	158	44	44	96	95	95	96	95	95	271	270	310	335	372	373
16	BEND	.10180E+06	498	72	72	122	121	121	122	121	122	328	327	380	414	460	460
19	BEND	.22145E+06	93	42	40	175	174	174	175	174	174	443	442	476	544	578	578
20	BEND	.26928E+06	77	43	42	206	205	205	206	205	205	507	507	532	618	642	642
21	ST	.88399E+05	67	34	33	170	169	169	170	169	170	440	439	475	546	583	583
22	ST	.52965E+05	94	50	48	174	173	173	174	173	174	442	441	465	544	570	571
32	BEND	.37996E+06	42	28	27	224	223	223	224	223	223	545	545	547	663	665	666
33	BEND	.32355E+06	30	26	25	216	216	216	216	216	216	530	530	534	645	649	650
36	BEND	.25950E+06	98	64	63	227	226	226	227	226	227	544	543	560	666	687	688
39	BEND	.46229E+06	38	28	28	224	224	224	224	224	224	548	548	552	668	672	672
42	BEND	.57471E+06	33	22	22	217	217	217	217	217	217	534	534	536	650	651	652
47	BEND	.88555E+05	112	17	16	128	128	128	128	128	128	351	350	371	436	456	458
54	BEND	.52715E+05	326	59	57	154	152	151	154	151	153	389	387	432	481	519	523
59	ST	.27099E+05	68	38	33	21	15	12	21	12	19	91	81	116	127	152	163
60	ST	.73001E+05	62	19	18	89	88	88	89	88	88	272	271	301	348	382	382
61	BEND	.18218E+06	67	29	29	174	173	173	174	173	173	446	446	471	552	580	580
62	BEND	.20831E+06	31	24	23	161	161	161	161	161	161	421	421	446	521	550	550
70	ST	.51587E+05	99	50	41	116	113	113	116	113	113	310	306	352	385	423	425

IV-106

 * ZBEND MODEL *

 PYRC DAMPING

EARTHQUAKE NO. 1

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.14472E+02	360	213	212	171	171	170	171	170	170	302	302	304	320	324	324
2	ST	.18693E+03	110	84	84	58	58	58	58	58	58	137	137	139	141	143	143
3	ST	.20692E+03	130	75	75	67	66	66	67	66	66	149	149	150	154	156	156
4	ST	.27710E+03	61	38	38	41	40	40	41	40	40	111	111	112	112	114	114
5	ST	.31923E+03	67	41	41	43	43	43	43	43	43	114	114	116	116	117	117
6	ST	.28866E+04	33	22	22	28	28	28	28	28	28	93	93	94	93	94	94
7	ST	.50117E+04	31	19	19	24	24	24	24	24	24	80	86	87	87	87	87
8	ST	.16658E+04	32	19	19	24	24	24	24	24	24	86	86	87	86	87	87
9	ST	.20479E+04	32	19	19	24	24	24	24	24	24	86	86	87	86	87	87
10	ST	.16861E+04	40	25	25	30	30	30	30	30	30	95	95	96	96	96	96
11	ST	.21130E+04	40	25	25	30	30	30	30	30	30	95	95	96	96	96	96
12	ST	.41546E+04	42	26	26	32	32	32	32	32	32	98	98	99	99	99	99
13	ST	.23050E+04	32	21	21	33	33	33	33	33	33	99	99	100	99	99	99
14	ST	.23874E+04	39	29	29	42	42	42	42	42	42	112	112	113	112	114	114
15	ST	.15117E+03	40	29	29	41	41	41	41	41	41	110	110	111	110	112	112
16	ST	.39620E+04	36	24	24	29	29	29	29	29	29	94	94	95	94	95	95
17	BEND	.11250E+05	35	22	22	24	24	24	24	24	24	87	87	87	87	88	88
18	ST	.45721E+04	37	22	22	21	21	21	21	21	21	84	84	85	85	85	85
19	ST	.25633E+03	37	22	22	21	21	21	21	21	21	84	84	84	84	85	85
20	ST	.46928E+04	38	23	23	21	21	21	21	21	21	84	84	84	85	85	85
21	ST	.47681E+04	39	24	24	23	23	23	23	23	23	87	87	87	88	88	88
22	ST	.26539E+03	40	25	25	25	25	25	25	25	25	89	89	90	90	90	90
23	ST	.47174E+04	41	26	26	28	28	28	28	28	28	93	93	93	93	94	94
24	BEND	.10249E+05	38	28	28	33	33	33	33	33	33	100	100	100	100	100	100
25	ST	.35788E+04	44	32	32	41	41	41	41	41	41	111	111	112	112	112	112
26	ST	.32798E+04	58	38	38	46	46	46	46	46	46	119	119	120	120	121	121
27	ST	.17246E+03	70	43	43	51	51	51	51	51	51	124	124	126	126	127	127
28	ST	.20450E+04	231	129	129	117	117	117	117	117	117	219	219	220	229	231	231
29	ST	.56726E+03	377	215	215	183	183	183	183	183	183	317	317	318	335	336	336
30	ST	.69989E+03	356	202	202	173	173	173	173	173	173	302	302	303	319	320	320
31	ST	.55091E+03	397	228	228	192	192	192	192	192	192	331	331	332	350	351	351
32	ST	.68318E+03	391	224	224	190	190	189	190	189	189	326	326	327	345	346	346
33	ST	.95331E+02	422	243	243	203	203	203	203	203	203	347	347	348	367	368	368
34	ST	.17407E+03	58	27	27	35	35	35	35	35	35	103	103	104	103	104	104
35	ST	.25882E+03	38	23	23	21	21	21	21	21	21	84	84	84	84	85	85
36	ST	.26389E+03	40	25	25	27	27	27	27	27	27	91	91	92	92	92	92
37	ST	.15802E+03	90	62	62	58	58	58	58	58	58	135	135	136	138	139	139
38	ST	.47248E+04	41	25	25	31	31	31	31	31	31	96	96	97	97	98	98
39	ST	.47346E+04	39	23	23	22	22	22	22	22	22	86	86	86	86	87	87

IV-107

 * BM1 MODEL *

EARTHQUAKE NO. 1

PVRC DAMPING

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.30591E+03	47	4	3	-15	-10	-10	-10	-10	-10	42	41	55	51	61	63
2	BEND	.18513E+03	90	20	17	5	3	1	5	1	3	69	67	79	85	89	93
3	ST	.83599E+02	45	3	1	-14	-15	-10	-14	-10	-15	42	40	53	52	61	65
4	BEND	.11517E+04	41	1	0	-17	-18	-19	-17	-19	-18	39	38	51	47	57	59
5	ST	.23284E+03	65	9	6	11	8	6	11	6	9	87	82	98	102	107	115
6	ST	.18641E+03	66	10	5	45	40	35	45	35	41	145	130	154	167	166	179
7	ST	.31890E+03	18	-10	-18	14	10	7	14	7	12	94	87	102	111	113	122
8	ST	.16338E+03	67	13	12	43	40	38	43	38	42	146	141	166	165	175	182
9	BEND	.56517E+03	109	41	30	74	67	63	74	63	70	192	181	203	219	222	237
10	TEE	.33329E+03	130	56	47	64	60	57	64	57	60	152	147	180	188	200	213
11	TEE	.10628E+04	82	22	15	25	22	20	25	20	22	94	91	115	118	130	135
12	TEE	.83192E+03	77	20	18	17	16	14	17	14	16	93	90	113	110	123	127
13	BEND	.97174E+03	75	18	10	10	15	14	10	14	15	92	90	112	109	122	126
14	ST	.25082E+03	242	158	145	119	114	111	119	111	113	225	220	252	270	292	296
15	ST	.13466E+03	239	159	144	122	116	114	122	114	115	232	226	263	283	302	306
16	ST	.97461E+02	234	152	139	119	114	111	119	111	113	223	218	248	270	290	294
17	ST	.31768E+02	245	144	115	144	138	135	144	135	139	308	299	344	342	362	372
18	ST	.33991E+02	247	151	142	132	127	124	132	124	128	281	274	318	316	337	346
19	BEND	.12864E+03	244	150	141	127	121	119	127	119	122	268	262	305	304	325	333
20	ST	.57676E-12	224	138	130	203	199	195	203	195	200	388	379	433	452	475	488
21	TEE	.83396E+03	82	25	25	108	104	102	108	102	106	275	269	291	300	304	313
22	ST	.10338E+04	90	46	45	117	114	112	117	112	118	281	275	294	310	312	320
23	ST	.70417E+03	113	72	71	116	113	110	116	110	113	284	278	301	308	316	324
24	ST	.17202E+04	71	35	34	90	86	83	90	83	87	237	230	246	261	260	270
25	ST	.20955E+04	68	28	28	98	94	91	98	91	96	252	244	260	278	275	287
26	ST	.18994E+04	62	15	14	108	103	100	100	100	106	268	258	273	297	291	304
27	ST	.13109E+04	69	9	8	132	127	124	132	124	130	307	297	310	342	335	348
28	ST	.88693E+03	181	120	119	199	197	191	199	191	195	417	411	440	455	462	472
29	ST	.27308E+04	69	32	31	93	89	86	93	86	91	240	233	251	265	266	275
30	BEND	.89485E+03	200	139	138	202	200	195	202	195	198	423	421	452	459	474	480
31	ST	.14774E+04	69	24	24	104	102	101	104	101	103	257	254	272	286	292	296
32	ST	.24552E+04	31	-18	-18	89	86	85	89	85	88	228	222	231	258	255	262
33	ST	.20411E+04	33	-26	-26	103	100	94	103	98	102	254	247	253	287	280	289
34	ST	.70621E+03	171	119	119	202	196	193	200	193	198	443	435	459	477	480	491
35	ST	.18632E+04	109	71	71	114	113	113	114	113	114	277	270	295	304	315	317
36	ST	.15416E+04	52	5	4	104	101	99	104	99	103	251	245	257	284	283	289
37	ST	.11584E+04	92	32	31	100	155	151	100	151	157	351	340	360	391	387	400
38	ST	.11185E+04	147	95	95	167	163	159	167	159	164	373	364	389	407	411	423
39	ST	.12582E+04	127	83	82	109	107	104	109	104	107	273	269	285	295	305	312
40	BEND	.28177E+04	119	77	77	94	93	90	94	90	92	246	243	256	265	278	282
41	ST	.78483E+03	133	100	100	119	117	115	119	115	117	299	296	309	319	324	329
42	ST	.15231E+04	129	97	97	122	121	120	122	120	121	311	308	323	330	336	339

801-Δ1

 * BM1 MODEL *

 PVRC DAMPING

EARTHQUAKE NO. 1

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
43	BEND	.42573E+04	133	101	101	125	123	122	125	122	124	315	312	327	335	340	344
44	ST	.15510E+04	124	96	96	108	107	105	108	105	107	283	279	292	301	306	310
45	ST	.10210E+04	142	100	100	130	128	126	130	126	129	316	311	328	340	345	353
46	ST	.73077E+03	175	104	103	180	182	179	180	179	184	412	405	428	446	450	461
47	BEND	.17408E+04	153	90	90	103	104	103	103	103	104	370	362	386	402	406	417
48	ST	.46827E+03	174	123	122	167	164	156	163	156	161	363	356	379	394	401	413
49	ST	.11721E+04	146	77	76	148	147	143	148	143	145	337	334	354	366	383	388
50	BEND	.29922E+04	146	77	76	149	147	143	149	143	146	339	336	355	368	384	390
51	ST	.49149E+03	143	107	106	124	121	116	124	116	121	297	292	306	321	326	335
52	ST	.70225E+03	195	130	129	185	182	176	185	176	181	405	399	419	437	448	458
53	BEND	.90070E+03	70	14	12	13	12	11	13	11	13	88	86	109	104	117	121
54	BEND	.46826E+03	108	52	51	144	139	136	144	136	142	335	326	349	366	366	378
55	ST	.23088E+03	30	-9	-13	32	28	25	33	25	30	127	118	135	147	145	158

601-AT

 * BM2 MODEL *
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 PYRC DAMPING

EARTHQUAKE NO. 1

*PIPE STRESSES(INERTIA COMPONENT)

ELEM. NO.	ELEM. TYPE	STRESS (T.H.)	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)														
			URS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.33849E+03	173	134	133	106	105	105	106	105	106	191	190	216	197	218	220
2	BEND	.47567E+03	48	22	22	11	10	9	11	9	10	67	68	64	62	66	68
3	ST	.93489E+02	134	100	99	80	78	77	80	77	79	146	144	165	152	167	170
4	BEND	.10333E+04	220	175	174	142	140	140	142	140	141	240	238	270	246	272	274
5	ST	.36075E+03	127	92	91	78	75	73	76	73	75	162	161	168	158	170	173
6	ST	.29955E+03	139	99	98	88	88	85	86	85	87	178	175	191	186	194	198
7	ST	.25985E+03	201	148	147	140	139	137	140	137	139	254	252	284	265	287	292
8	ST	.19365E+03	379	305	304	274	273	273	274	273	273	463	463	494	475	499	500
9	BEND	.65813E+03	404	325	324	295	293	291	295	291	294	490	487	515	504	523	529
10	TEE	.65818E+03	75	44	41	56	52	50	56	50	54	119	114	129	129	140	146
11	TEE	.16525E+04	75	49	47	67	64	62	67	62	65	132	127	143	140	147	153
12	TEE	.97893E+03	219	170	170	151	150	149	151	149	150	263	263	292	272	299	302
13	BEND	.12729E+04	221	172	171	152	152	150	152	150	152	268	265	295	274	302	304
14	ST	.36972E+03	282	225	220	246	233	232	246	232	240	373	365	377	388	393	400
15	ST	.17519E+03	338	273	267	299	283	282	299	282	292	452	431	463	469	485	500
16	ST	.14082E+03	275	219	213	244	231	230	244	230	238	372	354	376	387	391	404
17	ST	.66328E+02	375	302	301	274	271	270	274	270	272	456	452	475	468	486	491
18	ST	.66322E+02	356	287	285	262	258	257	262	257	260	431	426	448	443	462	468
19	BEND	.24296E+03	347	280	278	256	252	251	256	251	254	420	415	437	432	452	458
20	ST	.13314E-11	436	450	449	413	411	410	413	410	412	670	669	688	687	706	709
21	TEE	.67635E+04	360	288	288	251	251	251	251	251	251	442	442	447	453	456	456
22	ST	.31433E+04	371	298	298	260	260	260	260	260	260	456	456	458	458	468	468
23	ST	.16518E+04	355	282	282	247	247	247	247	247	247	435	435	439	447	449	449
24	ST	.58548E+03	564	148	146	183	180	175	183	175	180	328	324	371	376	392	404
25	ST	.14525E+04	350	252	251	228	227	226	228	225	227	408	407	423	425	433	436
26	ST	.24805E+04	353	277	277	243	243	242	243	242	243	431	431	436	443	446	446
27	ST	.32182E+04	363	291	291	254	254	254	254	254	254	448	448	450	459	460	460
28	ST	.37684E+04	356	285	285	249	249	249	249	249	249	439	439	440	450	451	451
29	ST	.48892E+04	361	287	287	251	251	251	251	251	251	443	443	446	454	456	456
30	BEND	.43776E+04	355	285	284	248	248	248	248	248	248	438	438	439	449	449	449
31	ST	.33138E+04	358	284	284	248	248	248	248	248	248	438	438	440	449	450	450
32	ST	.21638E+04	373	292	292	259	259	259	259	259	259	456	456	463	470	474	475
33	ST	.79847E+03	341	225	224	234	233	230	234	230	233	418	416	444	449	464	478
34	ST	.18559E+04	300	232	232	203	202	202	203	202	202	368	368	375	379	382	383
35	ST	.37082E+04	338	266	266	231	231	231	231	231	231	412	412	416	423	425	425
36	ST	.28096E+04	362	290	290	253	253	253	253	253	253	446	446	448	456	459	459
37	ST	.20425E+04	380	303	303	266	266	266	266	266	266	467	466	470	479	481	481
38	ST	.14483E+04	363	273	273	241	240	240	241	240	240	427	427	437	442	448	447
39	ST	.70273E+03	457	271	271	243	243	241	243	241	243	431	430	468	460	477	480
40	BEND	.13446E+04	495	180	279	251	251	249	251	249	250	442	441	494	478	503	506
41	ST	.83669E+03	310	219	219	192	192	192	192	192	192	354	353	378	368	382	383
42	ST	.14947E+04	292	198	198	175	175	175	175	175	175	328	328	351	341	355	355

011-11

 * BM2 MODEL *
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 PVRC DAMPING

EARTHQUAKE NO. 1

*PIPE STRESSES(INCRTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
43	BEND	.41864E+04	290	193	193	171	170	170	171	170	170	321	321	343	334	347	348
44	ST	.11696E+04	285	169	167	161	160	149	151	149	160	290	299	316	305	319	321
45	ST	.69179E+03	413	225	224	208	207	204	208	204	208	376	375	417	401	421	425
46	ST	.73448E+03	424	291	291	259	258	258	259	258	258	457	456	472	475	481	482
47	BEND	.20600E+04	397	290	290	258	256	256	258	255	258	452	451	463	467	472	473
48	ST	.81259E+03	378	290	290	254	254	253	254	253	254	447	447	460	463	469	470
49	ST	.92939E+03	435	278	278	247	247	248	247	248	247	439	438	468	465	477	479
50	BEND	.23388E+04	435	274	273	245	245	244	245	244	245	435	435	462	461	473	475
51	ST	.76814E+03	321	244	244	213	212	212	213	212	212	383	383	394	396	401	402
52	ST	.72914E+03	371	230	228	207	206	203	207	203	205	373	372	400	358	409	413
53	BEND	.12170E+04	230	180	179	159	159	157	159	157	159	277	276	306	286	313	316
54	BEND	.12100E+04	360	287	287	250	250	250	250	250	250	442	442	445	453	454	455
55	ST	.23379E+03	200	147	145	142	139	137	142	137	140	260	257	283	272	286	292

 * BM3 MODEL *

 PVRC DAMPING

EARTHQUAKE NO. 1

*PIPE STRESSES (INERTIA COMPONENT)

ELEM. NO.	ELEM TYPE	STRESS (T.H.)	URS	CASE NUMBERS (PERCENTAGE OVER TIME HISTORY (T.H.) VALUES)													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ST	.46937E+03	-12	2	8	26	24	24	26	24	26	49	48	50	50	51	53
2	BEND	.27923E+03	-23	-5	-7	19	17	17	19	17	19	42	40	42	42	43	44
3	ST	.67966E+02	-11	-10	-14	-7	-11	-11	-7	-11	-7	2	-1	2	3	4	8
4	ST	.32371E+02	36	39	33	47	41	41	47	41	47	67	61	65	69	68	75
5	BEND	.39719E+02	30	31	23	34	27	26	34	26	34	49	42	46	52	50	58
6	ST	.95842E+02	5	13	7	26	21	21	26	21	26	43	38	41	45	44	49
7	BEND	.85255E+02	4	13	8	28	23	23	28	23	28	45	41	43	48	46	51
8	ST	.98548E+02	58	54	43	51	39	39	51	39	51	61	50	56	65	61	73
9	ST	.91731E+02	47	42	37	39	34	34	39	34	39	62	58	63	66	67	72
10	ST	.12332E+03	47	46	36	46	37	37	46	37	46	68	48	52	61	57	67
11	ST	.96853E+02	4	30	27	66	64	63	66	63	66	98	96	99	100	100	102
12	ST	.19227E+03	-25	8	7	50	49	49	50	49	50	84	84	85	84	85	85
13	BEND	.15938E+03	-20	13	12	55	55	55	55	55	55	90	90	91	91	91	92
14	ST	.26335E+03	-38	-19	-20	6	6	6	6	6	6	31	30	32	32	32	33
15	ST	.63856E+02	54	71	70	105	104	104	105	104	104	152	151	156	155	157	159
16	BEND	.65497E+02	50	53	52	70	62	69	70	69	70	110	109	115	113	117	118
17	ST	.32958E+04	69	77	76	106	104	104	106	104	104	148	147	158	154	160	161
18	ST	.37893E+04	-6	10	9	39	39	38	39	38	39	71	71	74	73	75	75
19	BEND	.31862E+04	2	11	10	31	30	30	31	30	30	60	60	64	63	65	66
20	ST	.10170E+05	-9	20	20	66	66	65	66	65	66	105	104	107	106	107	108
21	ST	.25897E+04	49	39	37	71	69	68	71	68	69	105	104	108	111	113	124
22	ST	.20060E+04	95	95	93	146	143	142	146	142	143	192	187	202	203	206	221
23	BEND	.19796E+04	90	89	87	138	136	134	138	134	135	189	187	193	194	209	210
24	ST	.18067E+04	74	73	71	116	114	113	116	113	113	163	161	167	162	178	179
25	ST	.56431E+03	350	214	204	198	184	176	198	176	179	222	218	226	253	263	266
26	BEND	.67408E+03	240	141	133	133	122	115	133	115	117	154	145	159	177	189	192
27	ST	.12254E+04	48	10	7	13	9	7	13	7	8	28	25	29	38	49	50
28	ST	.18395E+04	-5	-21	-22	-9	-10	-10	-9	-10	-10	6	5	9	11	22	23
29	BEND	.17830E+04	-1	-19	-19	-5	-6	-6	-5	-6	-6	10	9	14	14	27	28
30	ST	.42394E+04	144	68	64	61	55	52	61	52	52	73	69	71	90	98	99
31	ST	.76735E+04	84	91	89	140	137	136	140	136	137	193	191	197	220	205	207
32	ST	.74108E+04	102	101	98	148	145	143	148	143	145	203	200	207	211	216	219
33	ST	.75365E+04	103	93	90	133	130	128	133	128	130	186	182	189	194	194	202
34	ST	.72448E+04	-2	32	32	85	84	84	85	84	84	127	126	128	128	131	132
35	BEND	.76015E+04	6	35	35	86	85	85	86	85	85	128	128	130	130	133	134
36	ST	.52610E+04	76	24	19	35	30	29	35	29	34	47	43	48	50	72	78
37	ST	.73845E+04	52	17	13	36	32	32	36	32	35	55	52	57	57	78	83

211-AT

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14. ABSTRACT (200 words or less) <p>An evaluation of Independent Support Motion (ISM) response spectrum methods of analysis coupled with the Pressure Vessel Research Committee (PVRC) recommendation for damping, to compute the dynamic component of the seismic response of piping systems, was completed. Response estimates for five piping/structural systems were developed using fourteen variants of the ISM response spectrum method, the Uniform Support Motion response spectrum method and the ISM time history analysis method, all based on the PVRC recommendations for damping. The ISM/PVRC calculational procedures were found to exhibit orderly characteristics with levels of conservatism comparable to those obtained with the ISM/uniform damping procedures. Using the ISM/PVRC response spectrum method with absolute combination between group contributions provided consistently conservative results while using the ISM/PVRC response spectrum method with square root sum of squares combination between group contributions provided estimates of response which were deemed to be acceptable.</p>			
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