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TEST REPORT

SEISMIC QUALIFICATION OF THE SAN ONOFRE, UNITS 2 & 3 MNSA CLAMPS FOR PRESSURIZER INSTRUMENT NOZZLES AND RTD HOT LEG NOZZLES

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Design-Related Testing Checklist

Section 3 – TEST REPORT

Document Title: Test Report Seismic Qualification of the San Onofre MNSA Clamps for Pressurizer Instrument Nozzles and RTD Hot Leg Nozzles

Document Number: TR-PENG-033 **Revision:** 00

		Yes	N/A
1	Is the test purpose stated?	☑	
2	Are the test procedures listed?	☑	
3	Are the test results listed?	☑	
4	Is the test request document number included on the test report cover page?	☑	
5	Has the test report been signed and dated by the author?	☑	
6	Has provision been made for approval by the manager of the testing organization?	☑	
7	Has provision been made for a statement of acceptance by the Cognizant Engineer?	☑	

Comments/Remarks:

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Printed Name — Signature — Date

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The information contained in this Report No. TR-PENG-033, Rev. 00 has been reviewed and approved as documented herein.

Approved By: C J Shinko for PL Date: 7/3/97

Manager, Primary Systems

The tests described in this report are accepted as meeting the objectives and instructions described in the referenced test request/test procedures.

Accepted By: K.V.MARCOTTA K.V. Date: 7/3/97

Cognizant Engineer

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1.0 INTRODUCTION

The Testing Services Group of the Primary Systems Department of ABB/CENO had been requested to perform a seismic qualification test on three specimens of MNSA Clamps with simulated cracks for the San Onofre Nuclear Power Plant. Reference 1, which incorporates the requirements, was the controlling document for the seismic qualification program. Testing was to demonstrate that the components could meet or exceed their specified performance characteristic when subjected to the stipulated seismic events. This report documents the seismic environments that were generated during this program and reports the leak resistance performances of the specimens.

These tests were performed in the Dynamic Test Facility at ABB/Combustion Engineering, Windsor CT, from June 10, 1997 through June 18, 1997.

The Quality Class 1 subject test program was conducted in compliance with Quality Assurance guidelines of QPM-101, QP 3.6 (Reference 13) as Design Verification per requirements of the Test Request (Reference 1) and the Project Plan (Reference 21). The testing was performed by personnel qualified for this work per Reference 19.

2.0 OBJECTIVE

The objective of this seismic test was to demonstrate that the San Onofre Pressurizer and Hot Leg MNSA nozzle assemblies, with simulated 180° cracks, can maintain their physical and functional integrity during and following exposure to a Safe Shutdown Earthquake (SSE) preceded by five Operating Basis Earthquakes (OBEs).

3.0 SUMMARY

Representative samples of the San Onofre MNSA designs, in conjunction with simulations of the Pressurizer (PZR) Temperature Nozzle, the Pressurizer Lower Level Instrumentation Nozzle, and the Hot Leg Temperature RTD Nozzle, all with simulated 180° cracks, were provided by ABB/FSME for seismic qualification testing. These components were tested as mounted in special fixtures that were provided by ABB/FSME and assembled specifically for the seismic test by ABB/CENO.

Exploratory low level sine sweep tests, conducted prior to seismic qualification testing, demonstrated that two of the three test assemblies, as mounted on the seismic simulator, were rigid within the seismic frequency range (1 to 33 Hertz). The free-standing Bottom Mounted PZR Instrumentation Nozzle with MNSA exhibited a nozzle resonance at 33 Hertz and a MNSA structure resonance at 38 Hertz. The sine sweep transfer functions are shown in Figures 16 and 17. To avoid unnecessary conservatism due to a seismic table resonance, the Bottom Mounted PZR Instrumentation Nozzle was first tested in a supported fashion. With regards to the MNSA qualification, this was determined to be acceptable (Section 5.1). There were no critical fixture resonances below 50 Hertz with exception of the MNSA resonance at 38 Hertz. The sine sweep transfer functions for the supported nozzle test configuration are shown in Figures 18 and 19.

Biaxial (vertical and horizontal) seismic base excitations were introduced to the test specimens in either one or in four test orientations to ensure the possibility of the test specimens to respond in all of their horizontal, vertical or torsional vibration modes, if any, located within the seismic frequency range. Qualification was conducted using modified Generic Floor Test curves that enveloped both sets of Plant Specific curves.

Artificial seismic time histories were synthesized with random multifrequency intensities that enveloped the stipulated OBE and SSE Required Response Spectra (RRS) curves of Figure 1. The leakage performance of all specimens was monitored after each event simulation. There were no observed leaks. Consequently, the test specimens provided are qualified to the seismic intensity levels represented by the specified seismic curves. Typical Time Histories and the resulting Test Response Spectra (TRS) are shown in Figures 23 through 30. A more comprehensive set of results is included in Appendix D. The Bottom Mounted PZR Instrumentation Nozzle with MNSA was tested first in the supported configuration and then in the free standing configuration. Because of the seismic table resonance being near the nozzle resonance, the latter configuration was a very conservative test. Nevertheless, the specimen was capable of withstanding these strong seismic responses without damage or loss of pressure.

All horizontal and vertical control and response accelerometer time histories were stored on magnetic tape and were simultaneously acquired by a PC-based Data Acquisition System. The data were subsequently analyzed off-line at 1% damping. These results are presented in Appendix D. For the free standing Bottom Mounted PZR Instrumentation specimen, horizontal Top Nozzle and MNSA Top Plate time history and response spectra were also generated and are provided in Appendix D for the four SSE level events. On-line spectrum analysis plots are not included in this report because of the narrower (1 to 50 Hertz) analysis range. They are, however, retained as raw data.

The physical integrity of the three specimen types was verified throughout the seismic testing. No damage was observed at any time, as indicated on the data sheets of Appendix A. Leak performance evaluations were performed by ABB/CENO test personnel before and after each seismic event.

4.0 TEST DESCRIPTION

4.1 Test Specimens and Mounting

One test specimen each was provided for the three test nozzle configurations with MNSA clamps. The drawings of References 2 through 4 and 14 provide details of the MNSA clamps. Reference 15 provides details of the test fixtures. Each MNSA clamp was assembled using the appropriate procedure of Reference 16 using calibrated torque wrenches. Minor adjustments were made to two of the seals which are reflected in the final sets of drawings and assembly procedure. One of these adjustments was the use of a spacer between the comparison collar and grafoil seal of the Bottom Mounted PZR Nozzle seal. This resulted in a drawing change, but did not affect the validity of the seismic test. The specimens were furnished already with weights that simulated the RTD heads and/or the valve that are present in the field installation. Each nozzle was inserted into an appropriately sized socket and a 180° crack was simulated by seal welding only a 180° arc rather than the entire 360° circumference. The bore below the nozzle was plugged and the top of each test nozzle was furnished with appropriate fittings to allow for internal pressurization during testing. The simulated piping or pressurizer wall pieces were welded onto 16x16x1 inch base plates that accommodated the bolting pattern of the seismic test table and permitted simple rotating of the test specimen in 90° increments. The Bottom Mounted PZR Instrumentation Nozzle was supported near its top using a Unistrut/Plate support structure. This support did not affect the MNSA, which was free to move. This specimen was subsequently also tested without this support.

Small diameter tubing was connected to a hand pump and to shut-off valves/pressure gauges to permit monitoring of internal pressures. The gauges and hand pump were located off the seismic table, using generous loops in the pressure tubing, in order to accommodate large relative table movements. Specimens were inspected for any physical defects prior to test, after each seismic event, and following completion of all qualification sequences. No damage was observed throughout this entire test program.

Symmetry of the test fixture bolting pattern allowed for simple re-orientation of the test fixture/specimen assemblies in any of the four required test orientations. The location of the test fixture was near the center of the table, in close proximity to the vertical and horizontal control accelerometers. Sine sweep testing was performed to determine the rigidity of the test fixtures within the extended seismic range of 1-50 Hertz. Photographic documentation of the mechanical setup is provided in Figures 5 through 13. Several figures show the placement of the response accelerometers during the sine sweep testing.

4.2 Equipment and Instrumentation

Seismic testing was performed in the Dynamic Test Facility using the seismic simulation shaker table. Figure 4 shows a block diagram of the general instrumentation hookup of the hydraulic test facility that was used in this test.

The excitation axis of the simulator is inclined at 45 degrees and, therefore, provides phase coherent motions of equal magnitudes in the vertical axis and in one horizontal axis. Two control accelerometers (Unholtz-Dickie 100-PA), mounted to the seismic table in a mutually perpendicular arrangement adjacent to the test fixture, were used to monitor the excitation levels in the horizontal and vertical axes during all testing. The control accelerometer signals were conditioned by Unholtz-Dickie 2216X Signal Conditioners. The horizontal and vertical response accelerometers (Unholtz-Dickie 75D21PA) used during sine sweep and seismic testing were mounted on standard aluminum fixturing blocks that were glued to selected equipment locations. Unholtz-Dickie D22H charge amplifiers were used to condition the response accelerometer signals.

For sine sweep testing, the "SN21T Version 04" software package (Reference 7) of the Digital Vibration Control and Analysis System (DVCA) was employed. The input listing for this program is shown as Figure 14. For synthesis and on-line analysis of the table motions of the generated seismic environments, the "WAE 3.0 Decade" software package of the DVCA was used. The permanent file identification of this code is WAEOVI.TSL, and the synthesized SRS on-line analysis function has been Q.A. verified by Reference 8. The input listings for this program are shown as Figure 21.

For each seismic event simulation, on-line analysis was performed for the horizontal motion of the table. These data were used to assure envelopment of the Required Response Spectra (RRS) by the achieved Test Response Spectra (TRS). For this qualification effort, the event duration was 32 seconds, yielding on-line test response spectra from 1 to 50 Hertz. Time history recordings of the table motions were used to verify adequacy of achieved Zero Period Acceleration (ZPA) levels.

In addition to performing on-line response spectrum analyses of the horizontal control accelerometer signals (at the specified damping of 1%), horizontal and vertical control accelerometer signals, and for selected events also up to two response accelerometers, were recorded by a magnetic tape recorder (Racal Store 7DS). In addition, a P.C. based computer program was used to acquire table time history records and to perform off-line analyses (1-100 Hertz range) from these recorded motions using the "SRSKHH" program of Reference 11. The referenced off-line analysis program was used to compute SRS analyses at the specified damping of 1% and to display the results in both graphical and tabular form (see Appendix D).

A list of all equipment used during this test program is given in Table 1.

4.3 Calibrations

Calibrations were required for the accelerometers, the signal conditioners, the charge amplifiers, the multimeter, the pressure gauges, and the torque wrenches. Required calibrations were accomplished in accordance with the guidelines of Reference 11. A signal calibration was performed on the tape recorder, using the multimeter and a signal source, as well as the full range calibration signals from the charge amplifiers. A 1 volt input signal check was used to verify the "Hands-off" autocalibration of the P.C. based data acquisition system. Time records of these signal calibrations are included in Appendix B. Table 1 lists accuracies and calibration dates of all equipment. Copies of pertinent calibration records are included in Appendix C.

4.4 Sine Sweep Test Procedure

Sine sweep resonance surveys were performed in either one or in two test Orientations A and B with response accelerometers mounted near the top of each test specimen. For the two axis symmetric nozzle specimens testing was limited to Orientation A only. Orientations are defined in Figure 22. Additional details are illustrated in the photographic records of Figures 5 through 13.

During resonance surveys, the specimens were excited over a frequency range of 1 to 50 Hertz at a sweep rate of 0.83 octaves per minute (0.25 decades per minute). The test intensity ranged between 0.1 and 0.2 Gs (a ramp from 0.1 G at 1 Hertz to 0.2 G at 2 Hertz and a constant 0.2 G above 2 Hertz). Several test runs were made using a constant 0.1 G excitation level over the same frequency range. Data runs were displayed on the CRT terminal in the form of transfer function graphs (horizontal response over horizontal input or vertical response over vertical input) and hard copies were made. Results of these surveys are shown in Figures 15 through 20.

4.5 Simulation of Seismic Environment

Seismic qualification was performed in accordance with the documented Modified Generic Response spectra that enveloped the two sets Plant Specific requirements. The test specimens were subjected to a minimum of five consecutive OBE level events in either one or in each of the four orthogonal test orientations, as specified in Reference 18. For the two axis symmetric

nozzle specimens testing was limited to Orientation A only. This was followed by one SSE level event in each test orientation. For each event, on-line monitoring of the horizontal control accelerometer was performed and results were evaluated to ensure that clear envelopment of the Required Response Spectra (RRS) had been achieved. In addition, for each event, the outputs from both the horizontal and the vertical control accelerometers were recorded on magnetic tape and stored via the P.C. based Data Acquisition System.

During the seismic events, the test specimens were pressurized to 3,175 $\pm$ 50 psig. Monitoring of the test pressures was performed by ABB/CENO personnel before and after the seismic event.

5.0 DISCUSSION

5.1 General

At the time of testing, it was decided to test the Hot Leg RTD Nozzle and the Side Mounted PZR Nozzle together, but separate from the Bottom Mounted PZR Instrument Nozzle. This decision was based on the fact that the first two nozzles are symmetric about the vertical axis, and thus needed to be tested only in one orientation on the seismic table. Furthermore, the Bottom Mounted PZR Instrument Nozzle required some special attention to deal with the fact that the nozzle resonance of about 33 Hertz coincided with the oil-column resonance of the seismic table. Since the Bottom Mounted PZR Instrumentation Nozzle had already been seismically qualified by analysis in Reference 20, emphasis was at first placed on removing unnecessary conservatism in qualifying the MNSA seal. Whereas the seismic SSE response spectrum intensity level for the pressurizer near the nozzle frequency of 33 Hertz was determined from Reference 18, Figure A-17, as approximately 4.8 Gs, the table resonance situation would have increased this level to approximately 35 Gs. Since the primary objective of this test was to qualify the MNSA seal, it was justifiable to stiffen the nozzle and to shift its natural frequency away from the table resonance peak, as long as it could be demonstrated that the Zero Period Acceleration (ZPA) level of the actual test motion is greater than the Required Response Spectrum level at the natural frequency of the nozzle with MNSA. According to Appendix A of Reference 18, respective OBE and SSE requirements at a frequency of 33 Hertz are 2.4 Gs and 4.6 Gs. As is demonstrated by the response spectra and time histories enclosed in this report, achieved ZPA levels for OBE and SSE events typically exceeded respective levels of 2.6 and 5.1 Gs, which met the stated requirement for this test. It should be noted here that these ZPA levels are obtained from the time histories and that the spectrum levels shown in the Test Response Spectra actually indicate higher levels up to 100 Hertz.

Since testing of the Bottom Mounted PZR Instrument Nozzle with support was successful, it was decided to also test this specimen in the free-standing configuration. This resulted in a very conservative, second seismic qualification test for this specimen. Maximum G levels of approximately 20 Gs were monitored near the nozzle top. However, the test specimen was shown

able to accept even these extremely conservative input motions without any loss of pressure or physical integrity.

5.2 Sine Sweep Testing

The transfer functions from the sine sweep surveys, which are shown in Figures 15 through 20, allow the following conclusions:

- The Side Mounted PZR Nozzle and the Hot Leg RTD Nozzle, both with MNSA seal installed, showed no horizontal or vertical resonances within the frequency sweep range of 1-50 Hertz. There was some motion amplification towards 50 Hertz in the horizontal monitoring directions which would indicate resonances somewhere between 60 and 80 Hertz.

- The unsupported Bottom Mounted PZR Instrumentation Nozzle with MNSA demonstrated a significant nozzle resonance peak near 33 Hertz and a MNSA structural resonance near 38 Hertz, as shown in Figures 16 and 17. As discussed above, it was decided to support the top of the nozzle and, thereby, forcing an upwards shift of the natural frequency of the nozzle. This was achieved successfully, as seen by the sine sweep plots of Figures 18 and 19. The sine sweep plots included in these figures show the response behavior of the nozzle and the MNSA hold-down plate in the horizontal direction and of the asymmetric valve simulation in both horizontal and vertical directions. Due to non-symmetry, sine sweep testing for this specimen was performed in two orientations. Seismic qualification of the MNSA seal for the Bottom Mounted PZR Instrumentation Nozzle was performed at first in the supported configuration followed by testing in the free-standing configuration.

5.3 Seismic Qualification Testing

As mentioned previously, OBE and SSE motion syntheses were performed using the Required Response Spectra (RRS) curves shown in Figure 1. Documentation of the adequacy of the components for these requirements is based in this document on the results from the off-line analyses. On-line analyses were also performed during the course of the testing to assure envelopment of the RRS curves by the achieved Test Response Spectra (TRS). The on-line analyses results are not included in this report. However, they are being retained as raw data.

Figures 23 through 26 show the waveform time histories and the resulting off-line analysis outputs for a typical OBE event (Orientation A) for the MNSA clamp seismic intensity requirements. Figures 27 through 30 provide the same complement of results, however this

time for a typical SSE event (Orientation A). As can be observed, the Required Response Spectra are always cleanly enveloped by the control accelerometer Test Response Spectra in both the vertical and horizontal directions.

Appendix D contains all pertinent off-line analyses, performed for the two control accelerometers. For the Hot Leg RTD and the PZR Side Mounted nozzle specimens, all five OBE events and the SSE event are included. For the Bottom Mounted PZR Instrument Nozzle, one OBE and one SSE event analyses are included for each test orientation of both the supported and the free-standing test configurations. There were no requirements to analyze any response accelerometer locations, however the horizontal MNSA hold-down plate and nozzle top motions were evaluated for the Bottom Mounted PZR Instrument Nozzle in the free-standing test configuration.

In viewing the previously mentioned time histories, the top portion always represents the "as digitized" signal, sampled at 1,000 Hertz. The bottom portion represent the same trace, however digitally RC low-pass filtered at 100 Hertz. This measure enables visual determination of the signal content within the analysis frequency range of 1 to 100 Hertz. The filtered time histories are the bases for the off-line analysis results. The unfiltered traces are usable for determination of actual Zero Period Acceleration (ZPA) levels. During respective OBE and SSE event simulations, ZPA levels in the horizontal direction were approximately 2.7 Gs (Figure 23) and 5.5 Gs (Figure 27). In the vertical direction, respective OBE and SSE event ZPA levels were 2.8 Gs (Figure 24) and 5.1 Gs (Figure 28). Specified ZPA levels, per Figure 1, were 1.5 Gs and 3.0 Gs for OBE and SSE events, respectively.

Table 3 identifies the required response spectrum levels for the 1/6th octave spaced off-line analysis frequencies. This information may be helpful in evaluating any of the tabulated spectrum results. Furthermore, Table 2 identifies the test runs and the data analysis file names. This facilitates cross referencing between the log sheets contained in Appendix A, the Table 2 test matrix, and the attached graphical and tabulated spectrum results included as Appendices D.

The spectral data are mostly self explanatory and any observed "peaking" phenomena evident in the TRSes are confined to the table resonance peak near 30 Hertz. There are some higher order frequency peaks, however, with regard to the qualification in general, these are considered irrelevant. The response spectra for the hold-down plate and the top nozzle (Bottom Mounted PZR Instrument Nozzle) reflect the respective natural frequencies of the MNSA and the test nozzle.

In summary it is stated that the requirements for envelopment of both horizontal and vertical RRSs by the TRSs were met during all seismic event simulations (20 OBEs and 4 SSEs for Bottom Mounted PZR Instrumentation Nozzle each for the supported and the free-standing test

configurations and 5 OBEs and 1 SSE for Hot Leg RTD and Side Mounted PZR Nozzles, all with MNSA clamps installed) documented herein for each of the specified sets of seismic requirements.

Since the selected, modified Generic Floor RRS curves completely enveloped those for the specific plant locations, the test specimens have been demonstrated to exceed all stipulated seismic requirements. With regard to the development/justification of the Test Response Spectrum requirements, one is referred to Appendix A of the applicable Test Procedure, Reference 18. Since, in addition, there was no observance of leaks or significant pressure drops in any one of the three test specimens, it is concluded that the seismic qualification test described has demonstrated full compliance with all acceptance criteria for the MNSA clamps, as stipulated in Reference 18.

6.0 RECORD RETENTION

Test records, raw data and original data sheets were assembled and transmitted to the Primary Systems (Testing Services Group) custodian of original raw data for storage. All pertinent test records are included in the test report. Magnetic tape recordings of test data are stored in the Seismic Laboratory for a minimum of five (5) years. There is no need to store the digital files since they can be regenerated from the analog tape recordings. The calibration records for instruments used to record test data are stored in accordance with the laboratory procedure of Reference 10. Copies of pertinent calibration records are included in Appendix C. Copies of the original test procedure and test report will be stored in the Primary Systems (Testing Services Group) files for a minimum of five (5) years. Q.A. Record Storage of the subject document is the responsibility of ABB-CENO/FSME.

7.0 REFERENCES

1. Test Request TS071A, Supplement 00.
2. ABB C-E Drawing E-MNSA-228-001, Rev. 02, "Bottom Pressurizer Mechanical Nozzle Seal Assembly".
3. ABB C-E Drawing E-MNSA-228-002, Rev. 02, "Side Pressurizer RTD Mechanical Nozzle Seal Assembly".
4. ABB C-E Drawing E-MNSA-228-003, Rev. 02, "Hot Leg RTD Mechanical Nozzle Seal Assembly".
5. IEEE Std. 323-1974 & 1983, "General Guide for Qualifying Class 1E Equipment for Nuclear Power Generating Stations."

6. IEEE Std. 344-1974 & 1987, "Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations."

7. C-E Analysis Report No. S669-100, Rev. 01, "Q.A. Verification of Time/Data Sinusoidal Vibration Control Code Version 04", issued April 11, 1985.

8. C-E Analysis Report No. S863-113, "Q.A. Verification 3.0 Decade Wave Synthesized SRS Analysis Program, Vibration Control System", issued May 2, 1979.

9. C-E Analysis Report No. SE90-125, Rev. 02, "Q.A. Verification of C-E SRS Analysis Modification", issued April 11, 1985.

10. MISC-PENG-IPQP-007, Rev. 01, "Quality Program Plan for the Control and Calibration of Measuring and Test Equipment".

11. C-E Analysis Report No. 00000-ESE-76D-224, Rev. 01, "Q.A. Verification of Computer Program SRSKHH used for Shock Response Spectrum Analyses", issued November 2, 1993.

12. S-NOME-WTR-0007, Rev. 00, "Test Requirements for the San Onofre MNSA Clamp for Pressurizer Instrument Nozzles and RTD Hot Leg Nozzles".

13. QPM-101, Rev. 01.

14. ABB C-E Drawing E-MNSA-228-004, Rev. 02, "Mechanical Nozzle Seal Assembly Details".

15. ABB C-E Drawing E-MNSA-228-008, Rev. 02, "MNSA Seismic Test Fixtures".

16. MNSA Assembly Procedures, S3-NOME-EP-0124, Rev. 00.

    16.1 MNSA - RTD Hot Leg, Section 7.0.

    16.2 MNSA - Pressurizer, Bottom Head, Section 6.0.

    16.3 MNSA - Pressurizer, Side Nozzle, Section 5.0.

17. Mini-Specification S023-411-57, Rev. 00, "RCS MNSA Assemblies, San Onofre Generating Station, Units 2 and 3".

18. 00000-PENG-037, Rev. 00, "Test Procedure, Seismic Qualification of the San Onofre MNSA Clamps for Pressurizer Instrument Nozzles and RTD Hot Leg Nozzles".

19. IOC PENG-96-501, Assessment of Test Personnel Certificates for 1997.

20. Report CENC-1743, "Addendum to Analytical Report for Southern California Edison San Onofre Unit No. 3 Pressurizer," December 1986.

21 PP-2007241, Rev. 00, Project Plan for MNSA Clamp Analysis and Testing.

TABLE 1

EQUIPMENT AND INSTRUMENTATION

INSTRUMENTATION	MANUFACTURER	MODEL NO.	SERIAL NO.	RANGE	ACCURACY	CAL DATE - DUE DATE
Seismic Motion Amplif. Unit	ABB/C-E	---	---	---	N/A	N/A
Hydraulic Shaker	MTS	104.61	412	---	N/A	N/A
Shaker Controller	MTS	406.11	1866	---	N/A	N/A
Shaker Control Unit	MTS	436.11AB	463	---	---	N/A
Digital Vibration Control and Analysis System	Time Data Corp.	P/N 2931-073 TDV25-P	Unit C-E	---	---	Q.A. Verification of Software Used
Control Accelerometers	Unholtz-Dickie	100-PA	492 & 494	1 & 10G	±5% of Rdg.*	*04/28/97-10/28/97 & 04/29/97 - 10/29/97
Signal Conditioners	Unholtz-Dickie	2216X	145 & 146	1 & 10G	±2% of Rdg.*	04/28/97 - 10/28/97
Response Accelerometers	Unholtz-Dickie	75D21PA	109 & 111	10G - 30G	±5% of Rdg.*	04/25/97 - 04/25/98
Charge Amplifiers	Unholtz-Dickie	D-22H	2025 & 5482	10G - 30G	±2% of Rdg.*	04/16/97 - 04/16/98
Tape Recorder	Racal	Store 7DS	6330	10V Input	±2% of Rdg.	Signal Cal., 05/15/97 - 05/15/98
Digital Multimeter	Fluke	8050A	6168012	2V &10V	±(0.2% of Rdg.)	12/18/96 - 12/18/97
Personal Computer System	Compaq	486DX-33	ABB 01718	N/A	N/A	N/A
Data Acquisition Board	Data Translation	DT2831-G	S/N 10593	0 - 10V	<<±1% of Rdg.	05/14/97 - 05/14/98 Signal Cal. **
Torque Wrench	Proto	153668	CL-1031	150 ft-lb	±1% of Rdg.	05/20/97 - 11/20/97
Torque Wrench	Proto		#25	250 in-lb	±4% of Rdg.	04/01/97 - 04/01/98
Pressure Gauges	Solfrunt	4½"	CL-1041-1043	0 - 5000 psig	½% of full range	05/15/97 - 11/15/97

*Overall Measurement Accuracy Better Than 5% of Reading.

**See Appendix B Reference 11.

TABLE 2

TEST MATRIX, OFF-LINE ANALYSIS AND DATA FILE IDENTIFICATION

PZR Bottom Mounted Instrument Nozzle/SRMSA Top Supported

TAPE RUN* NUMBER	TEST INTENSITY	TEST ORIENTATION	P.C. Acquisit. FILE NAMES FOR D.A. FILE NAME EXT DAT	CHANNEL 0 H-CONTR.	CHANNEL 1 V-CONTR.
80-30					
16	OBE-1	A	MN_OBEA1	HC-A-01	VC-A-01
17	OBE-2	A	MN_OBEA2	HC-A-02	VC-A-02
18	OBE-3	A	MN_OBEA3	HC-A-03	VC-A-03
19	OBE-4	A	MN_OBEA4	HC-A-04	VC-A-04
20	OBE-5	A	MN_OBEA5	HC-A-05	VC-A-05
21	SSE-1	A	MN_SS_A	HC-A-51	VC-A-51
22	OBE-1	B	MN_OBEB1	HC-B-01	VC-B-01
23	OBE-2	B	MN_OBEB2	HC-B-02	VC-B-02
24	OBE-3	B	MN_OBEB3	HC-B-03	VC-B-03
25	OBE-4	B	MN_OBEB4	HC-B-04	VC-B-04
26	OBE-5	B	MN_OBEB5	HC-B-05	VC-B-05
27	SSE-1	B	MN_SS_B	HC-B-51	VC-B-51
28	OBE-1	C	MN_OBEC1	HC-C-01	VC-C-01
29	OBE-2	C	MN_OBEC2	HC-C-02	VC-C-02
30	OBE-3	C	MN_OBEC3	HC-C-03	VC-C-03
31	OBE-4	C	MN_OBEC4	HC-C-04	VC-C-04
32	OBE-5	C	MN_OBEC5	HC-C-05	VC-C-05
33	SSE-1	C	MN_SS_C	HC-C-51	VC-C-51
34	OBE-1	D	MN_OBED1	HC-D-01	VC-D-01
35	OBE-2	D	MN_OBED2	HC-D-02	VC-D-02
36	OBE-3	D	MN_OBED3	HC-D-03	VC-D-03
37	OBE-4	D	MN_OBED4	HC-D-04	VC-D-04
38	OBE-5	D	MN_OBED5	HC-D-05	VC-D-05
39	SSE-1	D	MH_SS_D	HC-D-51	VC-D-51

PZR Bottom Mounted Instrument Nozzle/SRMSA Free Standing

TAPE RUN* NUMBER	TEST INTENSITY	TEST ORIENTATION	P.C. Acquisit. DATA FILE NAMES FOR D.A. FILE NAME EXT DAT	CHANNEL 0 H-CONTR.	CHANNEL 1 V-CONTR.	CHANNEL 2 RESP. NO.1	CHANNEL 3 RESP. NO.2
80-30							
45	OBE-1	A	MN_OBUA1	MNOBUATH	MNOBUATV		
46	OBE-2	A	MN_OBUA2	MNOBUA2H	MNOBUA2V		
47	OBE-3	A	MN_OBUA3	MNOBUA3H	MNOBUA3V		
48	OBE-4	A	MN_OBUA4	MNOBUA4H	MNOBUA4V		
49	OBE-5	A	MN_OBUA5	MNOBUA5H	MNOBUA5V		
50	SSE-1	A	MN_SS_UA	MNSSUAH	MNSSUAV	MNSSUAN	MNSSUAP
50	OBE-1	B	MH_OBUB1	MNOBUB1H	MNOBUB1V		
51	OBE-2	B	MH_OBUB2	MNOBUB2H	MNOBUB2V		
52	OBE-3	B	MH_OBUB3	MNOBUB3H	MNOBUB3V		
53	OBE-4	B	MH_OBUB4	MNOBUB4H	MNOBUB4V		
54	OBE-5	B	MH_OBUB5	MNOBUB5H	MNOBUB5V		
55	SSE-1	B	MH_SS_UB	MNSSUBH	MNSSUBV	MNSSUBN	MNSSUBP
56	OBE-1	C	MN_OBUC1	MNOBUC1H	MNOBUC1V		
57	OBE-2	C	MH_OBUC2	MNOBUC2H	MNOBUC2V		
58	OBE-3	C	MH_OBUC3	MNOBUC3H	MNOBUC3V		
59	OBE-4	C	MH_OBUC4	MNOBUC4H	MNOBUC4V		
60	OBE-5	C	MH_OBUC5	MNOBUC5H	MNOBUC5V		
61	SSE-1	C	MH_SS_UC	MNSSUCH	MNSSUCV	MNSSUCN	MNSSUCP
40	OBE-1	D	MN_OUTP1	SNOBUDTH	SNOBUDTV		
41	OBE-2	D	MH_OBUD2	MNOBUD2H	MNOBUD2V		
42	OBE-3	D	MH_OBUD3	MNOBUD3H	MNOBUD3V		
43	OBE-4	D	MH_OBUD4	MNOBUD4H	MNOBUD4V		
44	OBE-5	D	MH_OBUD5	MNOBUD5H	MNOBUD5V		
61	SSE-1	D	MH_SS_UA	MNSSUDH	MNSSUDV	MNSSUDN	MNSSUDP

Hot Leg RTD and PZR Side Mounted Nozzles with SRMSA

TAPE RUN* NUMBER	TEST INTENSITY	TEST ORIENTATION	P.C. Acquisit. FILE NAMES FOR D.A. FILE NAME EXT DAT	CHANNEL 0 H-CONTR.	CHANNEL 1 V-CONTR.
80-30					
10	OBE-1	A	MN_OBE1	MNOBSTH	MNOBSTV
11	OBE-2	A	MN_OBE2	MNOBR2H	MNOBR2V
12	OBE-3	A	MH_OBE3	MHOBR3H	MHOBR3V
13	OBE-4	A	MN_OBE4	MNOBR4H	MNOBR4V
14	OBE-5	A	MH_OBE5	MNOBR5H	MNOBR5V
15	SSE-1	A	MH_SSE1	MNSS1H	MNSS1V

* Refers to tape recorder log sheet (Appendix A) for tape I.D. #030

File Identification Scheme where

XX-Y-ZZ

XX = HC = Horizontal Control
XX = VC = Vertical Control

Y = Orientation A, B, C or D

Z_ = O = OBE Event Z_ = S = SSE Event
_Z = Event Number.

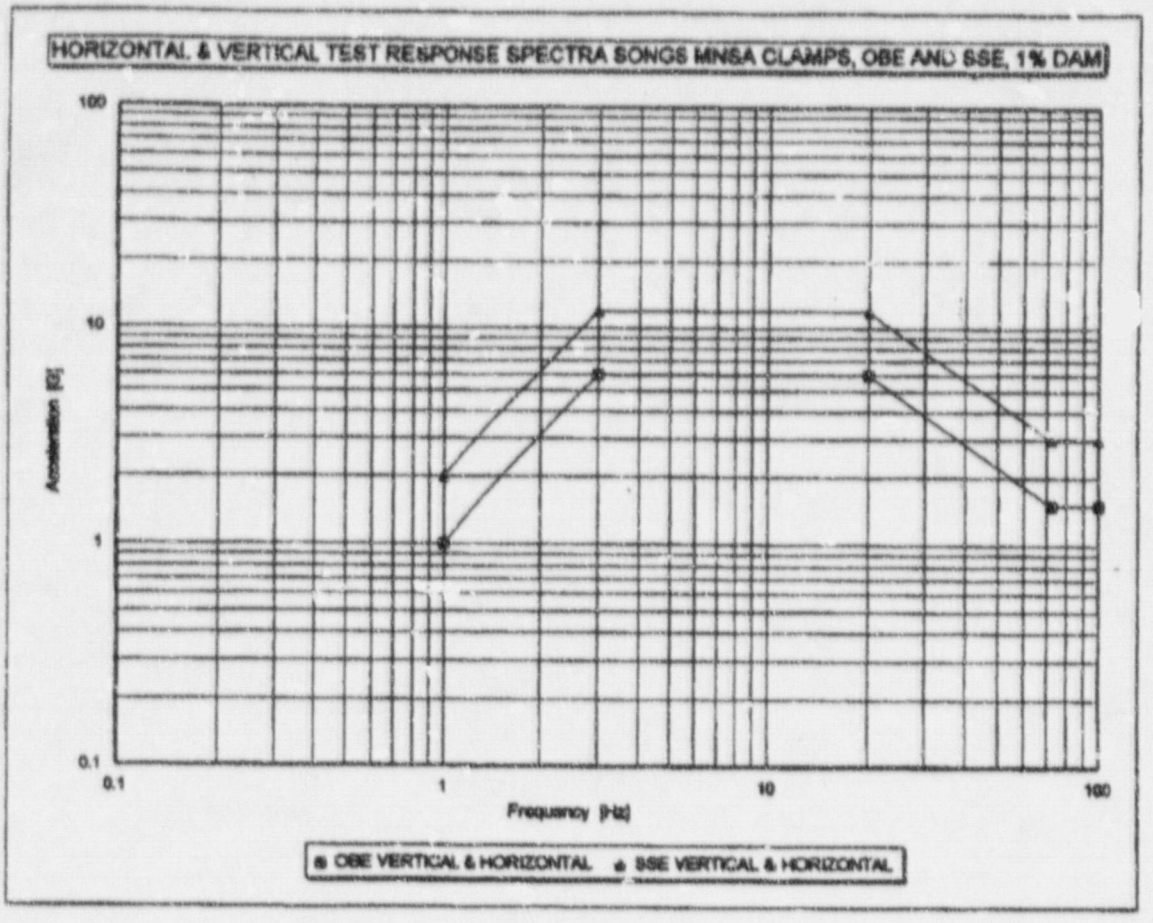
TABLE 3

REQUIRED RESPONSE SPECTRUM LEVELS
AT 1/6th OCTAVE ANALYSIS FREQUENCIES

San Onofre MNSA Nozzles

FREQUENCY [HERTZ]	OBE [G]	SSE [G]
1.00	1.00	2.00
1.12	1.20	2.40
1.26	1.46	2.92
1.41	1.75	3.50
1.59	2.07	4.14
1.78	2.56	5.12
2.00	3.20	6.40
2.24	3.73	7.46
2.52	4.51	9.02
2.83	5.46	10.92
3.17	6.00	12.00
3.56	6.00	12.00
4.00	6.00	12.00
4.49	6.00	12.00
5.04	6.00	12.00
5.66	6.00	12.00
6.35	6.00	12.00
7.13	6.00	12.00
8.00	6.00	12.00
8.98	6.00	12.00
10.08	6.00	12.00
11.31	6.00	12.00
12.70	6.00	12.00
14.25	6.00	12.00
16.00	6.00	12.00
17.96	6.00	12.00
20.16	6.00	12.00
22.63	5.16	10.32
25.40	4.48	8.96
28.51	3.89	7.78
32.00	3.37	6.74
35.92	2.93	5.86
40.32	2.54	5.08
45.25	2.21	4.42
50.80	1.91	3.82
57.02	1.66	3.32
64.00	1.50	3.00
71.84	1.50	3.00
80.63	1.50	3.00
90.51	1.50	3.00

NOTE:
OCCASIONAL, UNDERTESTING AT ISOLATED FREQUENCIES IS PERMISSIBLE ACCORDING TO THE IEEE-344 GUIDELINES, ESPECIALLY WHEN OCCURING AT LOW (LESS THAN 3 HERTZ) FREQUENCIES WHERE NO RESONANCE CONDITIONS EXIST.



Note: A less conservative spectra may be used based on the results from the Sine Sweep Test, provided they envelop the Plant Specific Curve(s) of Appendix A.

FIGURE 1: REQUIRED RESPONSE SPECTRA

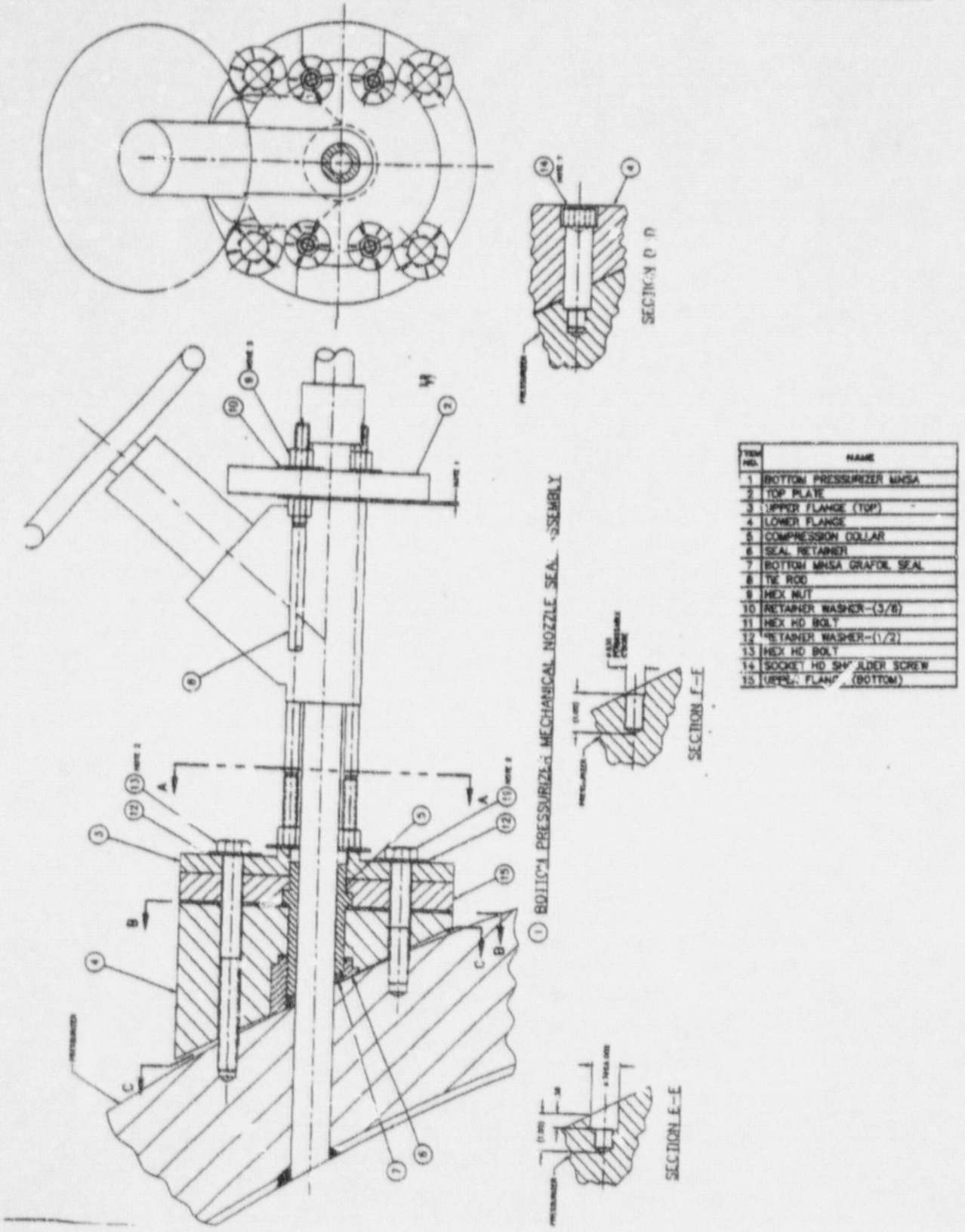
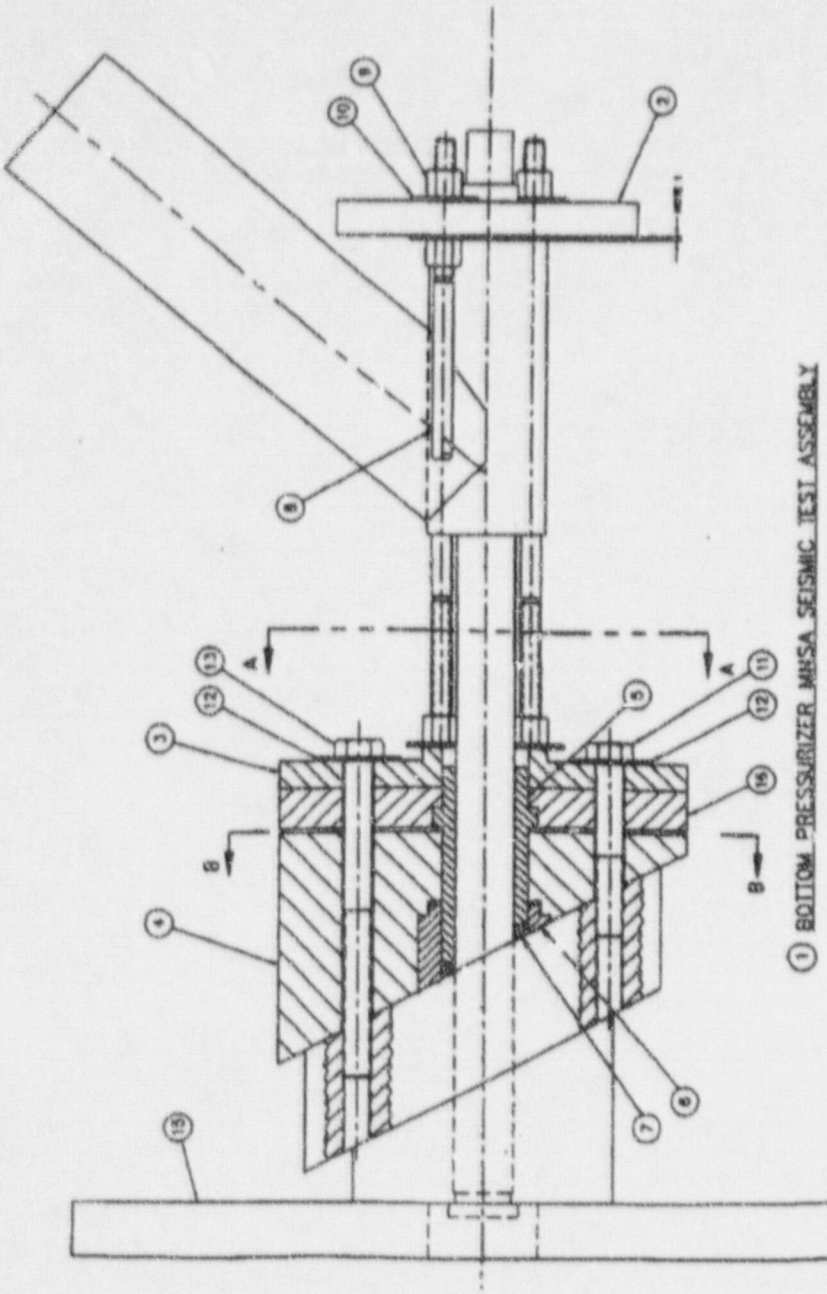


FIGURE 2: REPRESENTATIVE MNSA CLAMP DETAILS



Item	Name
1	BOTTOM PRESS. MHSA SEISMIC TEST
2	TOP PLATE
3	UPPER FLANGE (TOP)
4	LOWER FLANGE
5	COMPRESSION COLLAR
6	SEAL RETAINER
7	BOTTOM MHSA GRAFOIL SEAL
8	TIE ROD
9	HEX ROD
10	RETAINER WASHER - (3/8)
11	HEX HD CAP SCREW
12	RETAINER WASHER - (1/2)
13	HEX HD CAP SCREW
14	SOCKET HD SHOULDER SCREW
15	BOTTOM PRESS. MHSA TEST FIX. MTG
16	UPPER FLANGE BOLTING

FIGURE 3: REPRESENTATIVE TEST FIXTURE AND MOUNTING DETAILS

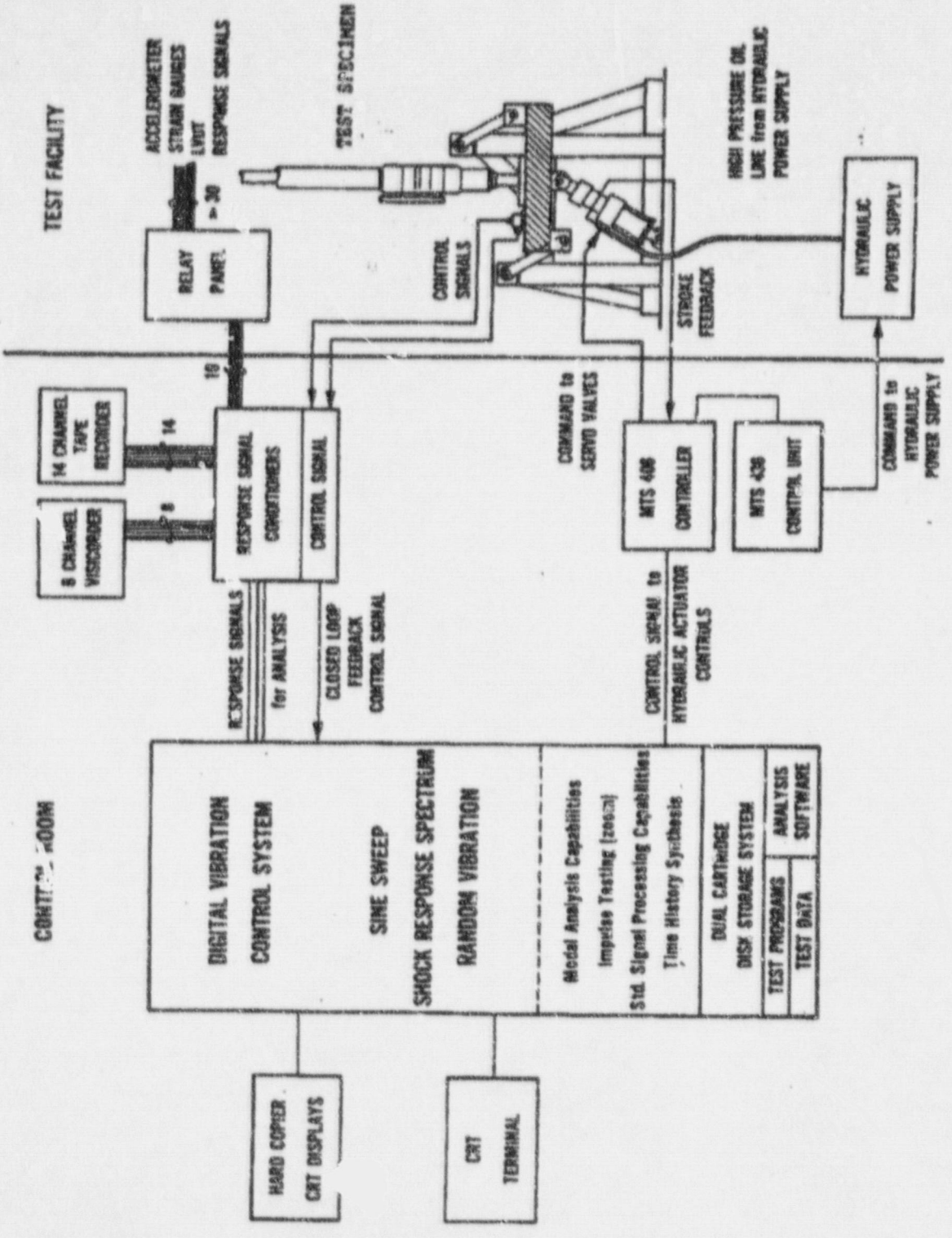


FIGURE 4: HYDRAULIC VIBRATION TEST FACILITY

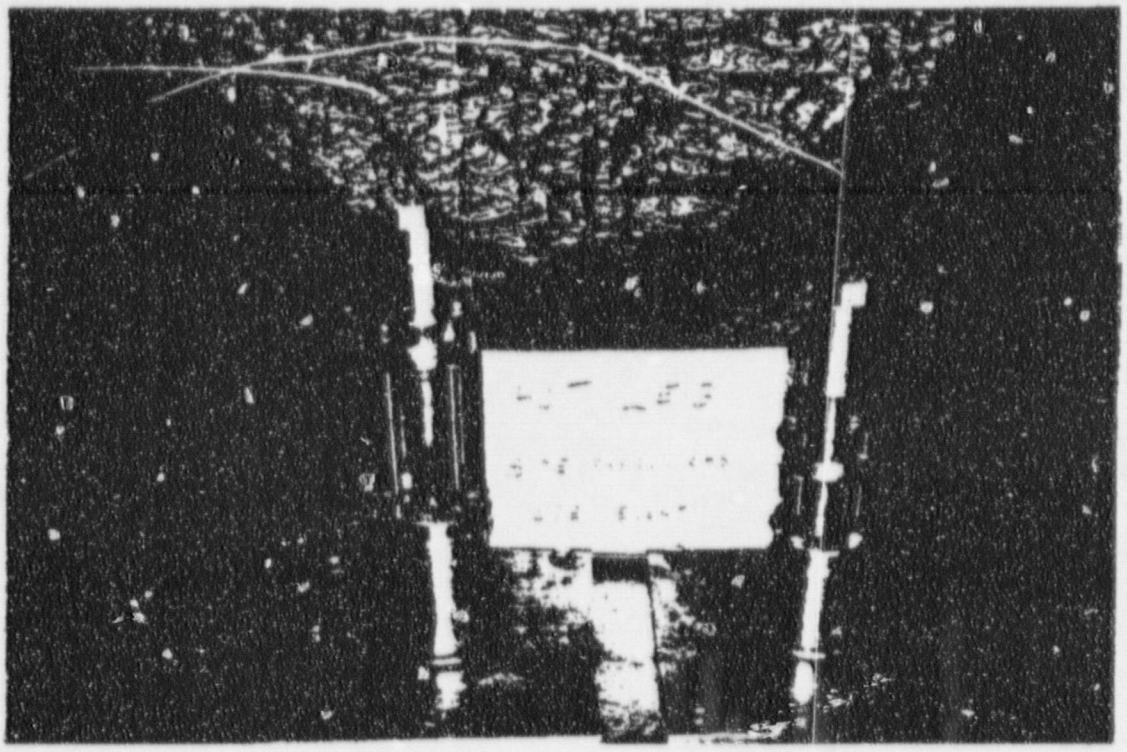


FIGURE 5: HOT LEG RTD AND PZR SIDE MOUNTED NOZZLES WITH MNSAs DURING SEISMIC TEST

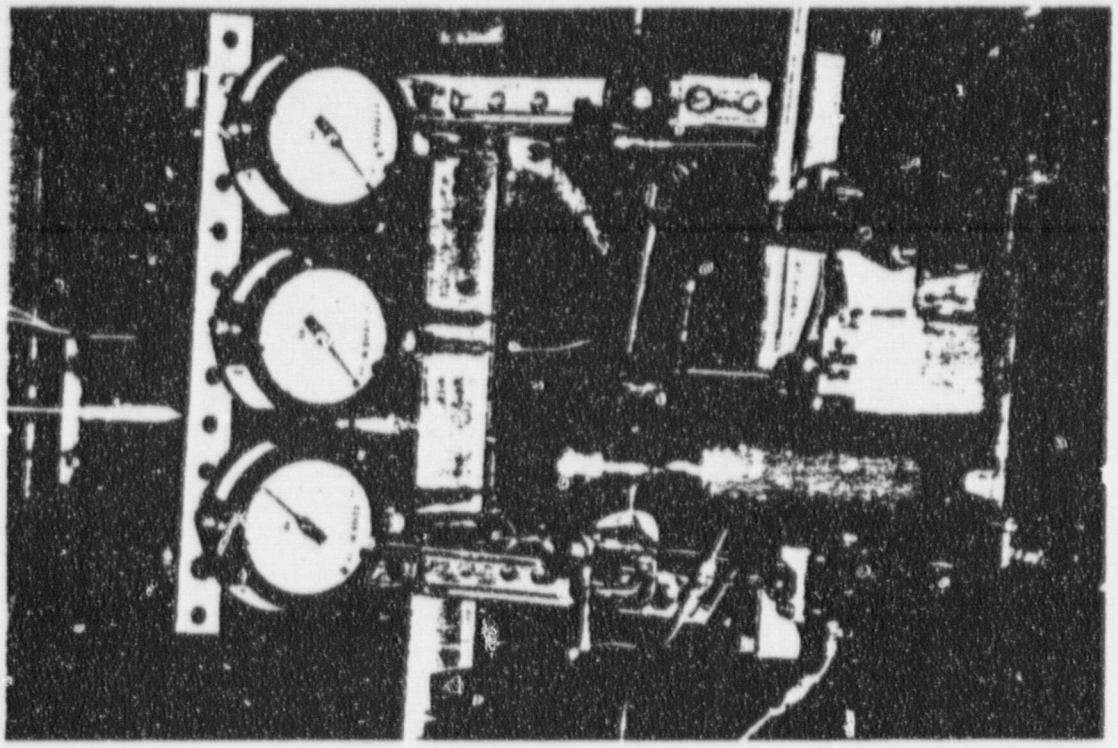


FIGURE 7: VIEW OF PRESSURE GAUGES AND HAND PUMP

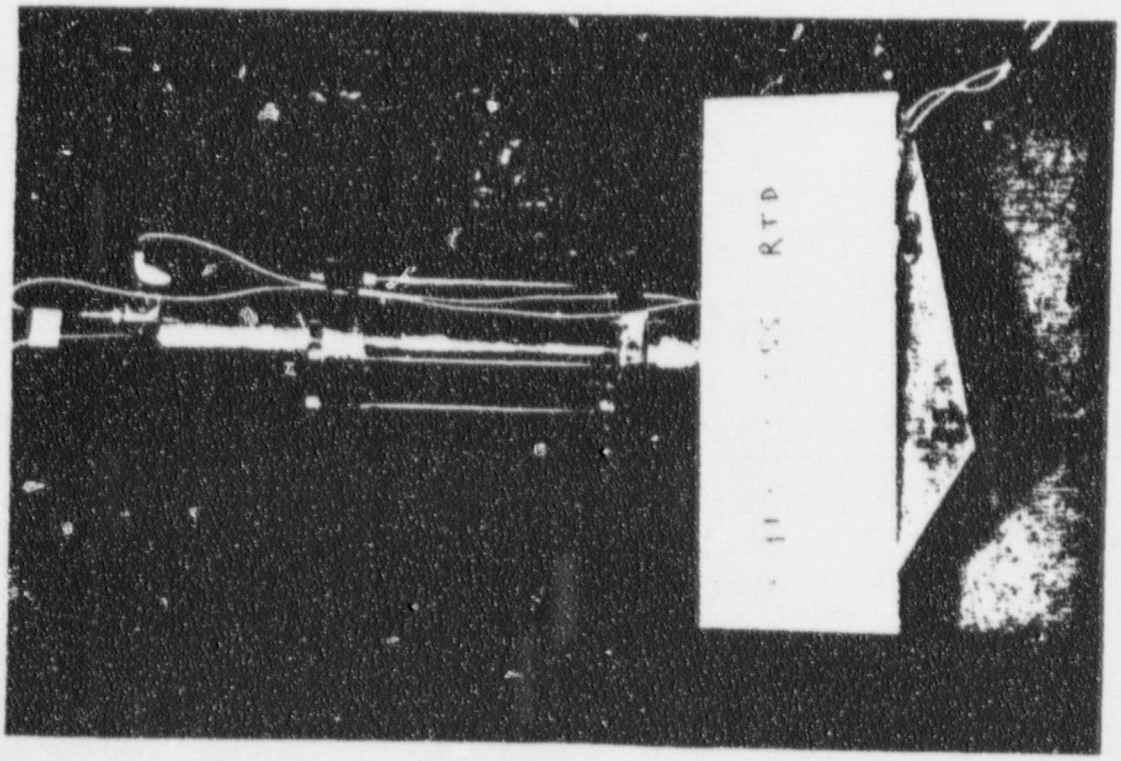


FIGURE 6: PZR SIDE MOUNTED NOZZLE SEISMIC TEST SET-UP

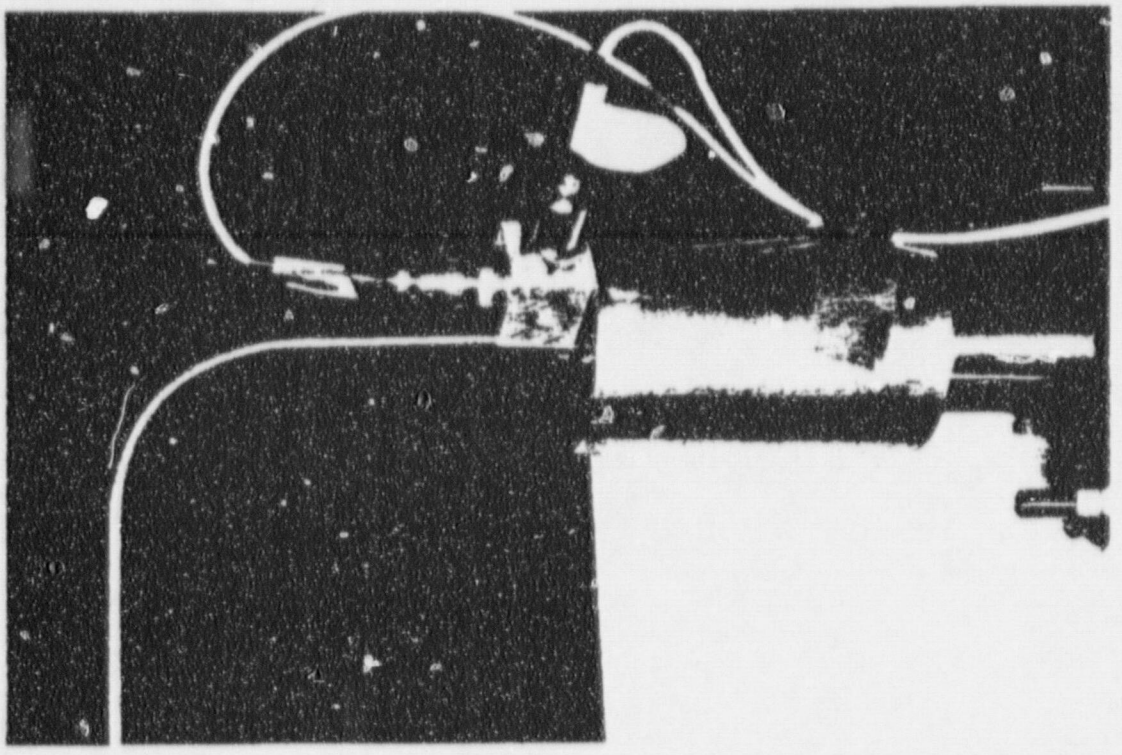


FIGURE 9: HOT LEG RTD NOZZLE WITH MNSA, VERTICAL & HORIZONTAL RESPONSE ACCELEROMETER

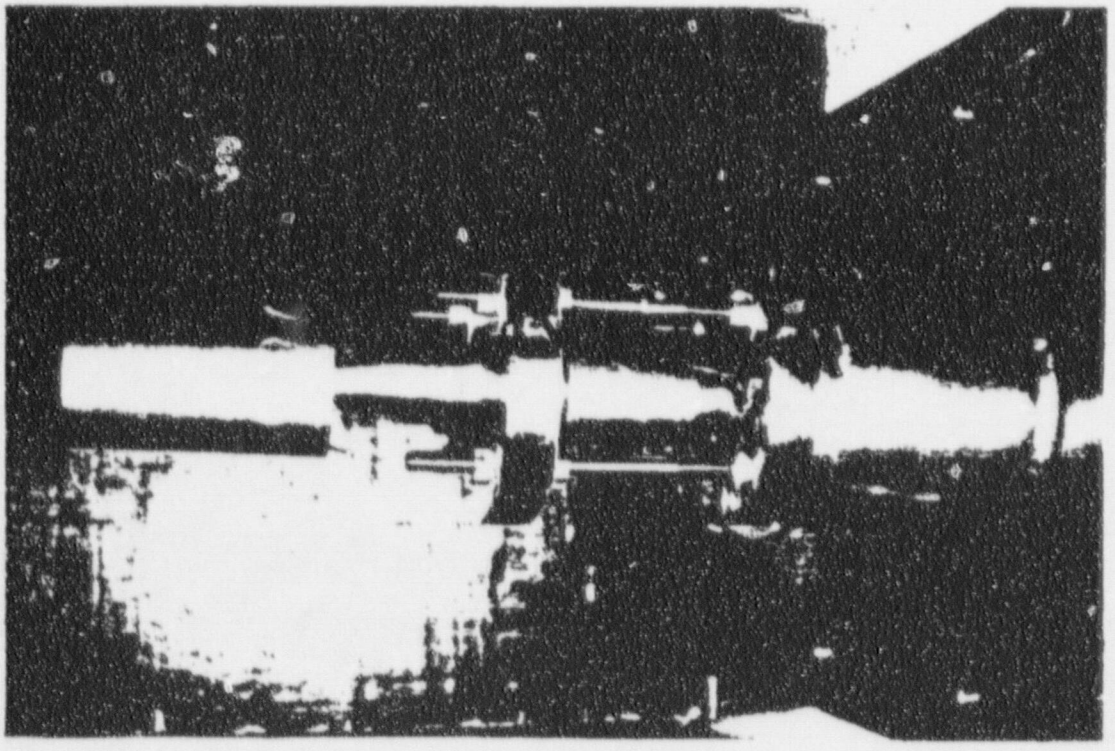


FIGURE 8: HOT LEG RTD NOZZLE WITH MNSA, SEISMIC TEST SET-UP

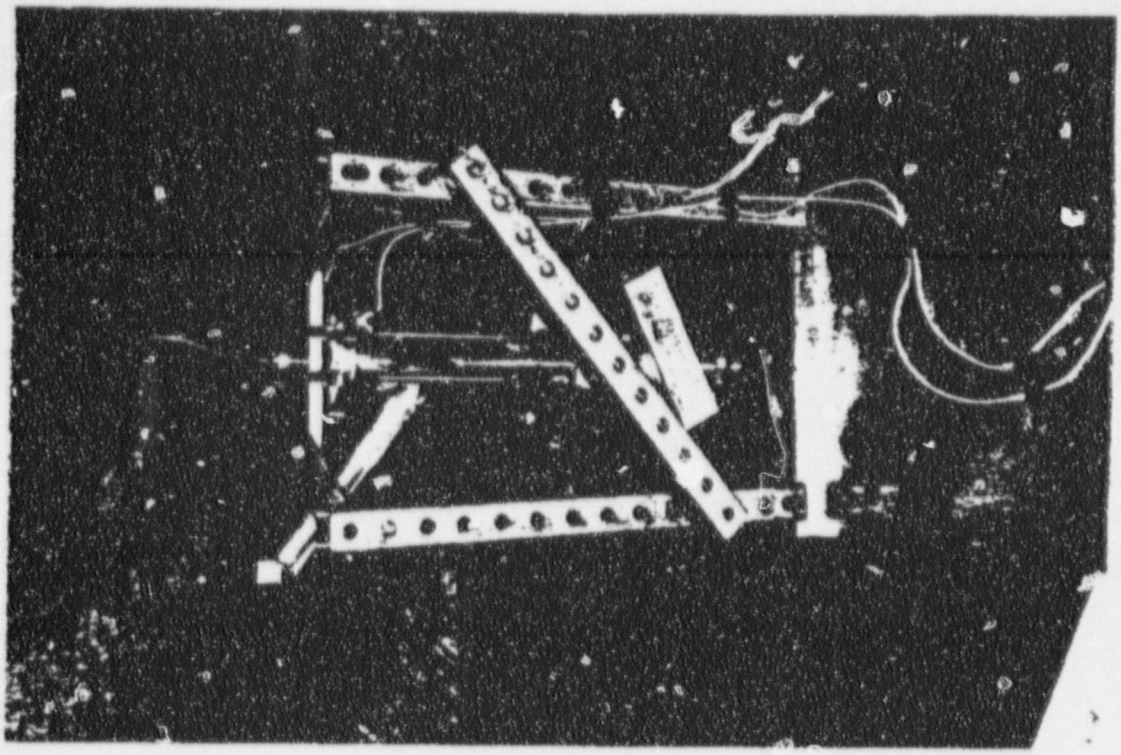


FIGURE 11: BOTTOM MOUNTED INSTRUMENTED NOZZLE WITH MNSA, SUPPORTED

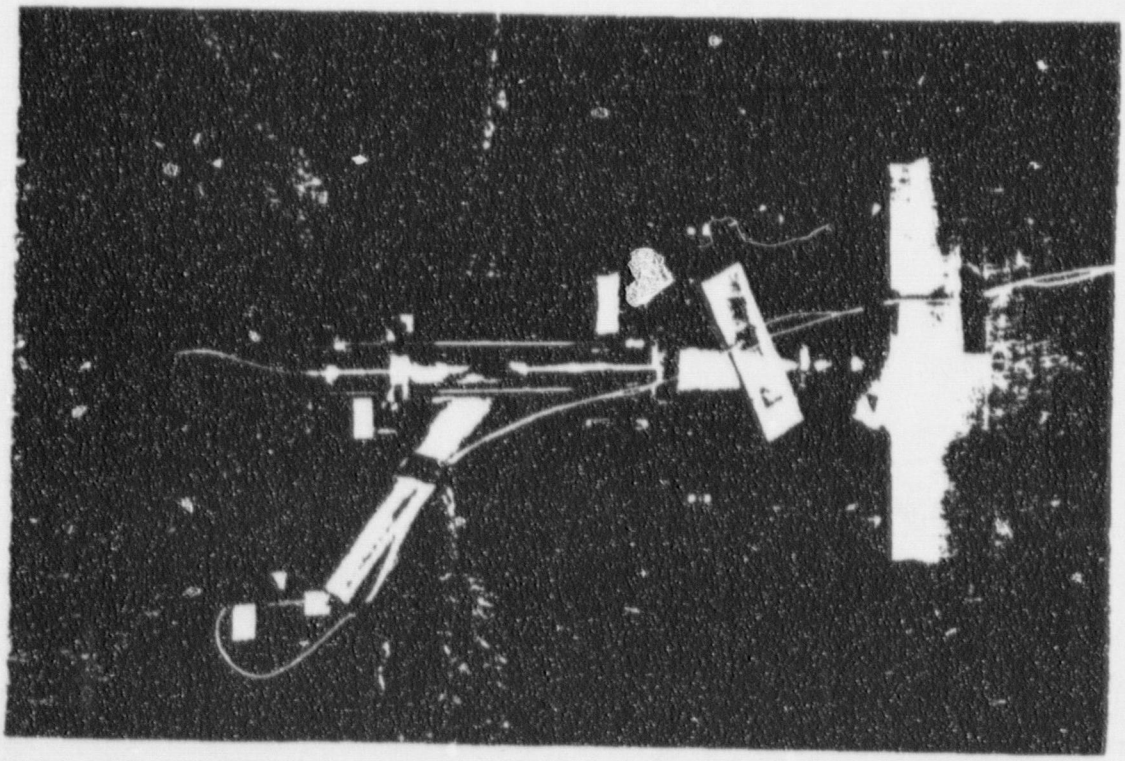


FIGURE 10: BOTTOM MOUNTED INSTRUMENTED NOZZLE WITH MNSA, FREE STANDING

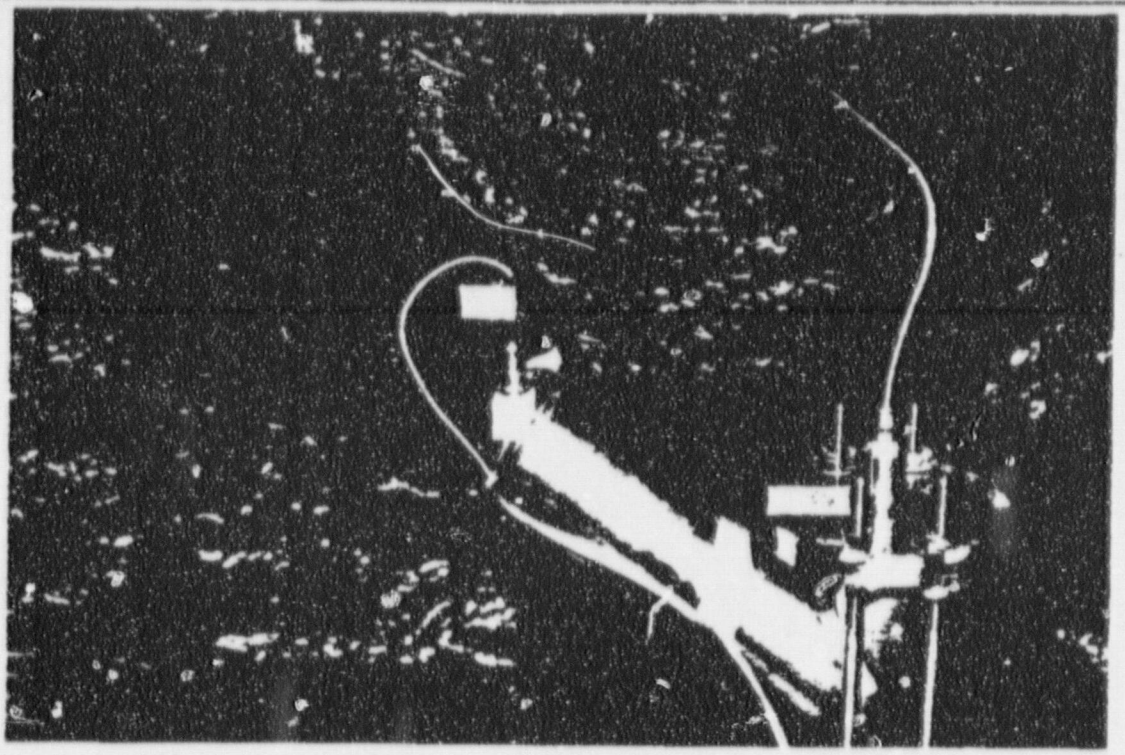


FIGURE 12: BOTTOM MOUNTED INSTRUMENTED NOZZLE WITH MNSA, RESPONSE ACCELEROMETER MOUNTING BLOCK AT VALVE MASS TOP

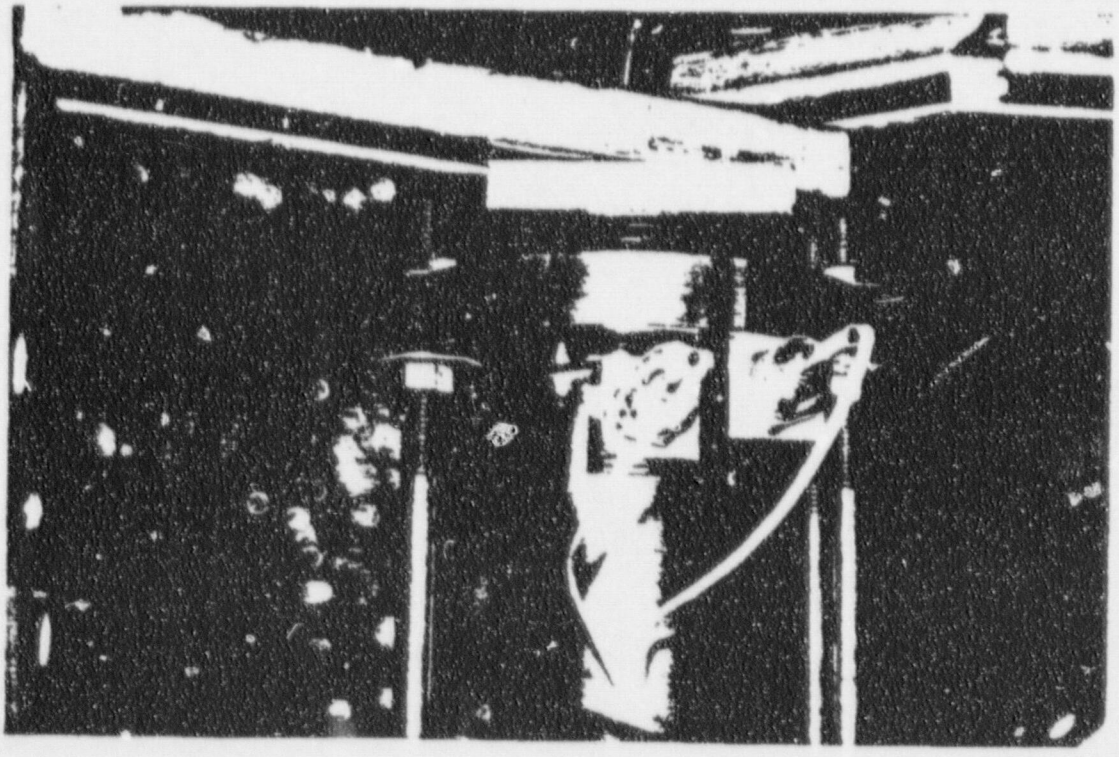
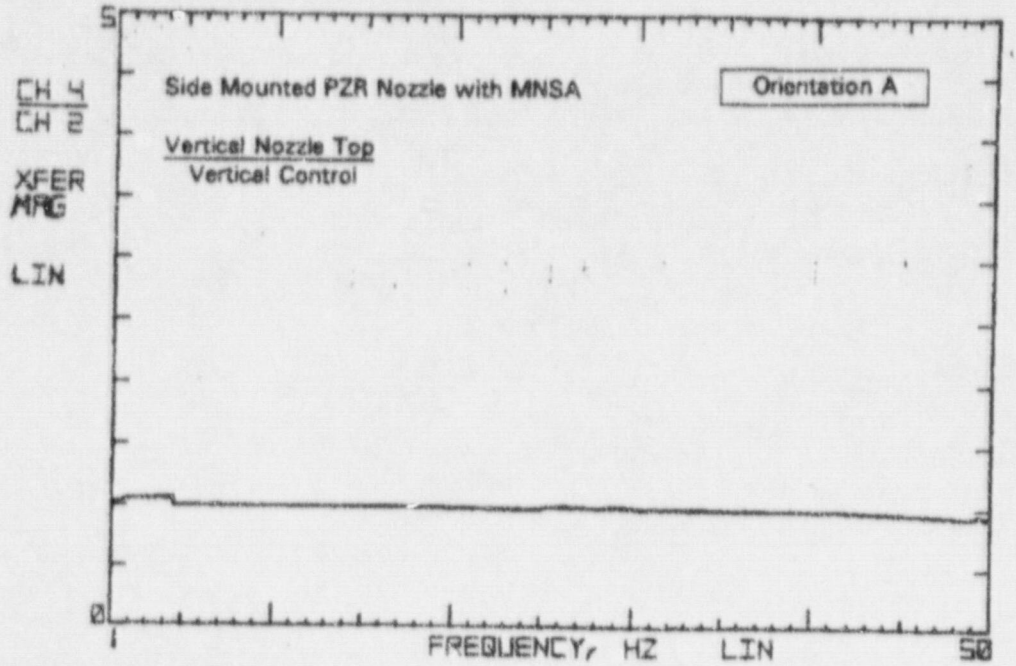


FIGURE 13: BOTTOM MOUNTED INSTRUMENTED NOZZLE WITH MNSA, RESPONSE ACCELEROMETER AT NOZZLE TOP AND TOP MNSA PLATE

```
 1 TEST ID: SIMJAS
 2 HEADING: SONGS MNSA CLAMPS

SWEEP PARAMETERS:
 3 MODE  2=LOG(DEC), 1=LOG(OCT), 0=LIN: 2
 4 START, END FREQ, HZ: 1.000,50.00
FREQ RANGE, DEC=1.698
 5 SPECIFICATION  1=RATE, 0=DURATION: 1
   RATE, DEC/MIN: .2500
SWEEP DURATION -- HRS, MIN, SEC: 0,6,47

TEST LENGTH:
 6 SPECIFICATION  1=TIME, 0=SWEEP CYCLES: 0
   CYCLES: 1.000
TEST TIME -- HRS, MIN, SEC: 0,6,47
 7 START-UP TIME, SEC: 10.00
 8 SHUT-DOWN TIME, SEC: 5.000

REFERENCE SPECTRUM:
 9 UNITS 1=METRIC, 0=NON-METRIC: 0
10 SPECTRUM LIMITS:
   DISPLACEMENT, IN(P-P): 2.500
   VELOCITY, IN/SEC: 10.00
   ACCELERATION, G: .2000

11 TYPE, VALUE, FREQ: 2,.1000,1.100
   ALARM LIMIT +DB, -DB: 3.000,-3.000
   ABORT LIMIT +DB, -DB: 10.00,-10.00

12 TYPE, VALUE, FREQ: 3,.2000,2.000
   ALARM LIMIT +DB, -DB: 3.000,-3.000
   ABORT LIMIT +DB, -DB: 10.00,-10.00

13 TYPE, VALUE, FREQ: 2,.2000,50.00
   ALARM LIMIT +DB, -DB: 10.00,-10.00
   ABORT LIMIT +DB, -DB: 40.00,-40.00

14 TEST LEVEL (DB BELOW REF): 0.

15 CONTROL CHANNELS: 1
   PROCESS 3=AVG ABS, 2=FUND, 1=PEAK, 0=RMS: 2
16 LIMIT CHANNELS: 0
17 AUXILIARY CHANNELS: 2,3,4
   PROCESS 3=AVG ABS, 2=FUND, 1=PEAK, 0=RMS: 2
   MAXIMUM EXPECTED G: 1.500
18 ACCEL SENS, MV/G:
   CH 1: 10000.
   CH 2: 10000.
   CH 3: 1000.
   CH 4: 1000.
19 FILTER  1=PROPORTIONAL BW, 0=FIXED BW: 1
   BW, %: 50.00

20 REFERENCE CHANNEL: 1
21 RESPONSE CHANNEL: 2
22 MONITOR CHANNEL: 3

23 COMPRESSION SPEED  2=HIGH, 1=NORMAL, 0=LOW: 1
24 LOOP-CHECK FREQ(HZ), MAX DRIVE(VOLTS): 2.000,.2000

REFERENCE LEVELS:
 MAX DISPLACEMENT, IN(P-P): 1.957
 MAX VELOCITY, IN/SEC: 6.150
 MAX ACCELERATION, G: .2000
 MIN ACCELERATION, G: .1000
 ACCELERATION RANGE, DB: 6.020

CORRECTIONS?
```

FIGURE 14: DVCS INPUT PARAMETERS FOR SINE SWEEP RESONANCE SURVEYS USING SN21T VERSION 04



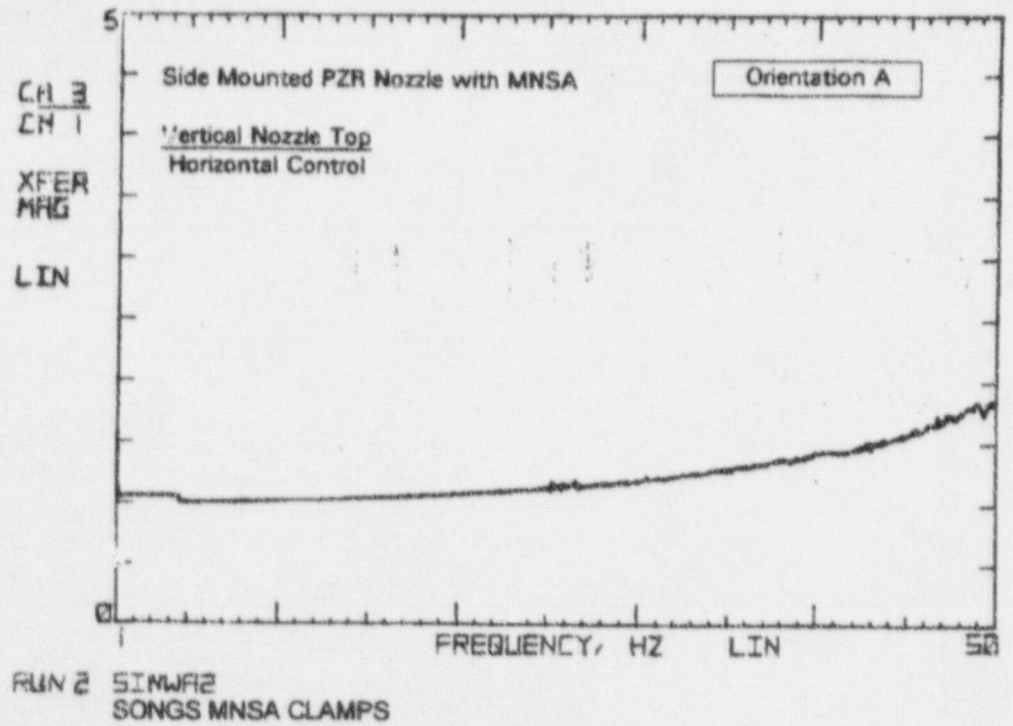


FIGURE 15: TRANSFER FUNCTION PLOTS, PRESSURIZER-TEMPERATURE NOZZLE, TEST ORIENTATION A

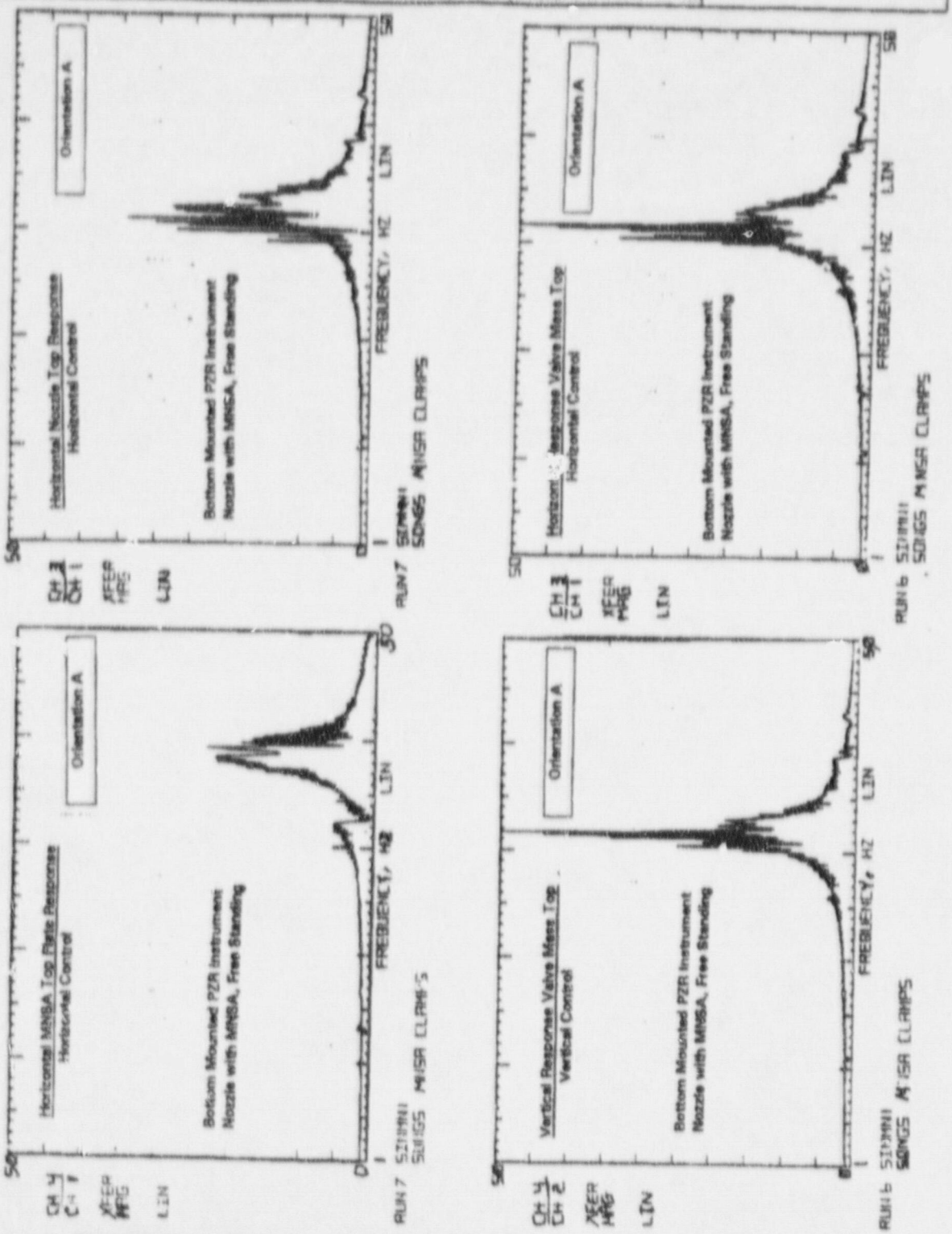


FIGURE 16: TRANSFER FUNCTION PLOTS, PRESSURIZER LOWER LEVEL INSTRUMENTATION NOZZLE, TEST ORIENTATION A, FREE STANDING

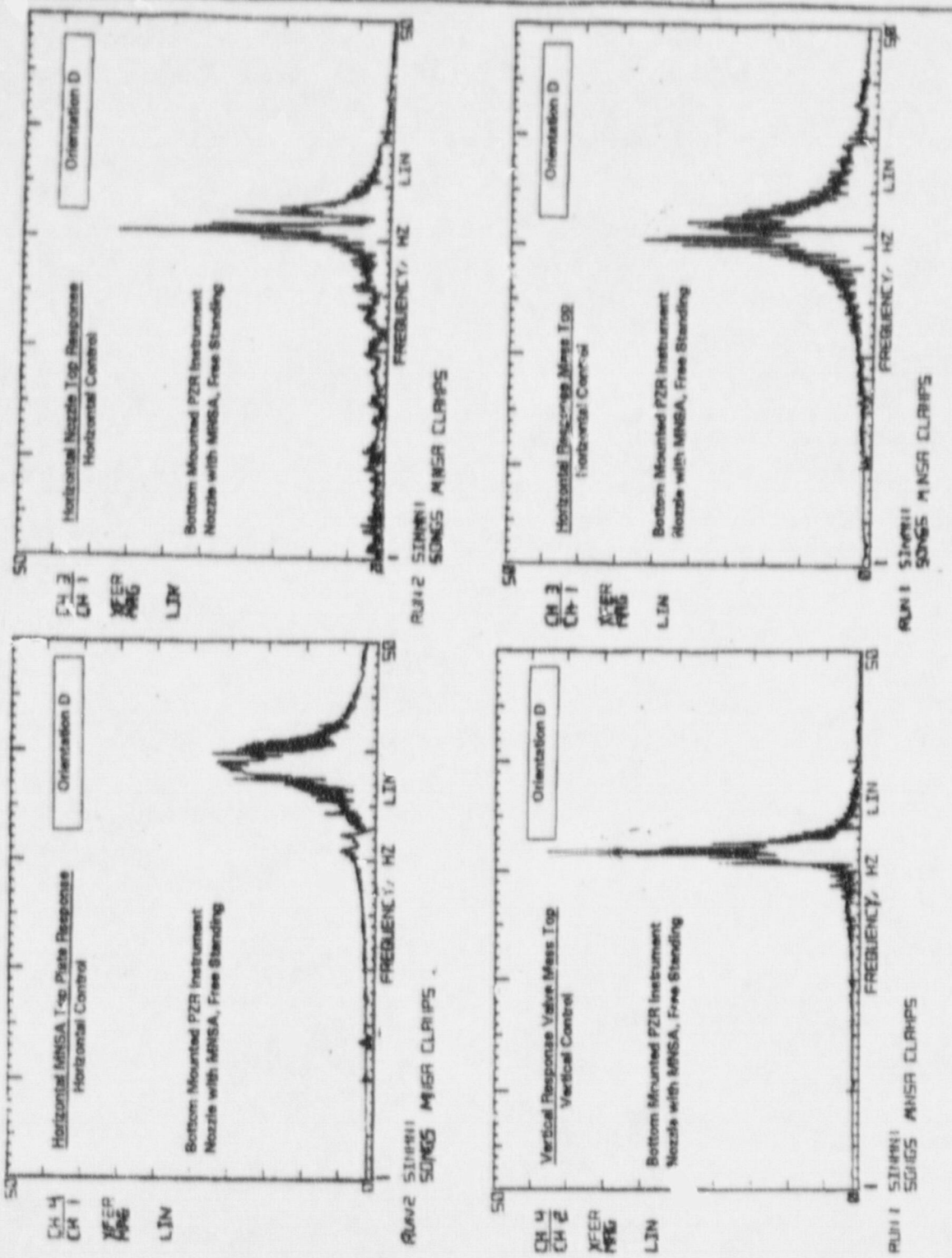


FIGURE 17: TRANSFER FUNCTION PLOTS, PRESSURIZER LOWER LEVEL INSTRUMENTATION NOZZLE, TEST ORIENTATION D, FREE STANDING

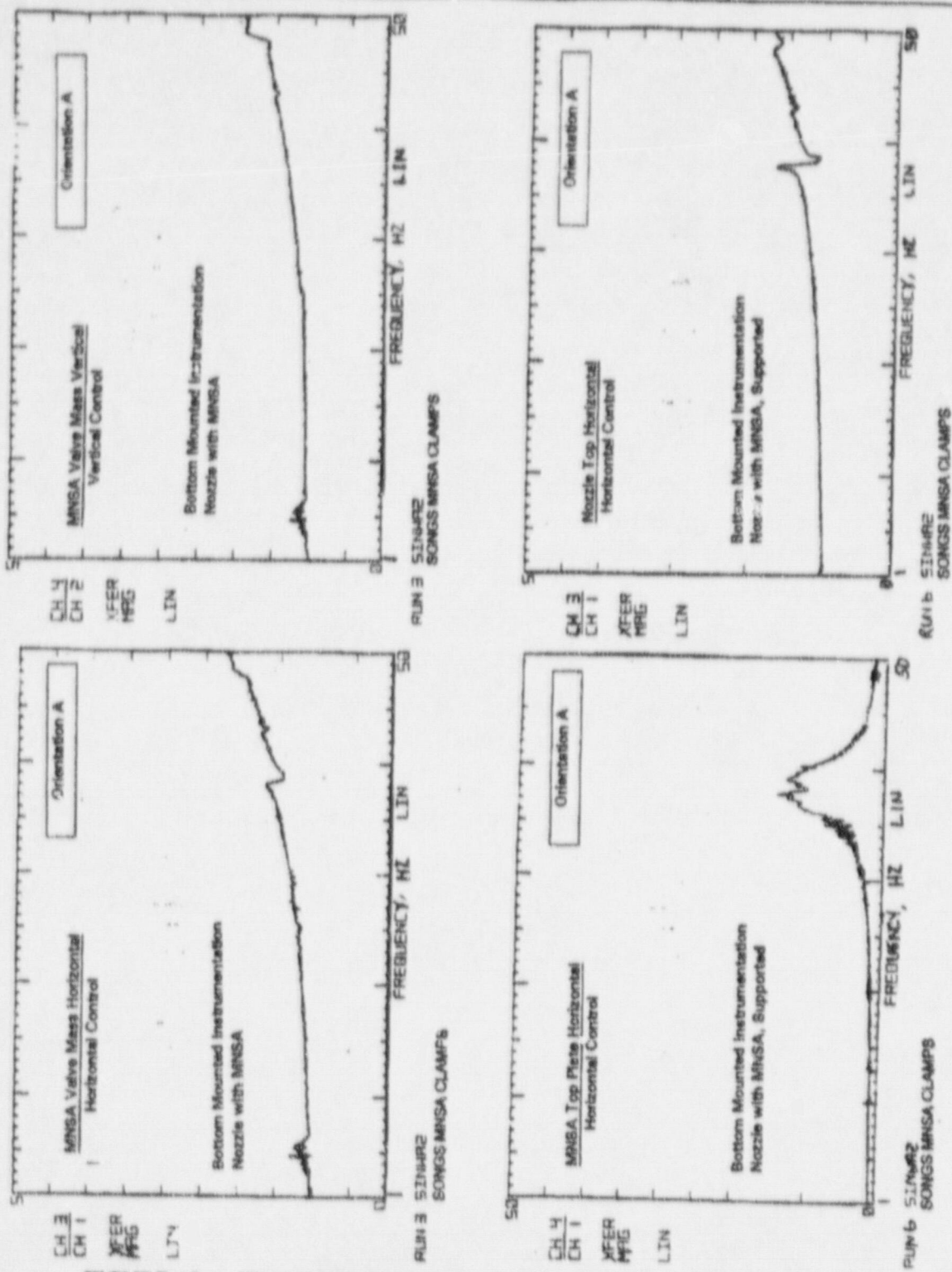


FIGURE 18: TRANSFER FUNCTION PLOTS, PRESSURIZER LOWER LEVEL INSTRUMENTATION NOZZLE, TEST ORIENTATION A, SUPPORTED

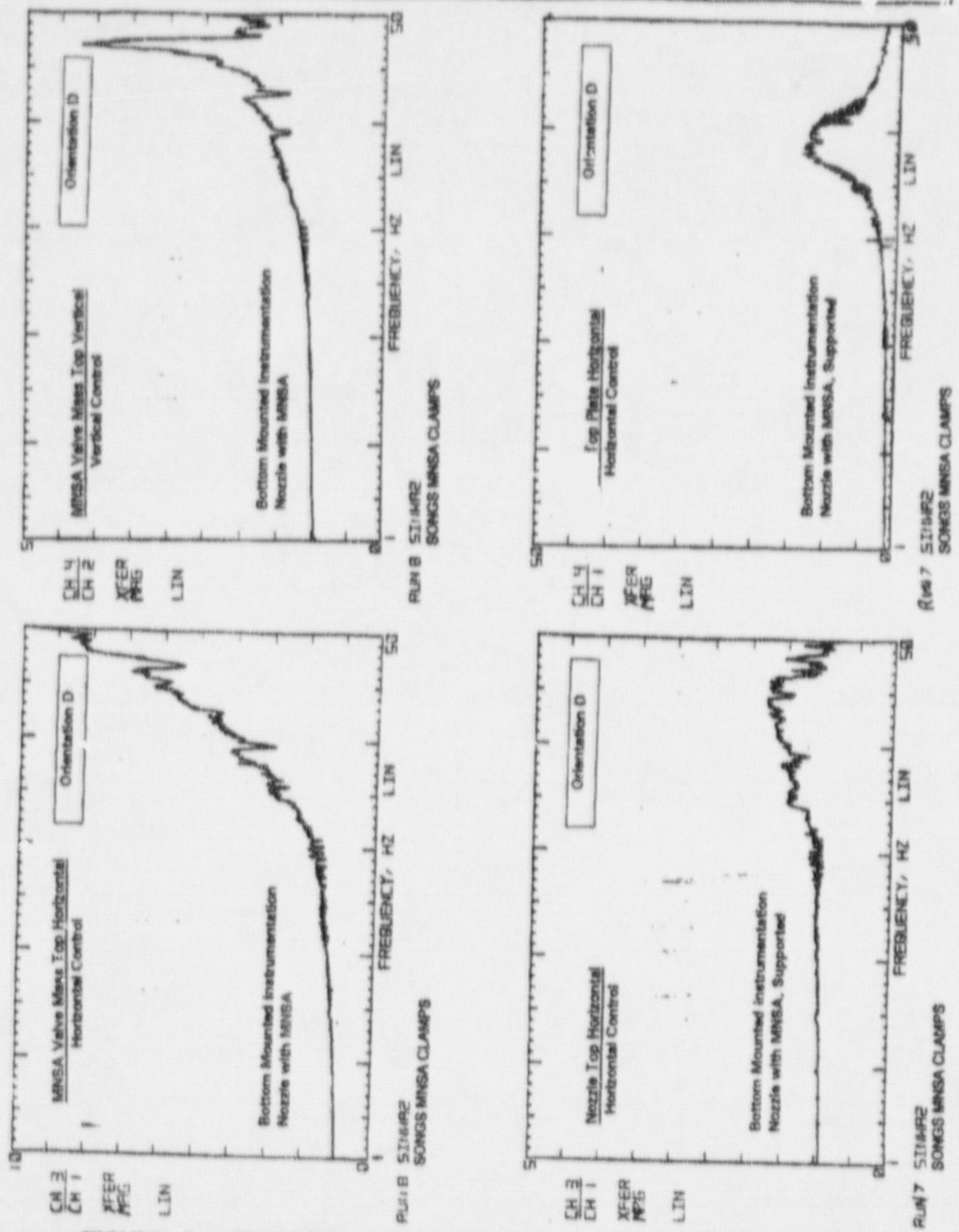
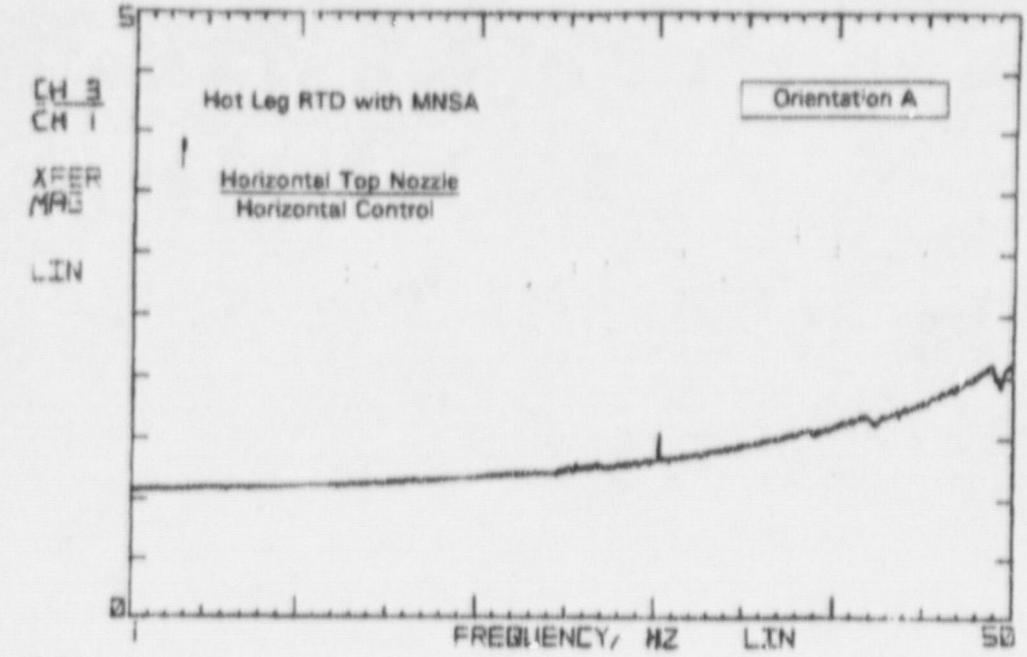


FIGURE 19: TRANSFER FUNCTION PLOTS, PRESSURIZER LOWER LEVEL INSTRUMENTATION NOZZI E, TEST ORIENTATION D, SUPPORTED



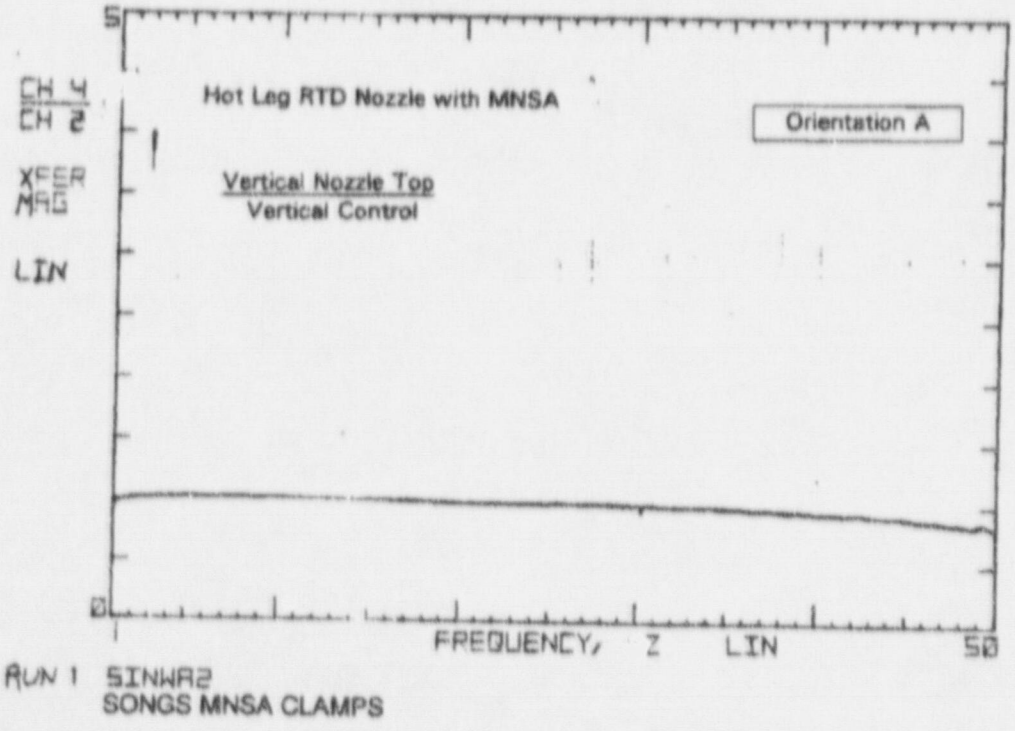


FIGURE 20: TRANSFER FUNCTION PLOTS, HOT LEG TEMPERATURE RTD NOZZLE, TEST ORIENTATION A

```
1 HEADING:SONGS MNSA SLE
2 SENSITIVITY(MV/G):1000.
3 SHOCK RESP DEFN 0=ABS ACCEL 1=REL DISPL:0
4 DAMPING COEFF:.01
5 MAX FREQ:50
6 # OF DECADES 0=2 1=2.3 2=2.6 3=3:3
7 WAVE PARAMETERS
     FREQ      AMPL
   1      1.        2.
   2      1.12      2.4
   3      1.25      2.92
   4      1.41      3.5
   5      1.58      4.14
   6      1.77      5.12
   7      1.99      6.4
   8      2.23      7.46
   9      2.51      9.02
  10      2.81     10.92
  11      3.16     12.
  12      3.55     12.
  13      3.98     12.
  14      4.47     12.
  15      5.01     12.
  16      5.62     12.
  17      6.31     12.
  18      7.01     12.
  19      7.94     12.
  20      8.91     12.
  21     10.       12.
  22     11.18     12.
  23     12.53     12.
  24     14.12     12.
  25     15.84     12.
  26     17.78     12.
  27     19.95     12.
  28     22.38     10.32
  29     25.11      8.98
  30     28.17      7.78
  31     31.62      6.74
  32     35.48      5.86
  33     39.81      5.08
  34     44.65      4.42
  35     50.1       3.82
8 PEAK WAVELET AMPL(V):10.
9 AUTO MODE LEVEL SEQ 0=FULL
  FIRST:3
  NEXT:2
  NEXT:2
  NEXT:1
  NEXT:1
10 EXTERNAL TRIGGER MODE 0=NO 1=YES:1
11 ALARM BAND 1
    +DB LIMIT:3.
    -DB LIMIT:-3.
    UPPER FREQ, HZ:50.

CORRECTIONS 0=NO 1=YES:
```

```
1 HEADING:SONGS MNSA OBE
2 SENSITIVITY(MV/G):1000.
3 SHOCK RESP DEFN 0=ABS ACCEL 1=REL DISPL:0
4 DAMPING COEFF:.01
5 MAX FREQ:50
6 # OF DECADES 0=2 1=2.3 2=2.6 3=3:3
7 WAVE PARAMETERS
     FREQ      AMPL
   1      1.        1.
   2      1.12      1.2
   3      1.25      1.46
   4      1.41      1.75
   5      1.58      2.07
   6      1.77      2.56
   7      1.99      3.2
   8      2.23      3.73
   9      2.51      4.51
  10      2.81      5.46
  11      3.16      6.
  12      3.55      6.
  13      3.98      6.
  14      4.47      6.
  15      5.01      6.
  16      5.62      6.
  17      6.31      6.
  18      7.01      6.
  19      7.94      6.
  20      8.91      6.
  21     10.        6.
  22     11.18      6.
  23     12.53      6.
  24     14.12      6.
  25     15.84      6.
  26     17.78      6.
  27     19.95      6.
  28     22.38      5.16
  29     25.11      4.48
  30     28.17      3.89
  31     31.62      3.37
  32     35.48      2.93
  33     39.81      2.54
  34     44.65      2.21
  35     50.1       1.91
8 PEAK WAVELET AMPL(V):10.
9 AUTO MODE LEVEL SEQ 0=FULL
  FIRST:3
  NEXT:2
  NEXT:2
  NEXT:1
  NEXT:1
10 EXTERNAL TRIGGER MODE 0=NO 1=YES:1
11 ALARM BAND 1
    +DB LIMIT:3.
    -DB LIMIT:-3.
    UPPER FREQ, HZ:50.

CORRECTIONS 0=NO 1=YES:
```

FIGURE 21: DVCS INPUT PARAMETERS FOR OBE AND SSE TEST EVENTS

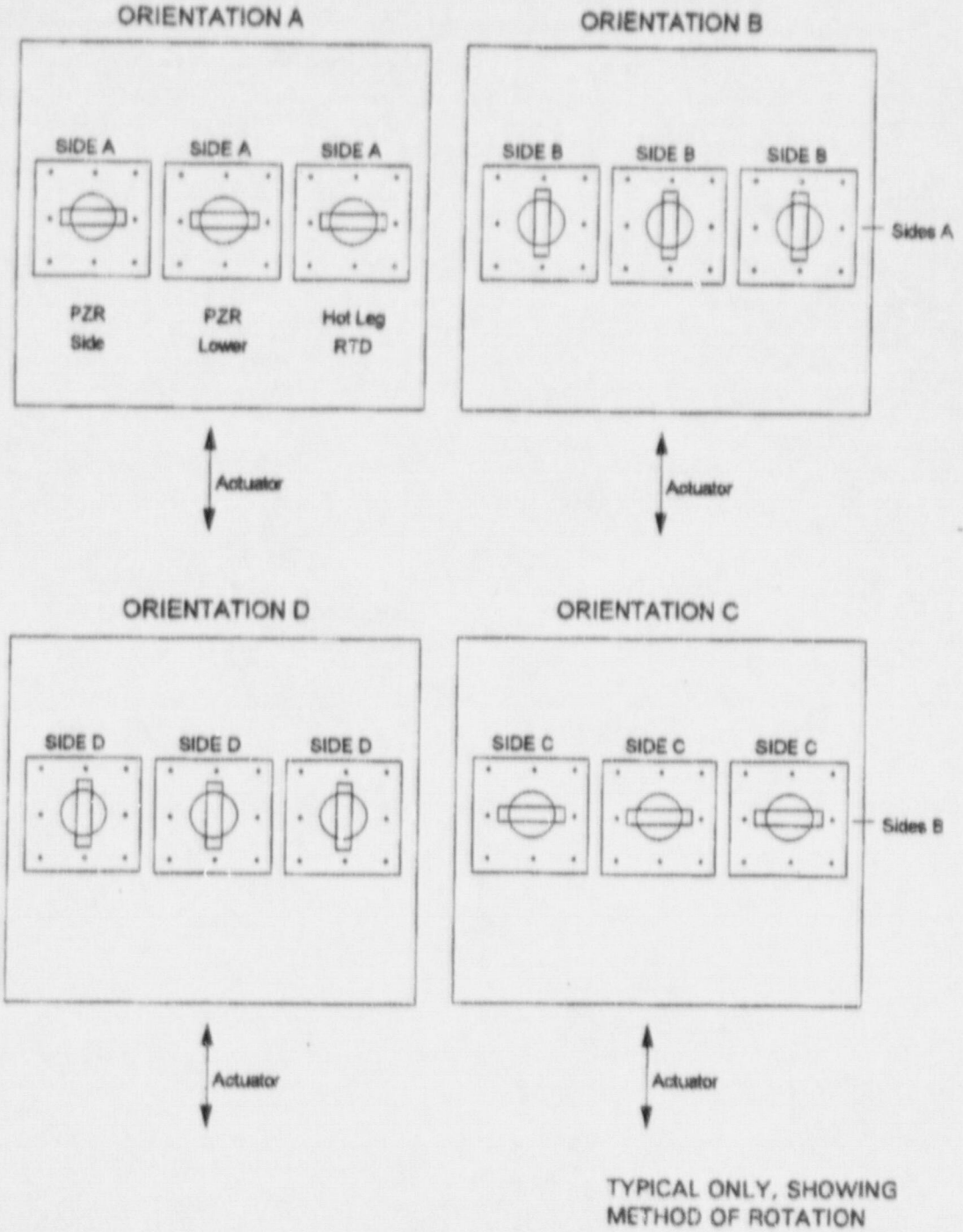
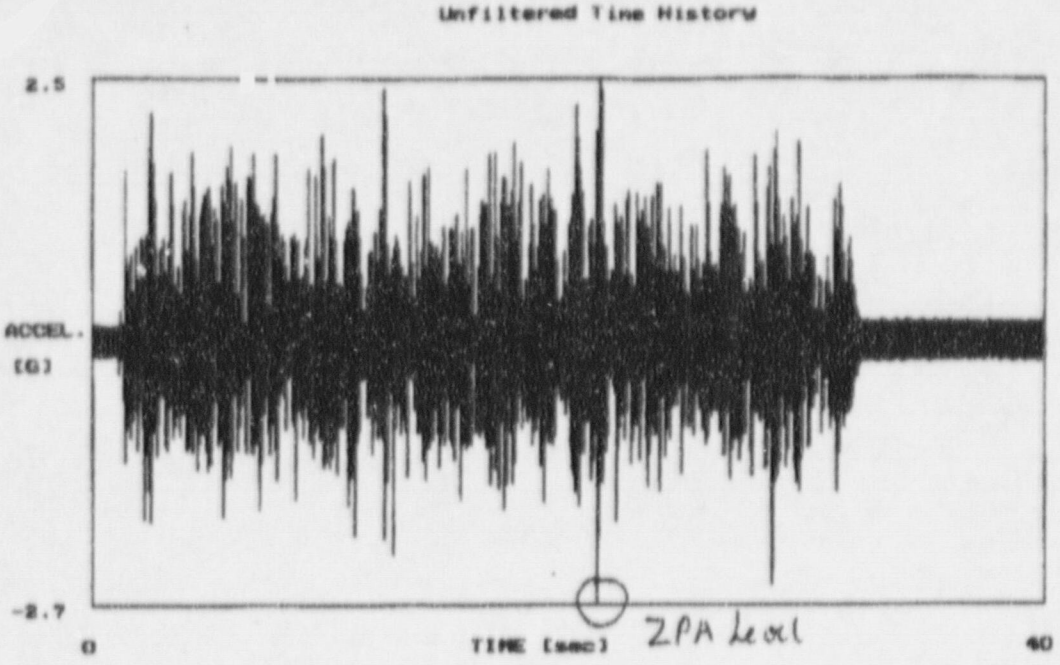


FIGURE 22: TEST ORIENTATIONS FOR SEISMIC QUALIFICATION TEST



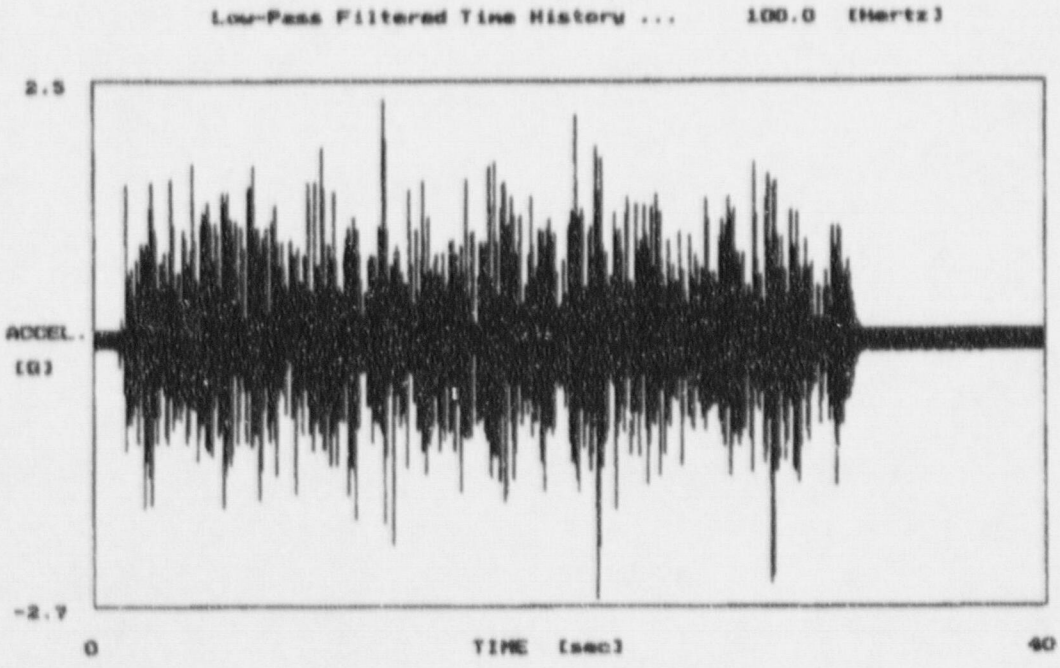
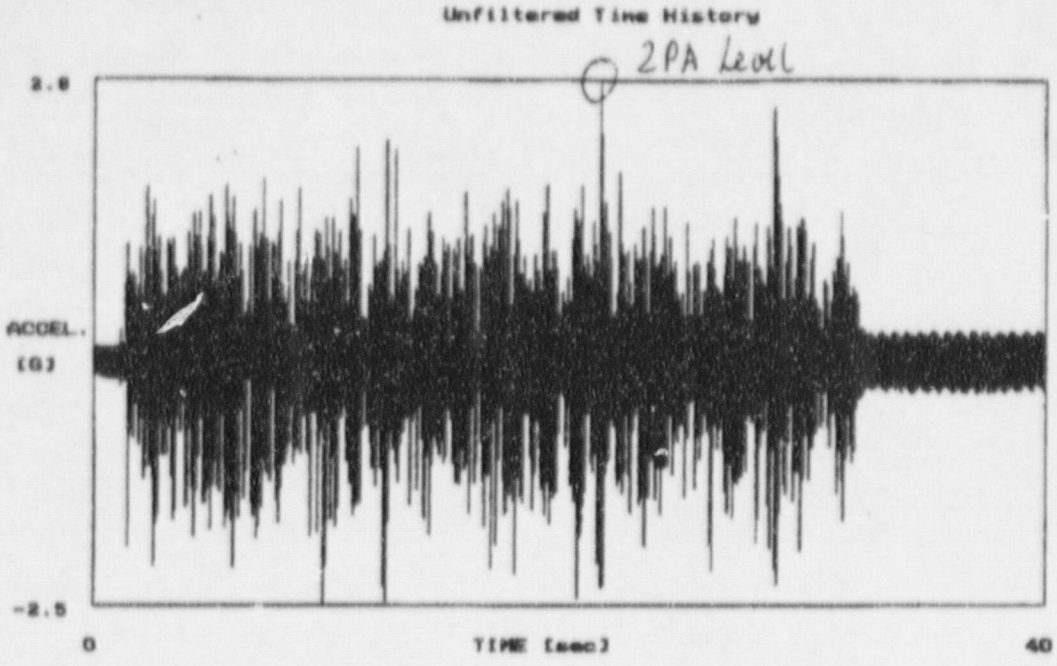


FIGURE 23: HORIZONTAL CONTROL ACCELEROMETER TIME HISTORY, TEST ORIENTATION A, OBE EVENT NO. 5



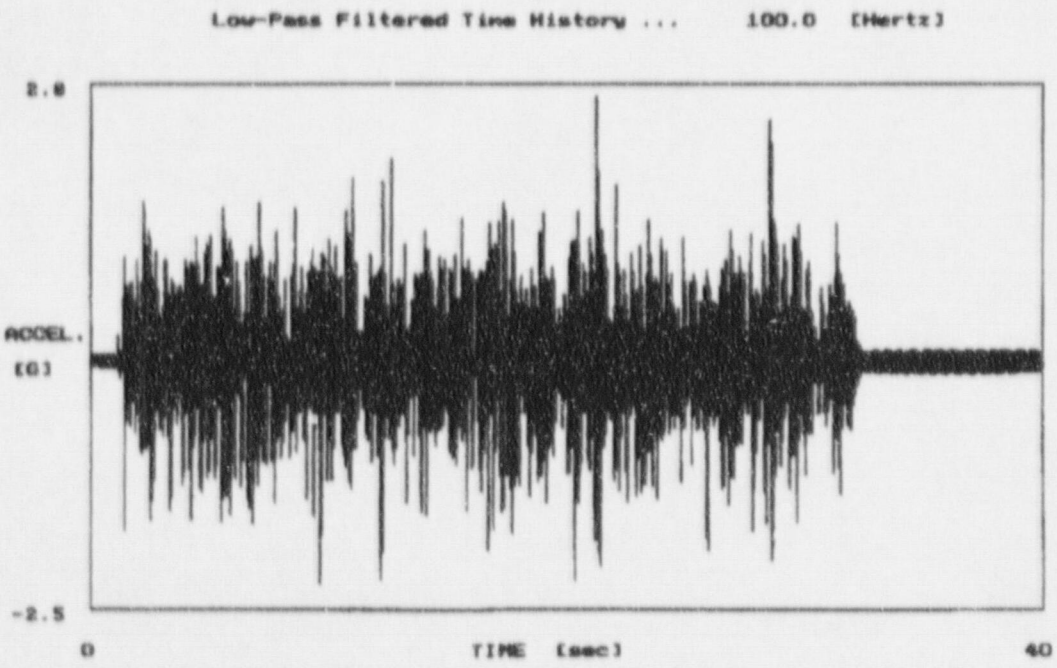


FIGURE 24: VERTICAL CONTROL ACCELEROMETER TIME HISTORY, TEST ORIENTATION A, OBE EVENT NO. 5

Analysis Code: SRSKHH Version 1

DATA FILE c:\ql\mr.ob5h.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G
1.00	0.9
1.12	1.15
1.26	1.70
1.41	2.09
1.59	2.40
1.78	3.05
2.00	3.85
2.24	4.52
2.52	5.49
2.83	7.15
3.17	8.08
3.56	8.89
4.00	7.88
4.49	8.08
5.04	8.08
5.66	8.11
6.35	8.45
7.13	10.23
8.00	10.43
8.98	8.81
10.08	8.09
11.31	9.88
12.70	8.83
14.25	8.82
16.00	9.56
17.96	10.48
20.16	10.27
22.63	15.29
25.40	20.69
28.51	14.36
32.00	8.05
35.92	5.04
40.32	3.68
45.25	4.32
50.80	3.53
57.02	4.17
64.00	3.50
71.84	3.80
80.63	3.60
90.51	3.01

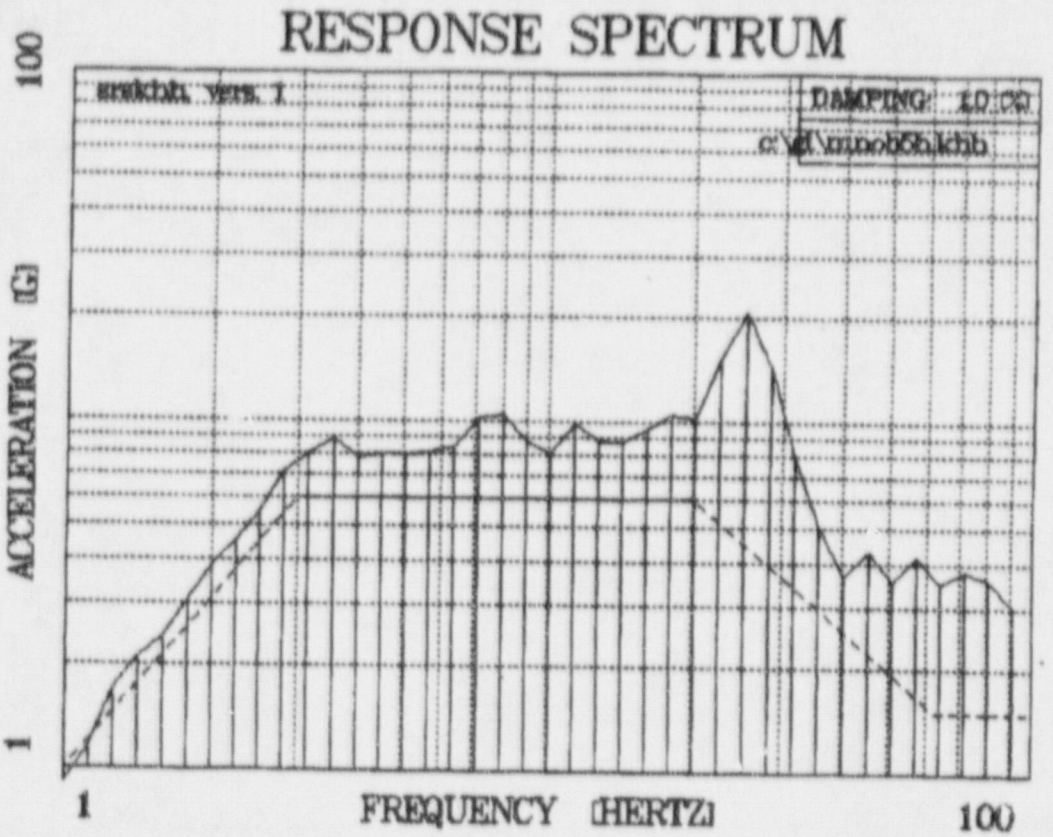


FIGURE 25: HORIZONTAL CONTROL ACCELEROMETER TRS & RRS, TEST ORIENTATION A, OBE EVENT NO. 5

Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnob5v.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.07
1.12	1.25
1.26	1.83
1.41	2.62
1.59	2.71
1.78	3.20
2.00	3.95
2.24	4.37
2.52	5.30
2.83	6.78
3.17	7.76
3.56	8.13
4.00	7.95
4.49	8.14
5.04	8.34
5.66	7.66
6.35	8.54
7.13	10.41
8.00	9.23
8.98	7.79
10.08	7.95
11.31	9.62
12.70	8.89
14.25	9.56
16.00	9.13
17.96	9.83
20.16	10.33
22.63	14.41
25.40	20.11
28.51	13.70
32.00	9.29
35.92	5.36
40.32	4.38
45.25	4.49
50.80	4.13
57.02	4.16
64.00	4.80
71.84	4.36
80.63	3.81
90.51	3.04

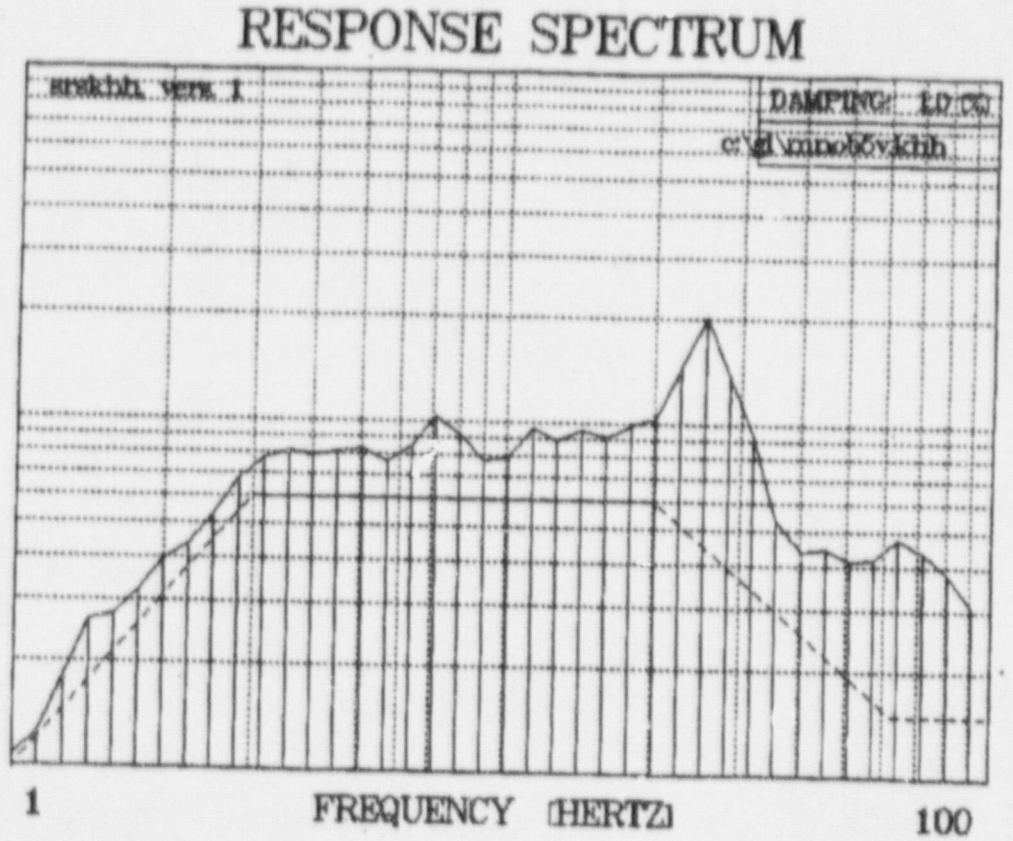
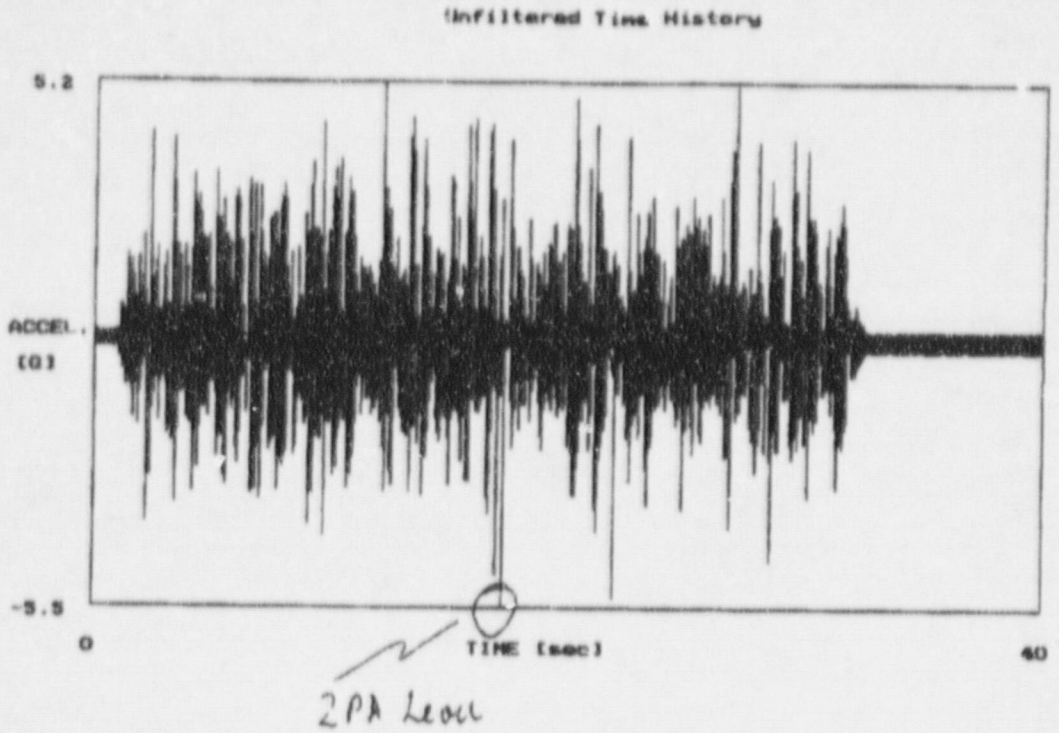


FIGURE 26: VERTICAL CONTROL ACCELEROMETER TRS & RRS, TEST ORIENTATION A, OBE EVENT NO. 5



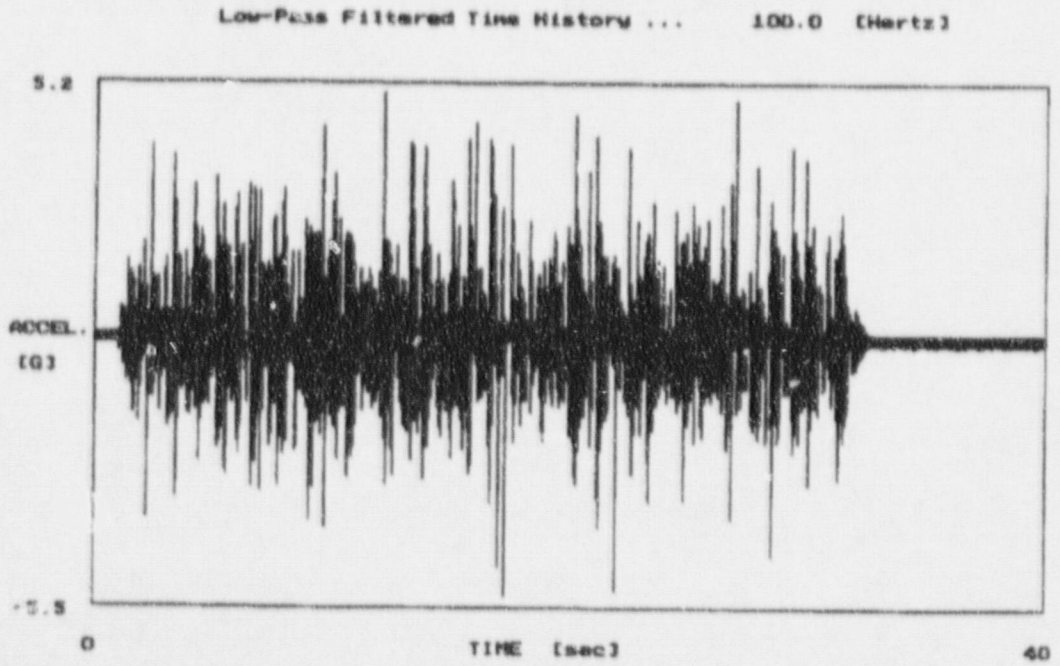
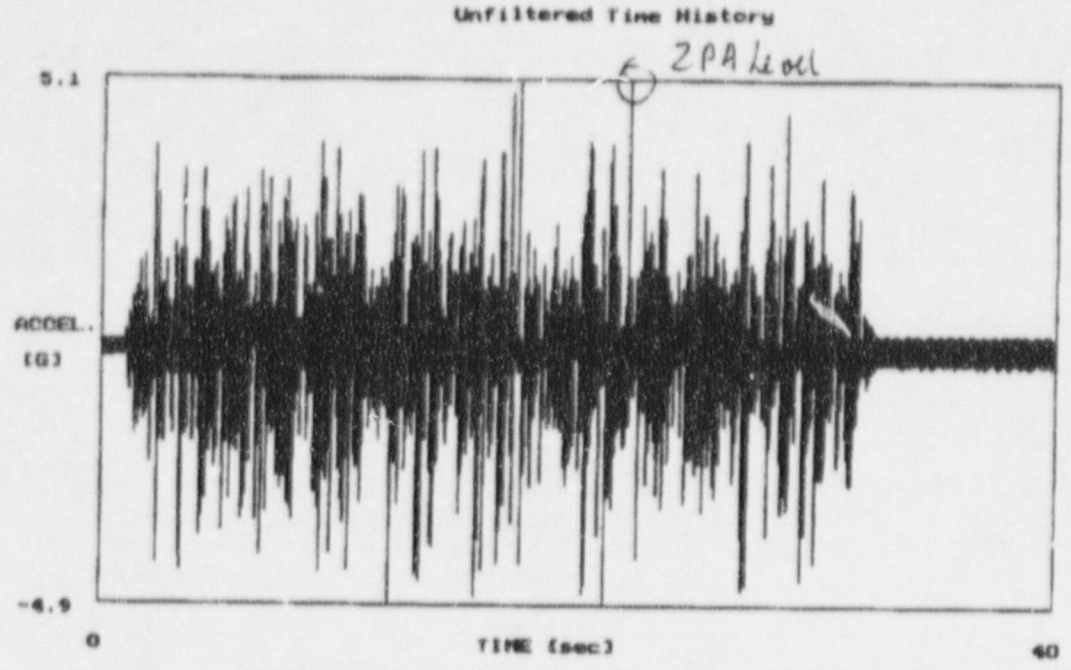


FIGURE 27: HORIZONTAL CONTROL ACCELEROMETER TIME HISTORY, TEST ORIENTATION A, SSE EVENT



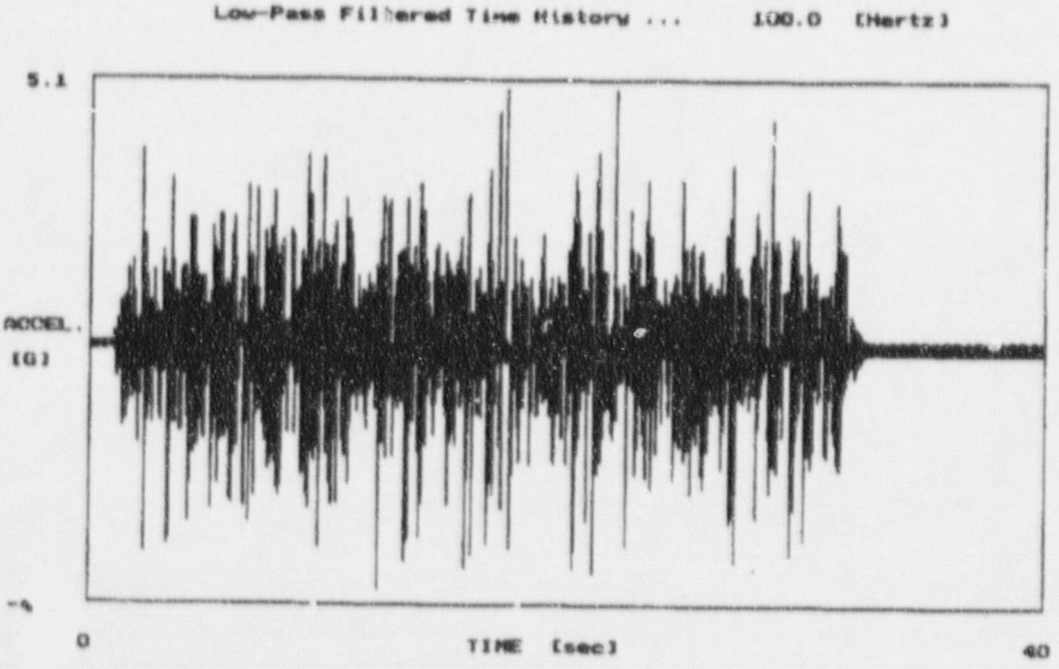


FIGURE 28: VERTICAL CONTROL ACCELEROMETER TIME HISTORY, TEST ORIENTATION A, SSE EVENT

Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssih.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.22
1.12	2.57
1.26	3.93
1.41	4.47
1.59	4.65
1.78	6.06
2.00	7.47
2.24	8.08
2.52	10.93
2.83	12.95
3.17	13.29
3.56	16.50
4.00	13.70
4.49	13.94
5.04	14.62
5.66	15.18
6.35	13.66
7.13	14.73
8.00	17.76
8.98	15.83
10.08	15.41
11.31	15.26
12.70	19.52
14.25	17.00
16.00	16.41
17.96	17.73
20.16	23.65
22.63	31.77
25.40	35.31
28.51	21.23
32.00	14.08
35.92	11.02
40.32	11.82
45.25	8.84
50.80	10.40
57.02	8.47
64.00	7.72
71.84	7.96
80.63	7.01
90.51	7.54

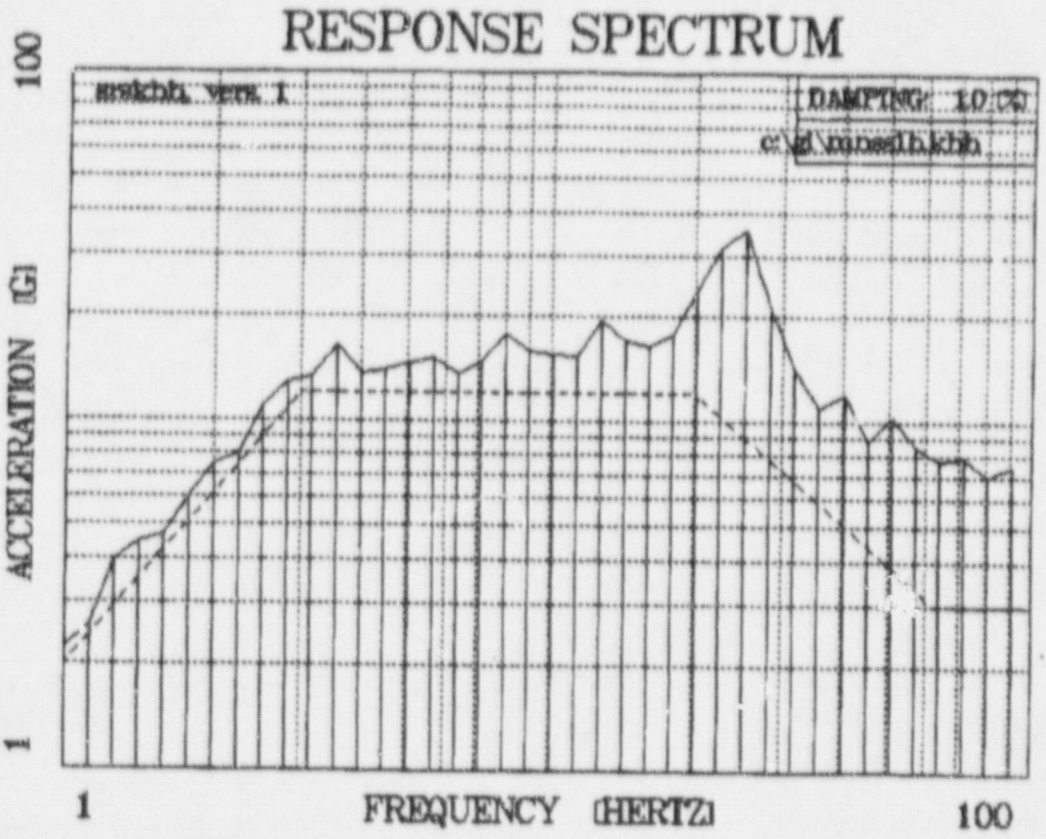


FIGURE 29: HORIZONTAL CONTROL ACCELEROMETER TRS & RRS, TEST ORIENTATION A, SSE EVENT

Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnss1v.khh DAMPING 7.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.95
1.12	2.56
1.26	3.58
1.41	5.30
1.59	5.06
1.78	6.41
2.00	7.31
2.24	8.02
2.52	10.71
2.83	12.43
3.17	13.47
3.56	17.18
4.00	13.94
4.49	14.55
5.04	13.67
5.66	14.92
6.35	13.74
7.13	15.40
8.00	17.34
8.98	17.00
10.08	14.97
11.31	15.27
12.70	19.96
14.25	15.95
16.00	16.35
17.96	18.07
20.16	21.81
22.63	29.16
25.40	34.29
28.51	20.82
32.00	15.11
35.92	10.72
40.32	10.12
45.25	10.71
50.80	10.10
57.02	8.54
64.00	7.56
71.84	7.39
80.63	6.62
90.51	6.11

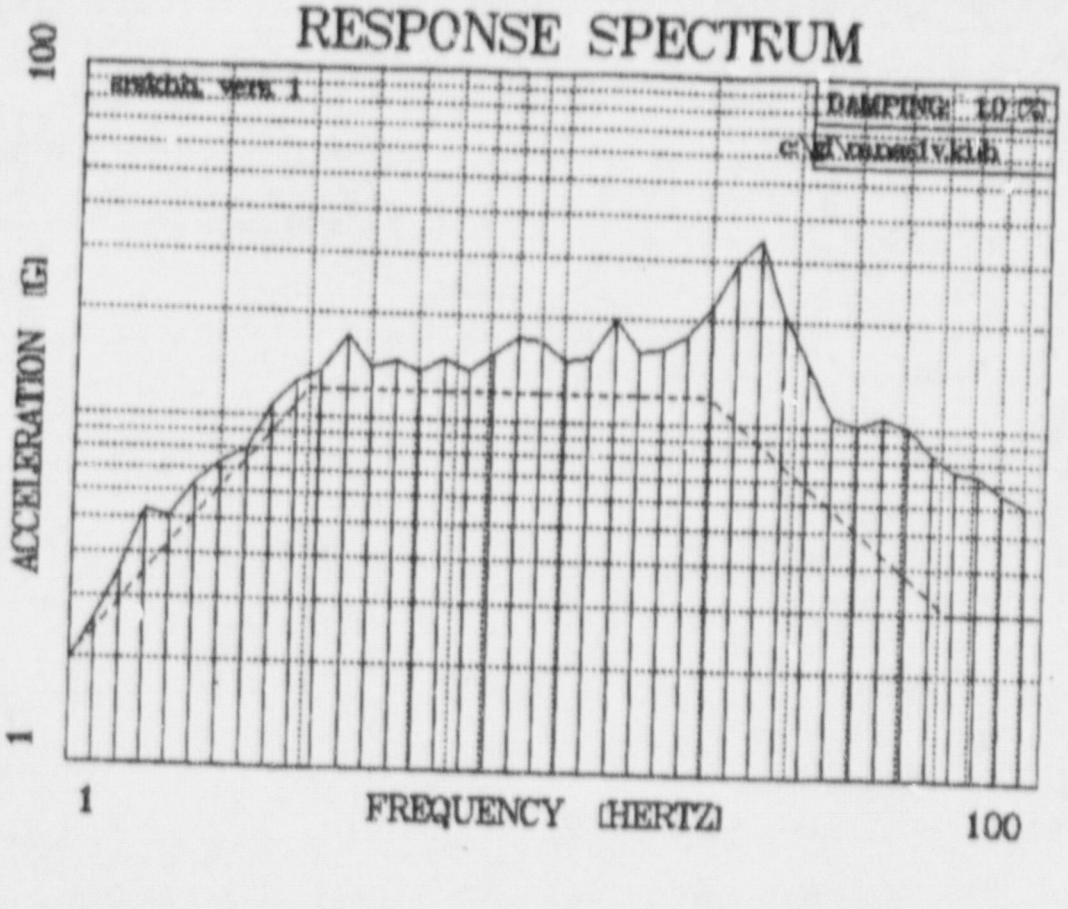


FIGURE 30: VERTICAL CONTROL ACCELEROMETER TRS & RRS, TEST ORIENTATION A, SSE EVENT

APPENDIX A

DATA SHEETS AND LOG SHEETS

DATA SHEET SINE SWEEP TEST

TEST ID. SCNUA2

DATE 6-12-97

TEST DESCRIPTION SONGS MSIV CLAMP

ENGINEER [illegible]

TECHNICAN G.A.G.

RUN NO.	DIGITAL VIBRATION CONTROL SYSTEM CHANNEL A	B	C	D	CHARGE AMPLIFIER A	B	C	D	ACCEL. SENSITIVITY A	B	C	D	COMMENTS
1	H.C	V.C.	H.R.	V.R.	EL695	EL694	EL942	EL1847	100	985	7515	7550	HOT LEG CLAMP + SEALS
2	"	"	"	"									SIDE PADS R+D W/CLAMP + SEAL
3	"	"	"	"			Nozzle H.R	Valve V.R			Nozzle Valve H.R	Nozzle Valve V.R	BOTTOM MSIV (A) W/CLAMP SEAL, UNCLAMP
4	"	"	H.R	H.R			Nozzle H.R	Plate V.R			Nozzle H.R	Plate V.R	N.G.
5	"	"	"	"			"	"			"	"	N.G.
6	"	"	"	"			Nozzle H.R	Plate V.R			"	"	Bottom MSIV A w/clamp Suppressed, Orientation A
7	"	"	"	"			"	"			"	"	(D)
8	"	"	H.R	V.R			Pass H.R	Pass V.R			Pass H.R	Pass V.R	
9	"	"											

AMPLIFIER NO.	CONTROL HORIZONTAL	CONTROL VERTICAL	1	2	3	4	5	6	13	14	15	16	17
FULL SCALE RANGE SETTING	1/3	1/3								10/5	10/5		

TAPE DATA LOG SHEET

TEST SONGS MANSA CLAMPS
DATE 6-14-97
TECHNICAN G.A. WILLIAMS
ENGINEER K.W. HUSLINGER

LOG SHEET NO. 1
HOOKUP SHEET NO. N/A
RECORD SPEED 3 3/4
RECORD BAND WB

REEL NO.	RUN NO.	FOOTAGE	ATTENUATOR - AMPLIFIER SETTING 1	2	3	4	5	6	7	COMMENTS
S9-36	10	236	HF 10	V.C. 10					TRIG 10	OBE 1 HH LAG & SIDE PLATE RTD'S
	11	266								OBE 2
	12	277								OBE 3
	13	295								OBE 4
	14	316								OBE 5
	15	328								SSE 1
	16	347			~~HF~~					BOTTOM MNSA, ORIEN A OBE 1
	17	358								BOTTOM MNSA ORIEN A OBE 2
	18	376								BOTTOM MNSA ORIEN A OBE 3
	19	392								BOTTOM MNSA OBE 4 ORIEN A
	20	409								BOTTOM MNSA OBE 5 ORIEN A
	21	425								BOTTOM MNSA SSE 1 ORIEN A
	22	442								BOTTOM MNSA OBE 1 ORIEN B
	23	460								BOTTOM MNSA OBE 2 ORIEN B
	24	476	"	"					"	BOTTOM MNSA OBE 3 ORIEN B

TAPE DATA LOG SHEET

TEST 50-65 MNSA CHANNEL

DATE 6-16-97

TECHNICIAN G.D WILLIAMS

ENGINEER K.H. HASENKRA

LOG SHEET NO. 2

HOOKUP SHEET NO. N/A

RECORD SPEED 3 3/4

RECORD BAND WB

REEL NO.	RUN NO.	FOOTAGE	ATTENUATOR - AMPLIFIER SETTING 1	2	3	4	5	6	7	COMMENTS
50-30	25	492	H.F. 10V	V.C. 10V					TRIG 10V	BOTTOM MNSA OBE 4 ORIEN B
	26	510								BOTTOM MNSA OBE 5 ORIEN B
	27	529								BOTTOM MNSA SSE 1 ORIEN B
	28	545								BOTTOM MNSA OBE 1 ORIEN C
	29	562								BOTTOM MNSA OBE 2 ORIEN C
	30	580								BOTTOM MNSA OBE 3 ORIEN C
	31	598								BOTTOM MNSA OBE 4 ORIEN C
	32	616								BOTTOM MNSA OBE 5 ORIEN C
	33	632								BOTTOM MNSA SSE 1 ORIEN C
	34	648								BOTTOM MNSA OBE 1 ORIEN D
	35	664								BOTTOM MNSA OBE 2 ORIEN D
	36	680								BOTTOM MNSA OBE 3 ORIEN D
	37	696								BOTTOM MNSA OBE 4 ORIEN D
	38	714								BOTTOM MNSA OBE 5 ORIEN D
	39	732	↓	↓					↓	BOTTOM MNSA SSE 1 ORIEN P

DATA SHEET 3

NOZZLE PRESSURE TEST OBSERVATIONS

Date: 6-17-97 Observation: 82.4

Reviewed By: [signature] Test Nozzle: SIDE PRESS. RED

	Nozzle Test Pressure		
	Prior to Event	Following Event	Comment
Orientation A			
OBE1	3150	3150	PRESSURE GAGE IP. CL 1.42
OBE2	3125	3125	
OBE3	3100	3100	
OBE4	3160	3150	
OBE5	3150	3150	
SSE1	3200	3200	
Orientation B			
OBE1			
OBE2			
OBE3			
OBE4			
OBE5		Due to Axis Symmetry,	
SSE1		Testing Limited to one Orientation	
Orientation C			
OBE1			
OBE2			
OBE3			
OBE4			
OBE5			
SSE1			
Orientation D			
OBE1			
OBE2			
OBE3			
OBE4			
OBE5			
SSE1			

DATA SHEET 3

NOZZLE PRESSURE TEST OBSERVATIONS

Date: 6-14-93 Observation: G.D.W.

Reviewed By: L. A. Hurley Test Nozzle: Hot Leg RTD

	Nozzle Test Pressure		
	Prior to Event	Following Event	Comment
Orientation A			
OBE1	3,200	3,200	PRESSURE GAGE AT EL 141
OBE2	3,200	3,200	
OBE3	3,175	3,175	
OBE4	3,175	3,175	
OBE5	3,175	3,175	
SSE1	3,200	3,190	
Orientation B			
OBE1			
OBE2			
OBE3			
OBE4			
OBE5			
		Due to Axis Symmetry	
SSE1			
Orientation C		Testing Limited to one Orientation	
OBE1			
OBE2			
OBE3			
OBE4			
OBE5			
SSE1			
Orientation D			
OBE1			
OBE2			
OBE3			
OBE4			
OBE5			
SSE1			

DATA SHEET 3

NOZZLE PRESSURE TEST OBSERVATIONS

Date: 6-14-97 Observation: GAUA

Reviewed By: H. H. Hostinger Test Nozzle: BOTTOM PASS RTD Instrumentation Nozzle

	Nozzle Test Pressure		
	Prior to Event	Following Event	Comment
Orientation A			
OBE1	3,200	3,200	PRESSURE GAGE CL 1%
OBE2	3,200	3,200	
OBE3	3,200	3,200	
OBE4	3,200	3,200	
OBE5	3,175	3,175	
SSE1	3,175	3,150	
Orientation B			
OBE1	3,225	3,225	
OBE2	3,200	3,200	
OBE3	3,200	3,200	
OBE4	3,175	3,175	
OBE5	3,175	3,175	
SSE1	3,250	3,250	
Orientation C			
OBE1	3,250	3,250	
OBE2	3,200	3,200	
OBE3	3,200	3,200	
OBE4	3,200	3,200	
OBE5	3,200	3,200	
SSE1	3,200	3,200	
Orientation D			
OBE1	3,175	3,175	
OBE2	3,200	3,200	
OBE3	3,200	3,175	
OBE4	3,200	3,200	
OBE5	3,175	3,175	
SSE1	3,175	3,175	

DATA SHEET SINE SWEEP TEST

TEST ID. SINAN1

DATE 6-17-97

TEST DESCRIPTION BOTTOM PLATE

ENGINEER B.N. HARRINGTON

TECHNICAN G.D. WILLIAMS

RUN NO.	DIGITAL VIBRATION CONTROL SYSTEM CHANNEL A	B	C	D	CHARGE AMPLIFIER A	B	C	D	ACCEL. SENSITIVITY A	B	C	D	COMMENTS
1	H.C.	V.C.	H.R. MASS	V.R. MASS	E.658	E.694	E.992	E.1184	100.	98.5	96.15	95.3	BOTTOM PLATE WELDED SEAL 1" to UNDERSIDE (A) MASS
2	"	"	H.R. NOZZLE	H.R. PLATE	↓	↓	↓	↓	↓	↓	↓	↓	" (B) UNDER PLATE
3	"	"	H.R. MASS	V.R. MASS									N.G (A) MASS
4	"	"	"	"									N.G.
5	"	"	"	"									N.G.
6	"	"	"	"									GOOD RUN (A) MASS
7	"	"	H.R. NOZZLE	H.R. PLATE									(A) UNDER PLATE
8	"	"											
9	"	"											

AMPLIFIER NO.	CONTROL HORIZONTAL	CONTROL VERTICAL	1	2	3	4	5	6	13	14	15	16	17
FULL SCALE RANGE SETTING	1	1								30	30		

TAPE DATA LOG SHEET

TEST Songs Bottom mnSA

DATE 6-17-97

TECHNICAN G.V. Williams

ENGINEER Karl H Hastings

LOG SHEET NO. 1

HOOKUP SHEET NO. N/A

RECORD SPEED 3 3/4

RECORD BAND WB

REEL NO.	RUN NO.	FOOTAGE	ATTENUATOR - AMPLIFIER SETTING 1	2	3	4	5	6	7	COMMENTS
50-30	40	752	H.C.	V.C					TRG	Bottom mnSA ORIEN D OBG1 NOT SUPPORTED
	41	768	〃	〃					〃	Bottom mnSA NOT SUPPORTED OBR 2 ORIEN D
	42	784	〃	〃					〃	Bottom mnSA NOT SUPPORTED OBR 3 ORIEN D
	43	800	〃	〃					〃	Bottom mnSA NOT SUPPORTED OBG 4 ORIEN D
	44	816	〃	〃					〃	OBG 5 ORIEN D
	45	832	〃	〃					〃	OBE 1 ORIEN A
	46	849	〃	〃					〃	OBE 2 ORIEN A
	47	866	〃	〃					〃	OBE 3 ORIEN A
	48	882	〃	〃					〃	OBE 4 ORIEN A
	49	898	〃	〃					〃	OBE 5 ORIEN A
	50	914	〃	〃					〃	OBR 1 ORIEN B
	51	930	〃	〃					〃	OBR 2 ORIEN B
	52	946	〃	〃					〃	OBR 3 ORIEN B
	53	962	〃	〃					〃	OBG 4 ORIEN B
	54	979	〃	〃					〃	OBR 5 ORIEN B

TAPE DATA LOG SHEET

TEST SONGS BITTER DNSA

DATE 6-18-97

TECHNICAL G.D. WILLIAMS

ENGINEER K.H. HASLINGER

LOG SHEET NO. 2

HOOKUP SHEET NO. N/A

RECORD SPEED 3 3/4

RECORD BAND WB

REEL NO.	RUN NO.	FOOTAGE	ATTENUATOR - AMPLIFIER SETTING 1	2	3	4	5	6	7	COMMENTS
50-30	55	995	HC	VC					TAC	BITTER DNSA UNSUPPRESSED OBE 1 ORIEN C
	56	1010	(	)						OBE 2 ORIEN C
	57	1026	/	/						OBE 3 ORIEN C
	58	1042	/	/						OBE 4 ORIEN C
	59	1060	/	/						OBE 5 ORIEN C
	60	1076	/	/						SSE 1 ORIEN C
	61	1093	/	/						SSE 1 ORIEN D
	62	1109	/	/						SSE 1 ORIEN A
	63	1125	/	/						SSE 1 ORIEN B
	64	1142	"	"						

DATA SHEET 3

NOZZLE PRESSURE TEST OBSERVATIONS

Date: 6-18-97

Reviewed By: Karl H. Hastings

Observation: G. D. WILLIAMS

Test Nozzle: BOTTOM MNSA UNSUPPORTED

	Nozzle Test Pressure		
	Prior to Event	Following Event	Comment
Orientation A			
OBE1	3,200	3,200	PRESSURE GAGE CL 1641
OBE2	3,175	3,175	MNSA NOT SUPPORTED
OBE3	3,200	3,200	
OBE4	3,200	3,200	
OBE5	3,175	3,175	
SSE1	3,200	3,150	NO VISIBLE SIGN OF LEAKAGE?
Orientation B			
OBE1	3,200	3,200	
OBE2	3,175	3,175	
OBE3	3,175	3,175	
OBE4	3,175	3,175	
OBE5	3,175	3,150	* small drop during count (air??)
SSE1	3,200	3,175	held pressure after 1 min.
Orientation C			
OBE1	3,225	3,200	
OBE2	3,200	3,200	
OBE3	3,200	3,200	
OBE4	3,200	3,200	
OBE5	3,200	3,175	
SSE1	3,200	3,175	
Orientation D			
OBE1	3,200	3,200	
OBE2	3,200	3,200	
OBE3	3,200	3,200	
OBE4	3,200	3,200	
OBE5	3,200	3,200	
SSE1	3,175	3,150	

APPENDIX B

1 VOLT PEAK SIGNAL CALIBRATION CHECK

OFF-LINE ANALYSIS SYSTEM

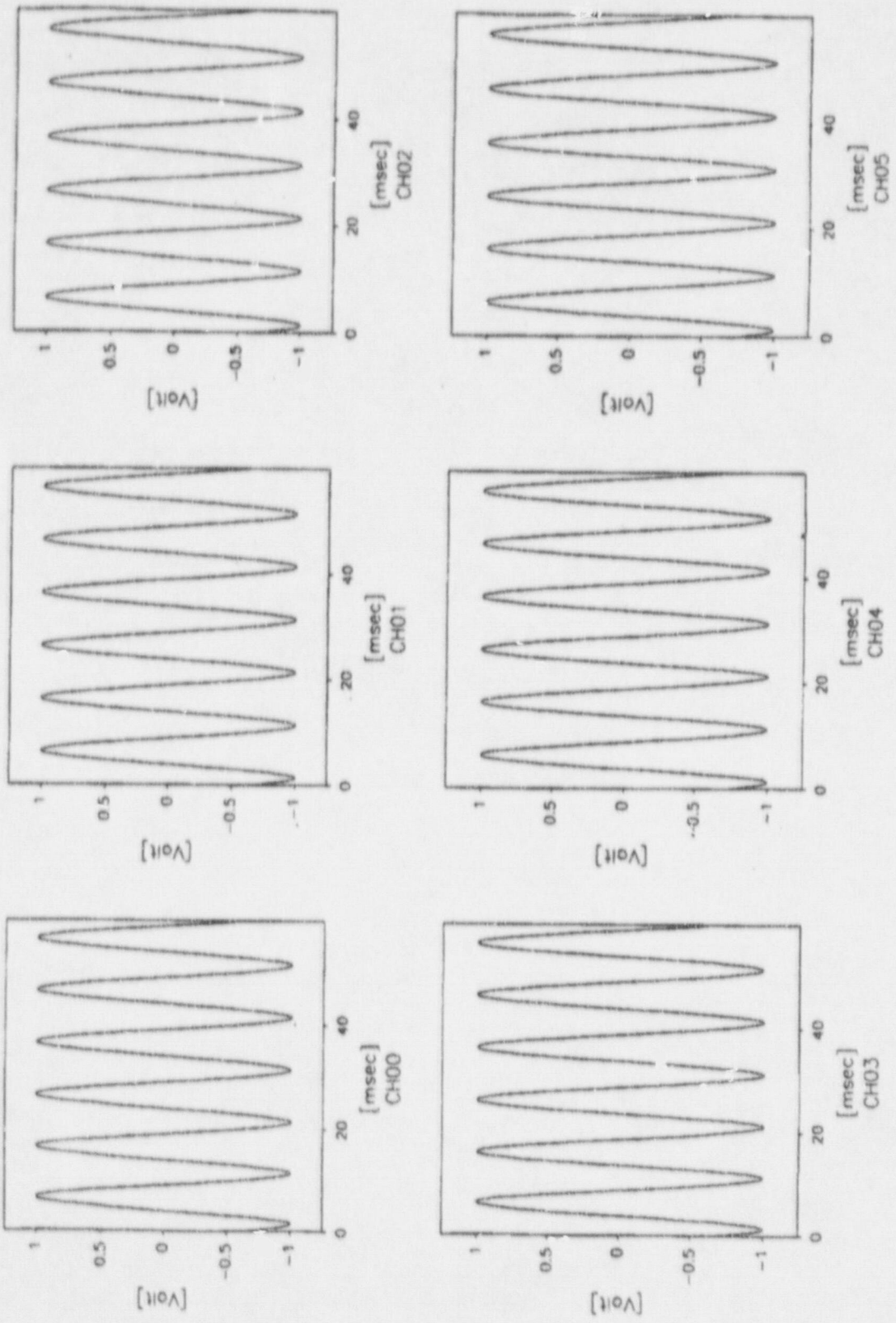
Page B2, As recorded by Data Acquisition System for Each of Six (6) Channels,

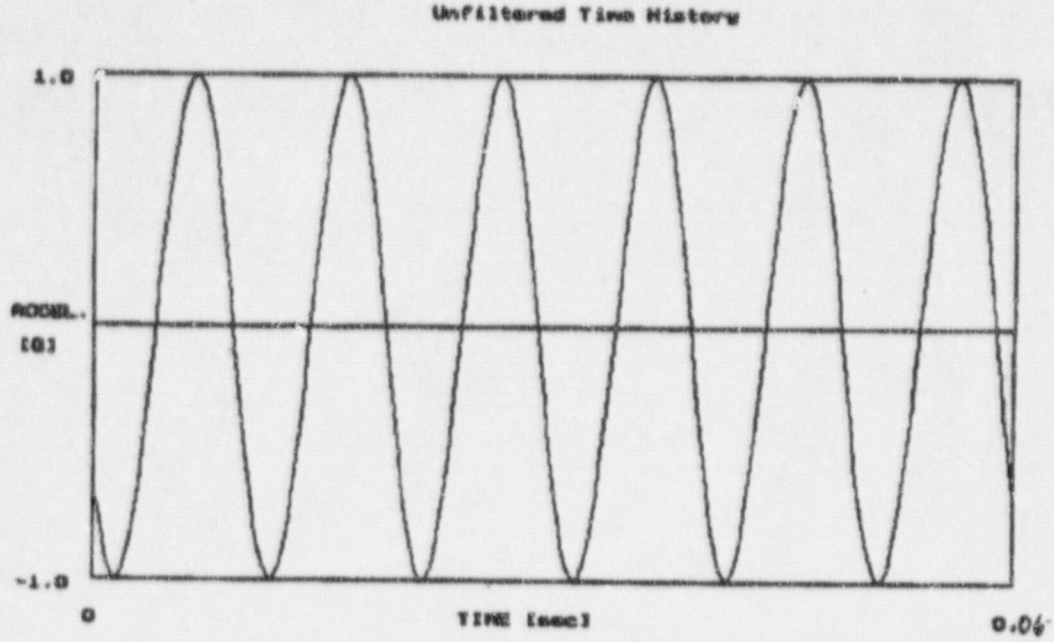
Page B3, As Registered by the Off-Line Analysis Program SRSKHH for Single Channel

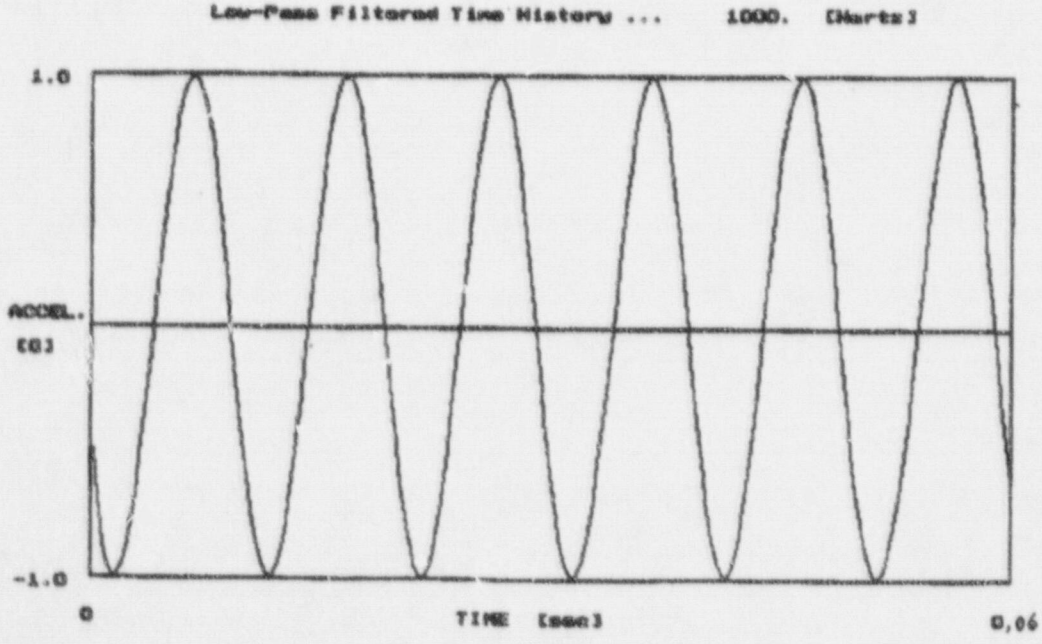
Note:

Calibration Check Consisted of Passing Nominal 100 Hertz Signal (+/- 1 Volt Peak) into PC based Data Acquisition System, Digitizing at Sample Rate of 5000 (each Channel), Display of Portions of Sampled Data by Data Acquisition System, and Finally Display of Portions of Sampled Data by Time History Display Section of Response Spectrum Analysis Code SRSKHH.

Calibration Performed May 14, 1997.


[Volt]
1
0.5
0
-0.5
-1
0
20
40
[msec]
CH02
CH05
CH01
CH04
CH00
CH03


Unfiltered Time History
1.0
ACCEL.
[G]
-1.0
0
TIME [sec]
0.06


Low-Pass Filtered Time History ... 1000. [Hertz]
1.0
ACCEL.
[G]
-1.0
0
TIME [sec]
0.06

APPENDIX C

CALIBRATION RECORDS

ABB
CALIBRATION LABORATORY

NON-PERMANENT QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Digital Multimeter
Manufacturer: Fluke (8050A)
Range: Multi Accuracy: Std Mfg Spec.
Mfg. Serial No.: 6168012
C-E ID No.: N/A

Calibration Date: 12-18-96
Calibration Due Date: 12-18-97 *
Calibration Document:
[ ] Procedure _____ Rev. ___
[X] Manufacturer's Specifications TMS-188/1984

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Fluke 5506A	CL-2006		
Fluke 5100B	IL-565		

NIST # 811/254790, 811/254993-95

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
Table 4-5 dB Voltage Test			
Steps	Display		
1	-81	Same	
2	-37.77		
3	-37.76		
4	+2.23		
Table 4-6 Current Test			
Steps	Display		
1	190.14	Same	
2	1.9013		
3	18.984		
4	189.80		
5	1859.7		
A/C	18.979		

Standard Value	As Found	As Left	Out of Tol.
Table 4-7 Resistance Test			
Steps	Display		
1	00.01	Same	
2	100.12		
3	.9997		
4	10.001		
5	100.00		
6	1000.2		
7	10.007		
8	1.0000		
9	99.93		

THIS CALIBRATION WAS PERFORMED IN ACCORDANCE WITH PROCEDURE #00000-EES-208-00
CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED.

REMARKS: A * one year cal. cycle per request

[X] ACCEPTED [ ] REJECTED

CALIBRATED BY: _____
Electronics and Electrical Systems

TEMPERATURE 71° F
HUMIDITY 53 %

Page 1 of 2

ABB CALIBRATION LABORATORY

NON-PERMANENT
QUALITY RECORD
CERTIFICATE OF CALIBRATION

Instrument Type: Pressure Gauge
Manufacturer: U.S. Gauge
Range: 0-30000 psi Accuracy: ±0.25%
Mfg. Serial No.: N/A
C-E ID No.: C.L. 1041
Calibration Date: 5-15-97
Calibration Due Date: 11-15-97
Calibration Document:
(X) Procedure QAP-CAL-013 Rev. 00
( ) Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
MTG DWT	11-90H		

NIST# 822/249620

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.	Standard Value	As Found	As Left	Out of Tol.
psi	psi						
0	0	Same					
10000	10000						
20000	20000						
30000	29900						
40000	39900						
50000	49900						
30000	30000						
10000	10000						
0	0						

THIS CALIBRATION WAS PERFORMED BY ACCORDANCE WITH PROCEDURE QAP-CAL-013

CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED

REMARKS: A

(X) ACCEPTED ( ) REJECTED

CALIBRATED BY: [signature]
Electronic and Electrical Section

TEMPERATURE 72°F
HUMIDITY 50%

ABB CALIBRATION LABORATORY

NON-PERMANENT
QUALITY RECORD
CERTIFICATE OF CALIBRATION

Instrument Type: Pressure Gauge
Manufacturer: U.S. Gauge
Range: 0-30000 psi Accuracy: ±0.25%
Mfg. Serial No.: N/A
C-E ID No.: C.L. 1041
Calibration Date: 5-15-97
Calibration Due Date: 11-15-97
Calibration Document:
(X) Procedure QAP-CAL-013 Rev. 00
( ) Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
MTG DWT	11-90H		

NIST# 822/249620

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.	Standard Value	As Found	As Left	Out of Tol.
psi	psi						
0	0	Same					
10000	10000						
20000	20000						
30000	29975						
40000	39990						
50000	49990						
30000	29975						
10000	10000						
0	0						

THIS CALIBRATION WAS PERFORMED BY ACCORDANCE WITH PROCEDURE QAP-CAL-013

CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED

REMARKS: A

(X) ACCEPTED ( ) REJECTED

CALIBRATED BY: [signature]
Electronic and Electrical Section

TEMPERATURE 72°F
HUMIDITY 50%

ABB CALIBRATION LABORATORY

NON-PERMANENT
QUALITY RECORD
CERTIFICATE OF CALIBRATION

Instrument Type: Pressure Gauge
Manufacturer: U.S. Gauge
Range: 0-30000 psi Accuracy: ±0.25%
Mfg. Serial No.: N/A
C-E ID No.: C.L. 1041
Calibration Date: 5-15-97
Calibration Due Date: 11-15-97
Calibration Document:
(X) Procedure QAP-CAL-013 Rev. 00
( ) Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
MTG DWT	11-90H		

NIST# 822/249620

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.	Standard Value	As Found	As Left	Out of Tol.
psi	psi						
0	0	Same					
10000	10000						
20000	20000						
30000	30000						
40000	40000						
50000	50000						
30000	30000						
10000	10000						
0	0						

THIS CALIBRATION WAS PERFORMED BY ACCORDANCE WITH PROCEDURE QAP-CAL-013

CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED

REMARKS: A

(X) ACCEPTED ( ) REJECTED

CALIBRATED BY: [signature]
Electronic and Electrical Section

TEMPERATURE 72°F
HUMIDITY 50%

ABB
CALIBRATION LABORATORY

NON-PERMANENT QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Signal Conditioner — Calibration Date: 4-28-97
Manufacturer: Hewlett-Dickis — Calibration Due Date: 10-28-97
Range: Multi — Accuracy: ±2%
Calibration Document:
Mfg. Serial No.: 145
[ ] Procedure _____ Rev. ___
C-E ID No.: EL-694
[X] Manufacturer's Specifications TMS-00Y

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Fluke	CL-2085		
Fluke	CL-2084		

NIST # 521/240585, 251971, 521/2420-97, 728/245850, 2KC98

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
Full Scale Calibration			
Input @ 50 Hz Tape Out			
707 mVrms	7.0657 Vrms		
Frequency Response			
50 Hz	7.0704		
100	7.0786		
200	7.0824		
300	7.0824		
500	7.0824		

Standard Value	As Found	As Left	Out of Tol.
Gain	Reference		
Input 707 mV @ 50 Hz			
Tape Dial	Tape Out		
10.00	7.0711		
8.00	5.6543		
6.00	4.2384		
4.00	2.8235		
2.00	1.4147		
Freq Response Tape Dial @ 10.00			
50 Hz	7.0697		
100	7.0784		
200	7.0814		
300	7.0854		
500	7.0814		

THIS CALIBRATION WAS PERFORMED IN ACCORDANCE WITH PROCEDURE #00000-EES-206-00
CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED.

REMARKS: A

[X] ACCEPTED [ ] REJECTED

CALIBRATED BY: _____
Electronics and Electrical Systems

TEMPERATURE 70°F
HUMIDITY 46%

ABB
CALIBRATION LABORATORY

NON-PERMANENT QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Signal Conditioner
Manufacturer: Unholtz-Dickie
Range: Multi Accuracy: ±2%
Mfg. Serial No.: 146
C-E ID No.: EL-695

Calibration Date: 4-28-97
Calibration Due Date: 10-28-97
Calibration Document:
[ ] Procedure _____ Rev. ___
[X] Manufacturer's Specifications TMS-008

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Fluke	CL-2085		
Fluke	CL-2084		

NIST #521/240585, 251971, 521/242677, 728/245550, 246498

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
Full Scale Calibration			
Input @ 50 Hz	Tape Out		
70.7 mVrms	7.0699 Vrms		
Frequency Response			
50 Hz	7.0698		
100	7.0778		
200	7.0814		
300	7.0855		
500	7.0725		

Standard Value	As Found	As Left	Out of Tol.
Strain Accuracy			
Input 70.7 mV @ 50 Hz			
Tape Dial	Tape Out		
10.00	7.0696		
8.00	5.6602		
6.00	4.2453		
4.00	2.8310		
2.00	1.4161		
Frequency Response	Tape Dial @ 10.00		
50 Hz	7.0721		
100	7.0801		
200	7.0836		
300	7.0876		
500	7.0747		

THIS CALIBRATION WAS PERFORMED IN ACCORDANCE WITH PROCEDURE #00000-EES-208-00
CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED

REMARKS: A

[X] ACCEPTED [ ] REJECTED

CALIBRATED BY: _____
Electronic and Electrical Systems

TEMPERATURE 70°F
HUMIDITY 46%

Page 1 of 1

ABB
CALIBRATION LABORATORY

NON-PERMANENT QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Signal Cond./Accel
Manufacturer: Unholtz-Dickie
Range: Multi Accuracy: ±5%
Mfg. Serial No.: 146 / 492
C-E ID No.: EL-695 / EL-696

Calibration Date: 4-29-97
Calibration Due Date: 10-29-97
Calibration Document:
( ) Procedure _____ Rev. ___
( ) Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Philips	CL-2077		
Fluke	CL-2084		
Columbia	CL-2083		

NIST 821/240585, 251971, 821/242371, 725/245750, 246495, 821/252109

CALIBRATION RESULTS

Standard Value	~~As Found~~	As Left	Out of Tol.
Standard Value			
Freq.	g Level		
50 Hz	1		
100	1		
100	10		

~~Standard Value~~	As Found	~~As Left~~	Out of Tol.
Test Values			
Range	Dial	Tape Out	
1	100	2.0706	
1	100	2.0734	
10	100.5	2.0713	

THIS CALIBRATION WAS PERFORMED IN ACCORDANCE WITH PROCEDURE #00000-EES-208-00
CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED

REMARKS: A Chg Sens @ 50 Hz · 100 mV/g

[X] ACCEPTED [ ] REJECTED

CALIBRATED BY: [signature]
Electronic and Electrical Systems

TEMPERATURE 70 °F
HUMIDITY 46 %

Page 1 of 1

ABB
CALIBRATION LABORATORY

NON-PERMANENT QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Signal Cond./Recd.
Manufacturer: Yokogawa-Dickie
Range: Multi Accuracy: ±.5%F/S
Mfg. Serial No.: 145 / 494
C-E ID No.: EL-694 / EL-698

Calibration Date: 4-28-97
Calibration Due Date: 10-28-97
Calibration Document:
[ ] Procedure _____ Rev. ___
[ ] Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Philips	CL-2077		
Fluke	CL-2084		
Calibrator	CL-2083		

NIST# 521/24032-95, 251971, 521/24255-2, 228/40850, 24638, 522/25179

CALIBRATION RESULTS

Standard Value	~~As Found~~	As Left	Out of Tol.
Standard Values			
Freq	Level		
50 Hz	1		
100	1		
100	10		

~~Standard Value~~	As Found	~~As Left~~	Out of Tol.
Test Values			
Range	Dial	Tape Out	
1	98.5	7.0747	
1	98.5	7.0720	
10	99	7.0707	

THIS CALIBRATION WAS PERFORMED IN ACCORDANCE WITH PROCEDURE #00000-EES-108-00
CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED

REMARKS: A Chg. Sens. @ 50 Hz = 98.5 mV/g

[X] I ACCEPTED [ ] I REJECTED

CALIBRATED BY: _____
Electronics and Electrical Systems

TEMPERATURE 70°F
HUMIDITY 46%

Page 1 of 1

ABB
CALIBRATION LABORATORY

NON-PERMANENT QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Charge Amplifier
Manufacturer: Unholtz-Dickie
Range: Multi Accuracy: ±2%
Mfg. Serial No.: 2025
C-E ID No.: EL-942

Calibration Date: 4-16-97
Calibration Due Date: ~~10-16-97~~ 4-16-98 (10/14/97)
Calibration Document:
[ ] Procedure _____ Rev. ___
[X] Manufacturer's Specifications TMS-008

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Fluke 5500	CL-2085		
Fluke 3840A	CL-2084		

NIST 811/240785, 251971, 811/240597, 228/255850, 246758

CALIBRATION RESULTS

Standard Value	As Found	~~As Left~~	Out of Tol.
F. Cal	7.0694		
Sens @	1-10		
Dial	10.00		
Input (1kHz)	Meter	Tape Out	
Range -1			
7.07 mVrms	100%	7.0825	
Range -10			
70.7 mV	100%	7.0718	
Range -100			
707 mV	100%	7.1146	
Range -1000			
7.07 Vrms	100%	7.1366	

Standard Value	As Found	~~As Left~~	Out of Tol.
Range -10			
Input 1kHz	Tape Gain	Tape Out	
70.7mV	10.00	7.0718	
	8.00	5.6575	
	6.00	4.2428	
	4.00	2.8310	
	2.00	1.4161	
Input 70.7mV			
50 Hz	10.00	7.0599	
100		7.0685	
200		7.0707	
300		7.0711	
500		7.0714	
1000		7.0714	
2000		7.0716	

THIS CALIBRATION WAS PERFORMED IN ACCORDANCE WITH PROCEDURE #00000-EES-208-00
CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED

REMARKS: A

[X] ACCEPTED [ ] REJECTED

CALIBRATED BY: _____
Electronics and Electrical Systems

TEMPERATURE 71°F
HUMIDITY 46%

Page 1 of 1

ABB
CALIBRATION LABORATORY

NON-PERMANENT QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Charge Amplifier
Manufacturer: Wilcoxon-Dickie
Range: Multi Accuracy: ±2%
Mfg. Serial No.: 5482
C-E ID No.: EL-1844

Calibration Date: 4-16-97
Calibration Due Date: ~~10-16-97~~ 4-16-98
Calibration Document:
[ ] Procedure _____ Rev. ___
[X] Manufacturer's Specifications MS-008/1974

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Fluke 5520	CL-2085		
Fluke 8840A	CL-2084		

NIST #521/240585, 251971, 521/242577, 228/253850, 246698

CALIBRATION RESULTS

Standard Value	As Found	As Left	Out of Tol.
F-Cal	7.0677		
Sens @	1-10		
Dist @	10.00		
Input (1K Hz)	Meter	tape Out	
Range - 1			
7.07 mVrms	100%	7.0860	
Range - 10			
70.7 mV	100%	7.0693	
Range - 100			
707 mV	100%	7.0976	
Range - 1000			
7.07 Vrms	100%	7.0691	

Standard Value	As Found	As Left	Out of Tol.
Range - 10			
Input 1K Hz	Tape Gain	Tape Out	
70.7 mVrms	10.00	7.0691	
	8.00	5.6526	
	6.00	4.2441	
	4.00	2.8341	
	2.00	1.4230	
Input 70.7mV			
50 Hz	10.00	7.0554	
100		7.0647	
200		7.0674	
300		7.0680	
500		7.0686	
1000		7.0691	
2000		7.0693	

THIS CALIBRATION WAS PERFORMED IN ACCORDANCE WITH PROCEDURE #00000-EES-208-00
CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED

REMARKS: A

[X] ACCEPTED [ ] REJECTED

CALIBRATED BY: _____
Electronics and Electrical Systems

TEMPERATURE 71 °F
HUMIDITY 46%

Page 1 of 1

ABB
CALIBRATION LABORATORY

NON-PERMANENT QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Accelerometer
Manufacturer: Unholtz-Dickie
Range: N/A Accuracy: ±5%
Mfg. Serial No.: 109
C-E ID No.: N/A

Calibration Date: 4-25-97
Calibration Due Date: 4-25-98
Calibration Document:
[ ] Procedure _____ Rev. ___
[ ] Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Philips	CL-2077	Unholtz-Dickie	EL-942
Fluke	CL-2084		
Columbia	CL-2083		

NIST 821/[illegible], 821/[illegible], 821/[illegible], 821/[illegible], 821/256179

CALIBRATION RESULTS

Standard Value	As Found	~~As Left~~	Out of Tol.
Chg Amp. Settings			
Range	Sens	Dial	
1	10.00	7.515	
Tape Out = 7.07 V Vrms			

Standard Value	As Found	As Left	Out of Tol.

THIS CALIBRATION WAS PERFORMED IN ACCORDANCE WITH PROCEDURE #00000-EES-208-00
CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED

REMARKS: A Chg Sens = 7.515 pC/g @ 50 Hz

CALIBRATED BY: [signature]
Electronics and Electrical Systems

[X] ACCEPTED [ ] REJECTED

TEMPERATURE 70°F
HUMIDITY 47%

Page 1 of 1

ABB
CALIBRATION LABORATORY

NON-PERMANENT QUALITY RECORD

CERTIFICATE OF CALIBRATION

Instrument Type: Accelerometer
Manufacturer: Unholtz-Dickie
Range: N/A Accuracy: ±5%
Mfg. Serial No.: 111
C-E ID No.: N/A

Calibration Date: 4-25-97
Calibration Due Date: 4-25-98
Calibration Document:
[ ] Procedure _____ Rev. ___
[ ] Manufacturer's Specifications

Test Equipment Used To Perform Calibration:

Test Equipment	Serial or ID No.	Test Equipment	Serial or ID No.
Philips	CL-2077	Unholtz Dickie	EL-942
Fluke	CL-2084		
Columbia	CL-2083		

NIST 721/[illegible]355, 250721, 521/[illegible]257, 724/245850, 246698, 812/[illegible]6179

CALIBRATION RESULTS

Standard Value	As Found	~~As Left~~	Out of Tol.
Chg Amp Settings			
Range	SENS	Dial	
1	10-100	7.580	
Tape Out = 7.0733 Vrms			

Standard Value	As Found	As Left	Out of Tol.

THIS CALIBRATION WAS PERFORMED IN ACCORDANCE WITH PROCEDURE #00000-EES-208-00
CALIBRATION HAS BEEN PERFORMED UTILIZING MEASUREMENT DEVICES WHICH HAVE KNOWN RELATIONSHIPS TO NIST STANDARDS WHERE SUCH STANDARDS EXIST. WHERE SUCH STANDARDS DO NOT EXIST, AN APPROVED PROCEDURE WRITTEN IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS HAS BEEN USED AND THE STANDARDS DOCUMENTED.

REMARKS: A Chg Sens = 75.80 pC/g @ 50 Hz

[X] ACCEPTED [ ] REJECTED

CALIBRATED BY: [signature]
Electronics and Electrical Systems

TEMPERATURE 70°F
HUMIDITY 47%

SIGNAL CHECKS, STORE 7 RECORDER, CHANNELS 1-7

CAL. DATE: 05-15-97	DUE DATE: 05-15-98	TECH. G.D.W.	ENG. K.H.H.

1 V ATTEN, RECORD SPEED 7 1/2 - DC INPUT

INPUT VOLT (all channels) DCV	ATTEN.	OUTPUT VOLT CH. 1 DCV	CH. 2 DCV	CH. 3 DCV	CH. 4 DCV	OUTPUT VOLT CH. 5 DCV	CH. 6 DCV	CH. 7 DCV
1.000	1.000	0.994	0.999	0.998	1.001	0.995	1.005	1.008
0.800	0.800	0.795	0.800	0.800	0.805	0.795	0.803	0.805
0.600	0.600	0.595	0.598	0.599	0.602	0.596	0.602	0.604
0.400	0.400	0.396	0.399	0.399	0.401	0.395	0.401	0.402
0.200	0.200	0.195	0.197	0.199	0.198	0.194	0.201	0.201
0.000	0.000	-0.005	-0.004	-0.001	-0.003	-0.005	0.001	0.000

2 V ATTEN, RECORD SPEED 7 1/2 - DC INPUT

INPUT VOLT (all channels) DCV	ATTEN.	OUTPUT VOLT CH. 1 DCV	CH. 2 DCV	CH. 3 DCV	CH. 4 DCV	OUTPUT VOLT CH. 5 DCV	CH. 6 DCV	CH. 7 DCV
2.000	1.000	0.989	0.993	0.993	1.002	0.992	0.999	1.000
1.600	0.800	0.794	0.796	0.797	0.803	0.795	0.801	0.803
1.200	0.600	0.595	0.598	0.598	0.602	0.595	0.600	0.601
0.800	0.400	0.394	0.397	0.398	0.401	0.395	0.400	0.401
0.400	0.200	0.195	0.197	0.199	0.200	0.195	0.201	0.202
0.000	0.000	-0.005	-0.003	-0.000	-0.001	-0.004	0.002	0.001

5 V ATTEN, RECORD SPEED 7 1/2 - DC INPUT

INPUT VOLT (all channels) DCV	ATTEN.	OUTPUT VOLT CH. 1 DCV	CH. 2 DCV	CH. 3 DCV	CH. 4 DCV	OUTPUT VOLT CH. 5 DCV	CH. 6 DCV	CH. 7 DCV
5.000	1.000	0.993	0.997	0.995	1.003	0.993	0.999	1.000
4.000	0.800	0.795	0.798	0.798	0.805	0.796	0.801	0.803
3.000	0.600	0.595	0.598	0.598	0.603	0.596	0.601	0.602
2.000	0.400	0.392	0.396	0.399	0.401	0.395	0.399	0.399
1.000	0.200	0.192	0.195	0.197	0.199	0.194	0.199	0.199
0.000	0.000	-0.005	-0.003	-0.000	-0.000	-0.004	0.002	0.001

10 V ATTEN, RECORD SPEED 7 1/2 - DC INPUT

INPUT VOLT (all channels) DCV	ATTEN.	OUTPUT VOLT CH. 1 DCV	CH. 2 DCV	CH. 3 DCV	CH. 4 DCV	OUTPUT VOLT CH. 5 DCV	CH. 6 DCV	CH. 7 DCV
10.000	1.000	0.994	0.997	0.995	1.004	0.994	0.999	1.000
8.000	0.800	0.795	0.798	0.797	0.803	0.796	0.801	0.801
6.000	0.600	0.595	0.598	0.598	0.603	0.595	0.600	0.601
4.000	0.400	0.394	0.397	0.398	0.403	0.395	0.400	0.401
2.000	0.200	0.193	0.195	0.197	0.200	0.195	0.200	0.199
0.000	0.000	-0.005	-0.000	-0.000	-0.000	-0.004	0.002	0.001

SIGNAL CALIBRATION EQUIPMENT:

TYPE	MANUFACTURER	MOD	S/N	CAL. DATE	DUE DATE
INPUT VOLT					
D.V.M.	FLUKE	8050A	6168012	12-18-96	12-18-97
OUTPUT VOLT					
D.V.M.	FLUKE	8050A	6168012	12-18-96	12-18-97

Range used for Storage and Retrieval of San Onofre MNSA Seismic Data.

Quality Plus Inc - *Metrology Services*

ACCEPTED [signature]
DATE 4/16/97

CERTIFICATION OF ACCURACY

CUSTOMER:
ABB COMBUSTION ENGINEERING
1000 PROSPECT HILL RD.
WINDSOR CT 06095
P.O.#: 44716KP

DATE: 04/01/97
GAGE TYPE: TORQUE WRENCH
MAKE: PROTO
SER#: #25
DATE DUE: 04/01/98

Mech Lab #25

THE FOLLOWING TORQUE WRENCH WAS CALIBRATED PER QUALITY PLUS, INC. PROCEDURE QP-552 WITH A CONTROL DATE OF 03/31/98. IN ACCORDANCE WITH QUALITY PLUS, INC. QUALITY MANUAL, REV.8, 3-31-95. MASTER USED IS TSD 6806, S/N 67P223, CAL'D. ON 2/22/97. A.L.S.T. TEST# 821/257176-96 TOLERANCE: +/- 4% IN/LBS;10CFR21 APPLIES.

		ACTUAL RESULTS			
		AS FOUND		AFTER ADJUSTMENT	
CAL.POINT		CLOCKWISE	COUNTERCLKWS	CLOCKWISE	COUNTERCLKWS
50	IN/LBS	49.50	50.80		
100	IN/LBS	98.90	100.20	NO ADJUSTMENTS REQUIRED	
150	IN/LBS	148.50	150.00		
200	IN/LBS	197.80	201.20		
250	IN/LBS	246.80	250.40		

INSPECTED BY: [signature]

GAGE CALIBRATION • FIRST ARTICLE INSPECTION • REPAIRS • GRANITE PLATE RESURFACING • CASTING LAYOUT
TORQUE CALIBRATION • ON SITE CALIBRATION • PRESSURE GAGE CALIBRATION • CMM CONTRACT INSPECTION
170 Grove Street • Chicopee MA 01020 • (413) 594-5529 • (413) 594-5596 fax

ACCEPTED
DATE 5/20/97

PRECISION
INSPECTION, Inc.

PLYMOUTH INDUSTRIAL PARK
CORNER OF NAPCO AND CONTAINER DRIVES
P.O. BOX 46
TERRYVILLE, CONNECTICUT 06786
TELEPHONE 203/583-2050

TORQUE CALIBRATION CERTIFICATE

REPORT NUMBER: 21301-2 **PO Number:** 45676KP

DATE OF CALIBRATION: 5/20/97

CUSTOMER: ABB Combustion Engineering

CALIBRATION
DUE DATE 11-20-97

INSTRUMENT: Torque Wrench, 150 ft/lbs.

S/N: CL-1031 **MAKE:** Proto 153668

	PRECENT OF RANGE				
CLOCKWISE	**20%**	**40%**	**60%**	**80%**	**100%**
INDICATED WRENCH TORQUE:	30'lbs.	60'lbs.	90'lbs.	120'lbs.	150'lbs.
ACTUAL TORQUE:	30'lbs.	60'lbs.	90'lbs.	120'lbs.	149'lbs.
COUNTERCLOCKWISE					
INDICATED WRENCH TORQUE:					
ACTUAL TORQUE:					

PROCEDURE: #32
TEMPERATURE /HUMIDITY: 68°/41%
THIS INSTRUMENT WAS CALIBRATED USING MASTER CALIBRATOR
SERIAL NO. 5217
CALIBRATED ON 6/17/96 DUE: 6/17/98
TRACEABLE TO THE NIST THROUGH NIST TEST NO. MMAP 822/LA

Chris Poulin
CALIBRATION TECHNICIAN

Ref. ANSI B107.14
Ref. Federal Spec. GGG-W-686
Mil-W-26497
Calibration conforms to ANSI Z540-1
Estimated level of accuracy is ± 1%

APPENDIX D

OFF-LINE ANALYSIS - RESULTS

GRAPHS & TABULATIONS

Hot Leg RTD Nozzle and PZR Side Mounted Nozzle

Input Test Response Spectra for 5 OBE Events and 1 SSE Event in one Test Orientation (Axis-Symmetric Specimens)

Pages D2 through D11 Horizontal & Vertical OBE Spectra
Pages D12 & D13 Horizontal & Vertical SSE Spectra

PZR Bottom Mounted PZR Instrument Nozzle, Supported Configuration

Input Test Response Spectra for 1 OBE and 1 SSE Events in Each of Four Test Orientations

Pages D14 through D17 Orientation A
Pages D18 through D21 Orientation B
Pages D22 through D25 Orientation C
Pages D26 through D29 Orientation D

PZR Bottom Mounted PZR Instrument Nozzle, Free Standing Test Configuration

Input Test Response Spectra for 1 OBE and 1 SSE Events in Each of Four Test Orientations

Pages D30 through D33 Orientation A
Pages D34 through D37 Orientation B
Pages D38 through D41 Orientation C
Pages D42 through D45 Orientation D

Time Histories for 4 SSE Events, for Horizontal Nozzle Top and Horizontal MNSA Top Plate

Pages D46 and D47 Orientation A
Pages D48 and D49 Orientation B
Pages D50 and D51 Orientation C
Pages D52 and D53 Orientation D

Test Response Spectra for 4 SSE Events, for Horizontal Nozzle Top and Horizontal MNSA Top Plate

Pages D54 and D55 Orientation A
Pages D56 and D57 Orientation B
Pages D58 and D59 Orientation C
Pages D60 and D61 Orientation D

Note: Graphs can be identified by File Number in combination with Table 2.

Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnob1h.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
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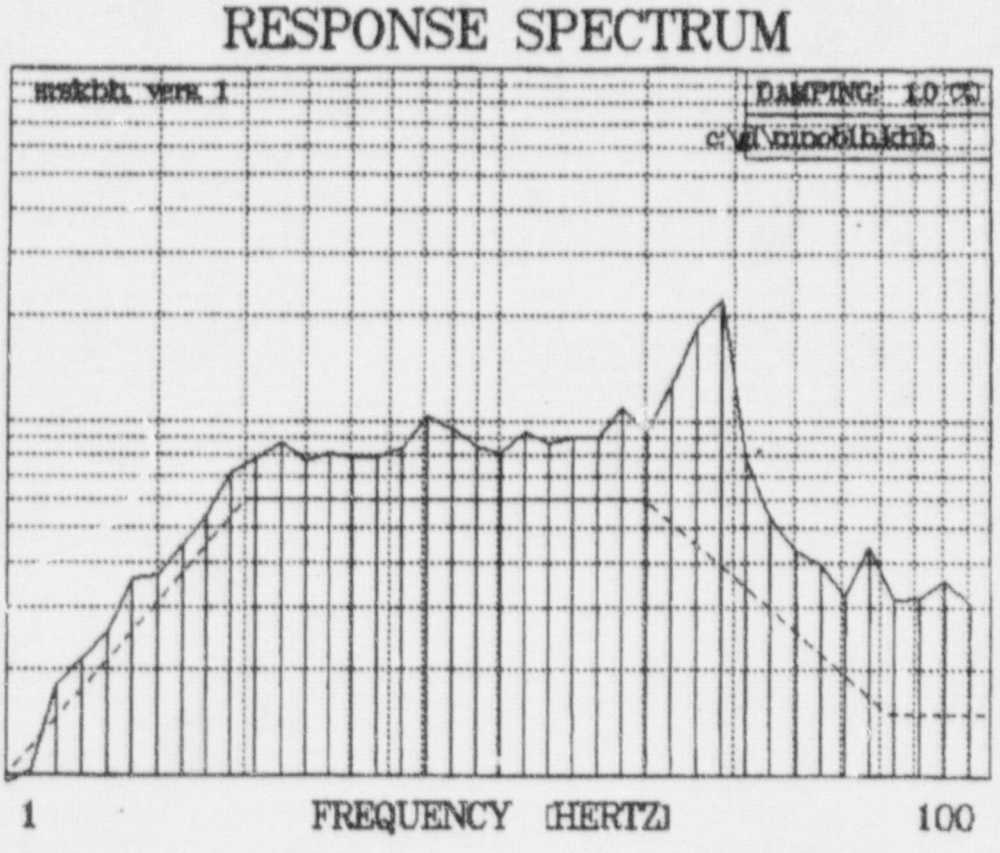
1.12	1.03
1.26	1.81
1.41	2.15
1.59	2.53
1.78	3.57
2.00	3.69
2.24	4.49
2.52	5.42
2.83	7.13
3.17	7.82
3.56	8.74
4.00	7.77
4.49	8.16
5.04	7.94
5.66	7.98
6.35	8.40
7.13	10.33
8.00	9.60
8.98	8.47
10.08	8.09
11.31	9.31
12.70	8.69
14.25	8.97
16.00	9.05
17.96	11.00
20.16	9.43
22.63	12.74
25.40	18.70
28.51	22.12
32.00	7.89
35.92	5.35
40.32	4.34
45.25	3.92
50.80	3.19
57.02	4.41
64.00	3.13
71.84	3.15
80.63	3.53
90.51	3.06



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnoblv.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
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1.12	1.01
1.26	1.70
1.41	2.16
1.59	2.69
1.78	3.39
2.00	3.86
2.24	4.49
2.52	5.36
2.83	7.10
3.17	7.40
3.56	8.16
4.00	7.63
4.49	8.06
5.04	7.50
5.66	8.18
6.35	7.97
7.13	9.30
8.00	9.59
8.98	8.44
10.08	7.57
11.31	9.03
12.70	8.56
14.25	8.95
16.00	8.99
17.96	11.18
20.16	8.90
22.63	11.26
25.40	18.35
28.51	19.56
32.00	7.34
35.92	5.36
40.32	4.99
45.25	4.07
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71.84	3.76
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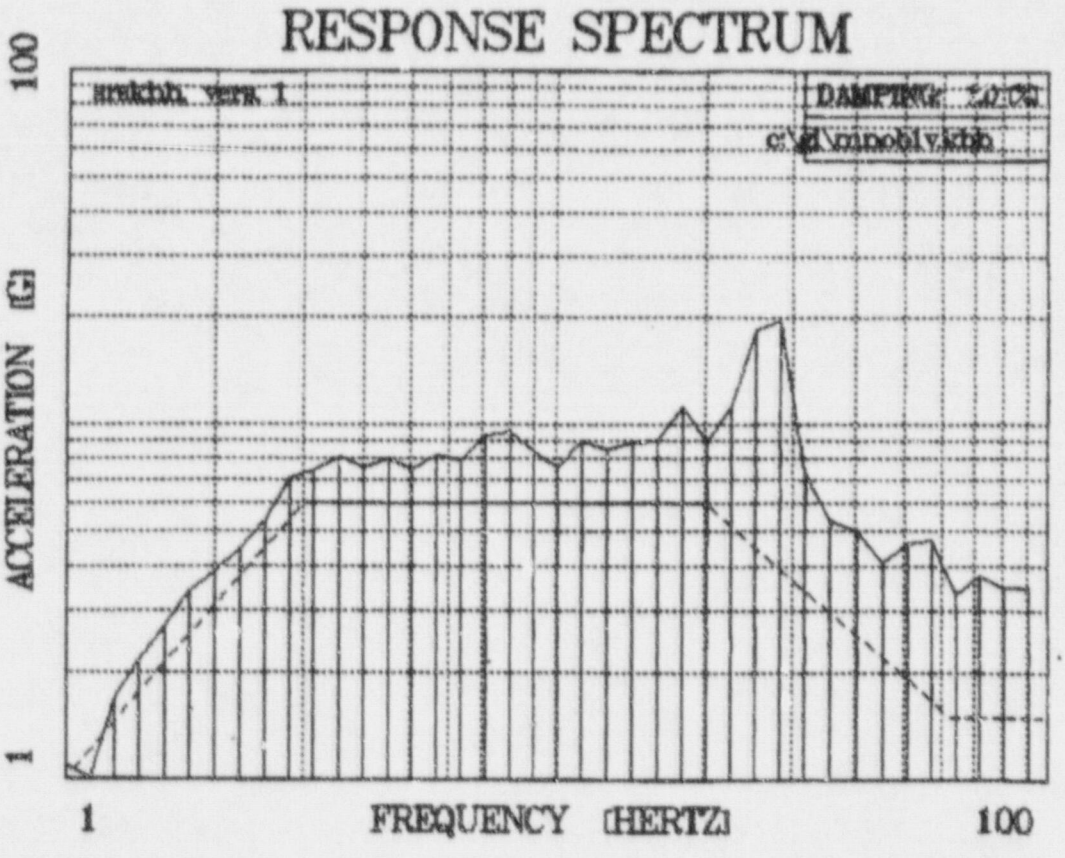
90.51	3.46



Analysis Code: SRSKHH Version 1

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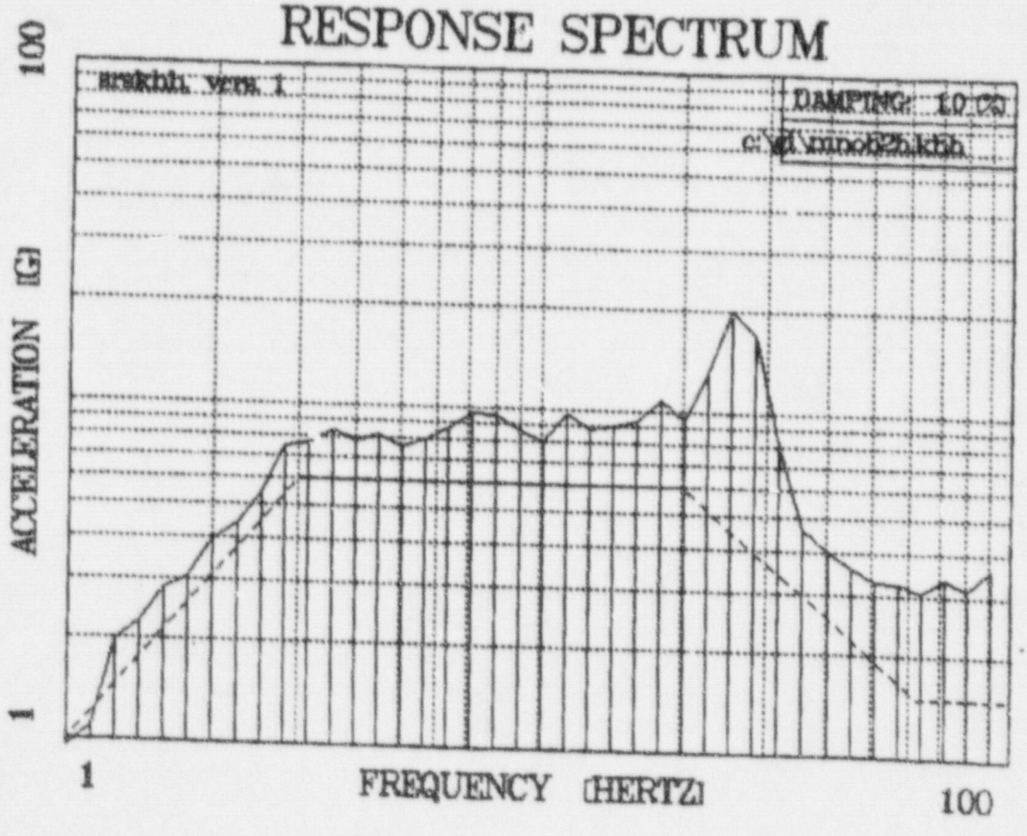
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.96
1.12	1.10
1.26	1.98
1.41	2.23
1.59	2.80
1.78	3.04
2.00	3.95
2.24	4.39
2.52	5.45
2.83	7.47
3.17	7.67
3.56	8.37
4.00	7.88
4.49	8.25
5.04	7.59
5.66	8.02
6.35	8.70
7.13	9.70
8.00	9.58
8.98	8.61
10.08	8.00
11.31	9.76
12.70	8.82
14.25	9.06
16.00	9.29
17.96	10.84
20.16	9.48
22.63	13.25
25.40	19.99
28.51	17.01
32.00	8.09
35.92	4.60
40.32	3.96
45.25	3.58
50.80	3.29
57.02	3.24
64.00	3.05
71.84	3.35
80.63	3.14
90.51	3.59



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnob2v.khh DAMPING 1.00 [%]

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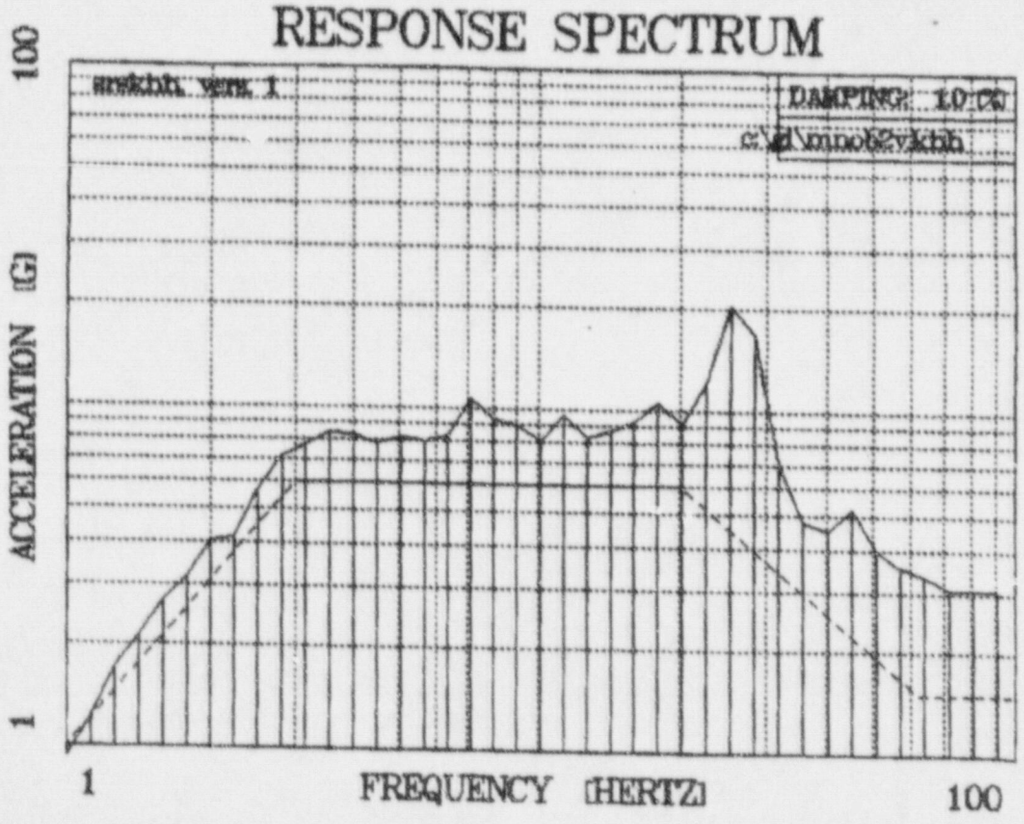
1.12	1.21
1.26	1.71
1.41	2.11
1.59	2.69
1.78	3.17
2.00	4.04
2.24	4.13
2.52	5.71
2.83	7.19
3.17	7.75
3.56	8.38
4.00	8.36
4.49	7.81
5.04	8.19
5.66	8.01
6.35	8.28
7.13	10.70
8.00	9.37
8.98	9.01
10.08	8.15
11.31	9.72
12.70	8.35
14.25	8.67
16.00	9.28
17.96	10.55
20.16	9.13
22.63	11.99
25.40	20.47
28.51	16.78
32.00	7.17
35.92	4.80
40.32	4.54
45.25	5.28
50.80	4.00
57.02	3.54
64.00	3.34
71.84	3.04
80.63	3.06
90.51	3.06



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FREQUENCY [HERTZ]	ACCELERATION [G]
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1.12	1.15
1.26	1.84
1.41	2.27
1.59	2.71
1.78	3.33
2.00	3.97
2.24	4.28
2.52	5.72
2.83	7.50
3.17	8.02
3.56	8.78
4.00	7.99
4.49	8.25
5.04	7.78
5.66	8.06
6.35	8.54
7.13	10.29
8.00	9.60
8.98	8.34
10.08	8.10
11.31	9.83
12.70	8.90
14.25	9.06
16.00	9.61
17.96	10.94
20.16	9.72
22.63	14.46
25.40	20.83
28.51	14.99
32.00	8.01
35.92	4.72
40.32	3.70
45.25	3.73
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71.84	3.93
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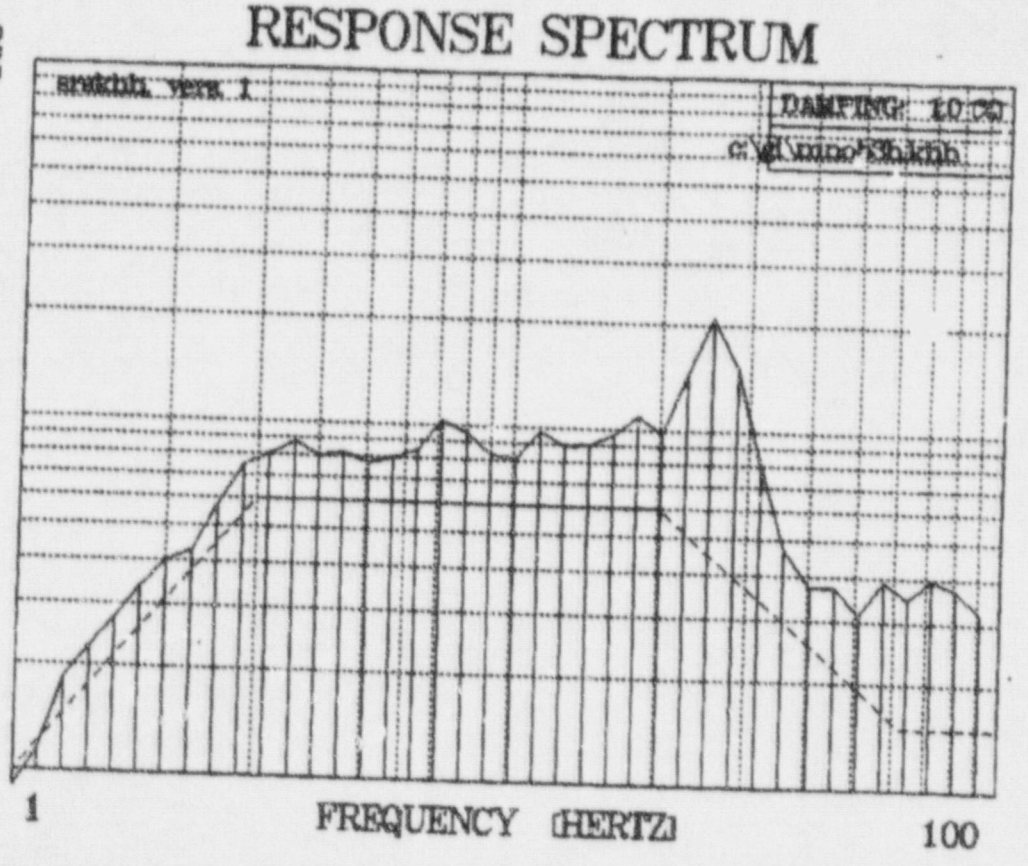
90.51	3.21



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnob3v.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.89
1.12	0.94
1.26	1.76
1.41	2.14
1.59	2.76
1.78	3.34
2.00	3.70
2.24	4.21
2.52	5.46
2.83	7.47
3.17	7.93
3.56	8.33
4.00	7.74
4.49	8.16
5.04	7.81
5.66	7.68
6.35	8.30
7.13	10.11
8.00	9.27
8.98	8.06
10.08	8.21
11.31	9.70
12.70	9.02
14.25	8.76
16.00	8.59
17.96	10.86
20.16	9.83
22.63	13.74
25.40	20.25
28.51	14.22
32.00	7.69
35.92	5.84
40.32	4.54
45.25	3.90
50.80	4.03
57.02	4.79
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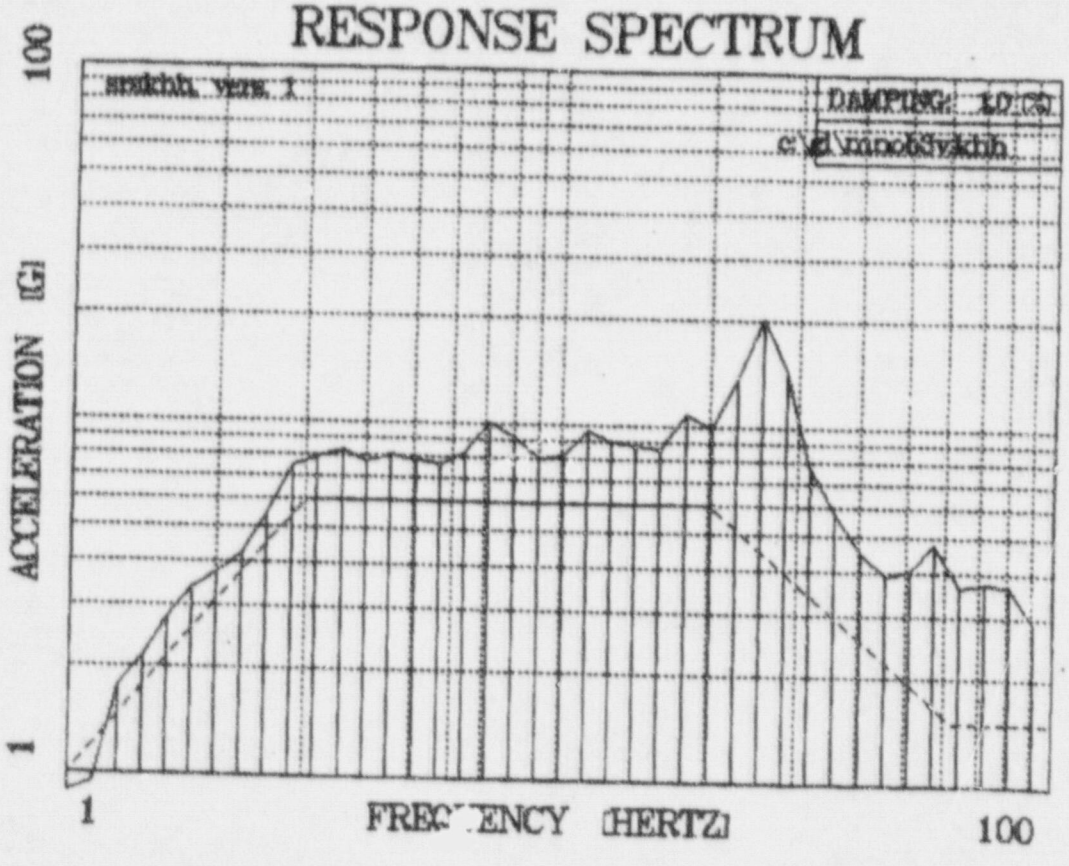
71.84	3.73
80.63	3.65
90.51	2.88



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnob4h.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
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1.12	0.98
1.26	1.62
1.41	2.40
1.59	2.76
1.78	3.30
2.00	3.93
2.24	4.40
2.52	5.62
2.83	7.41
3.17	7.68
3.56	8.95
4.00	7.78
4.49	8.16
5.04	7.78
5.66	7.83
6.35	8.25
7.13	9.98
8.00	9.57
8.98	8.92
10.08	8.21
11.31	9.89
12.70	8.91
14.25	9.09
16.00	9.33
17.96	10.77
20.16	10.19
22.63	15.21
25.40	20.03
28.51	14.44
32.00	8.57
35.92	5.18
40.32	4.10
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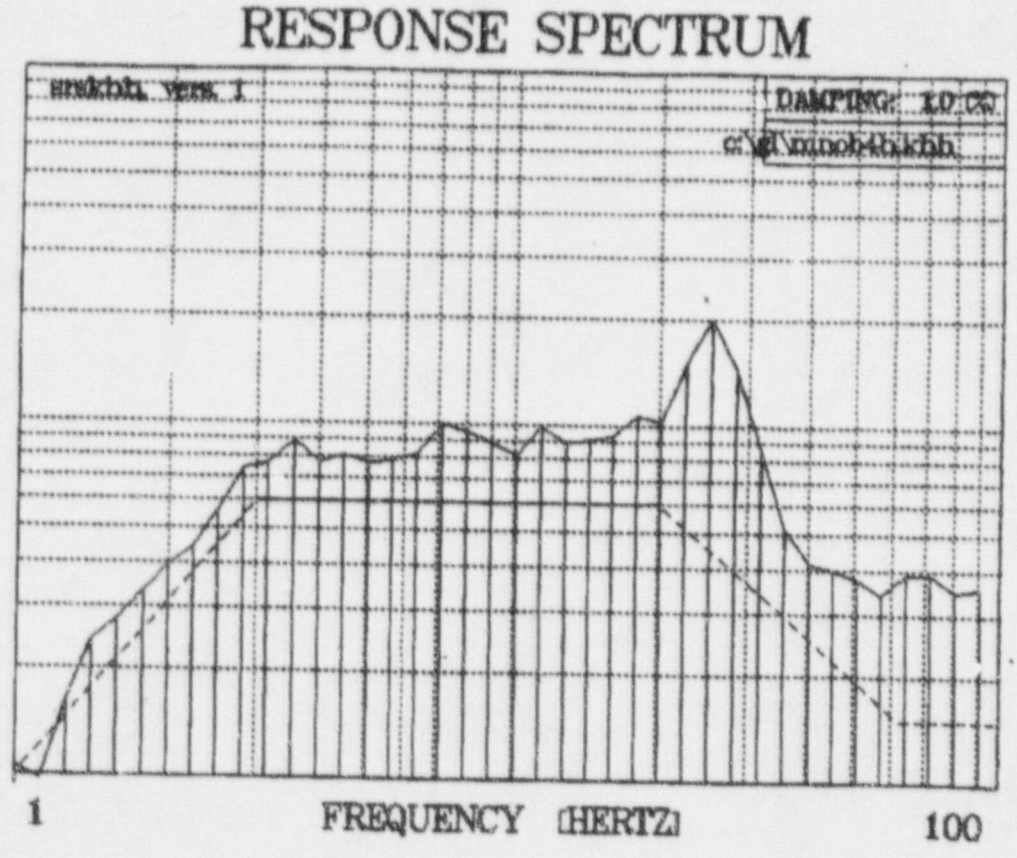
64.00	3.87
71.84	3.89
80.63	3.45
90.51	3.53



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnob4v.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
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1.26	1.64
1.41	2.37
1.59	2.52
1.78	3.40
2.00	4.22
2.24	4.46
2.52	5.80
2.83	6.87
3.17	7.45
3.56	8.90
4.00	7.88
4.49	8.15
5.04	7.50
5.66	7.77
6.35	7.98
7.13	9.97
8.00	9.41
8.98	8.84
10.08	7.89
11.31	9.34
12.70	8.51
14.25	8.66
16.00	9.10
17.96	10.16
20.16	9.16
22.63	15.16
25.40	19.99
28.51	13.98
32.00	7.97
35.92	4.82
40.32	5.86
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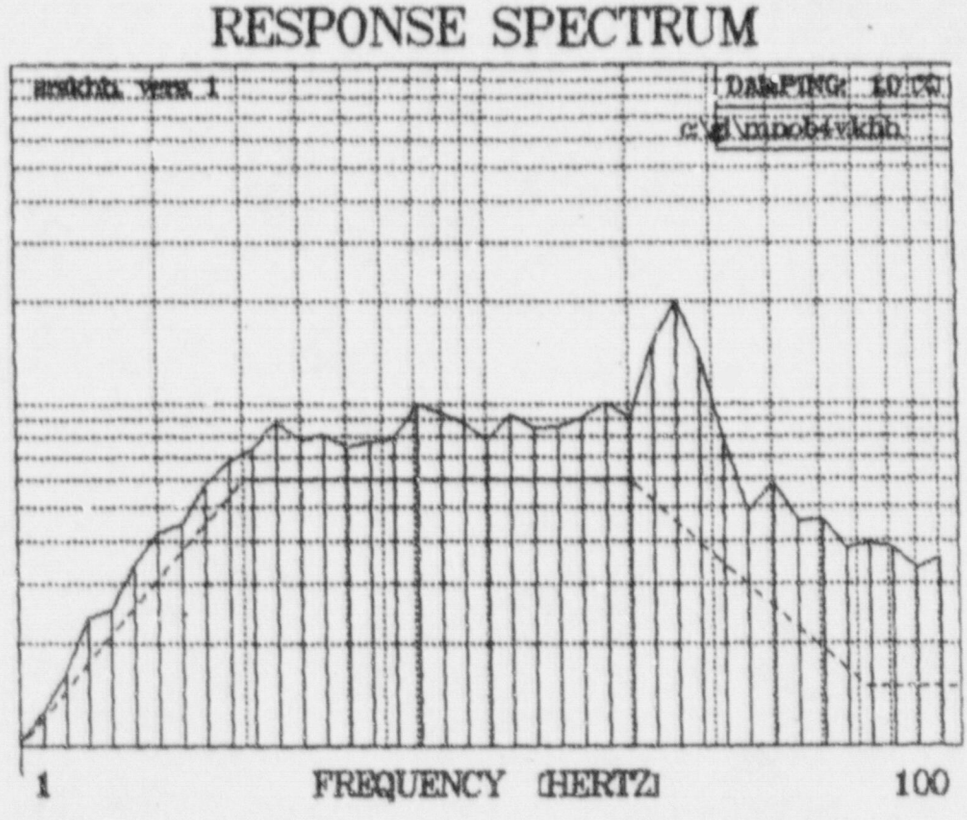
80.63	3.32
90.51	3.54



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnob5h.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.92
1.12	1.15
1.26	1.70
1.41	2.09
1.59	2.40
1.78	3.05
2.00	3.85
2.24	4.52
2.52	5.49
2.83	7.15
3.17	8.08
3.56	8.89
4.00	7.88
4.49	8.08
5.04	8.08
5.66	8.11
6.35	8.45
7.13	10.23
8.00	10.43
8.98	8.81
10.08	8.09
11.31	9.88
12.70	8.83
14.25	8.82
16.00	9.56
17.96	10.48
20.16	10.27
22.63	15.29
25.40	20.69
28.51	14.36
32.00	8.05
35.92	5.04
40.32	3.68
45.25	4.32
50.80	3.53
57.02	4.17
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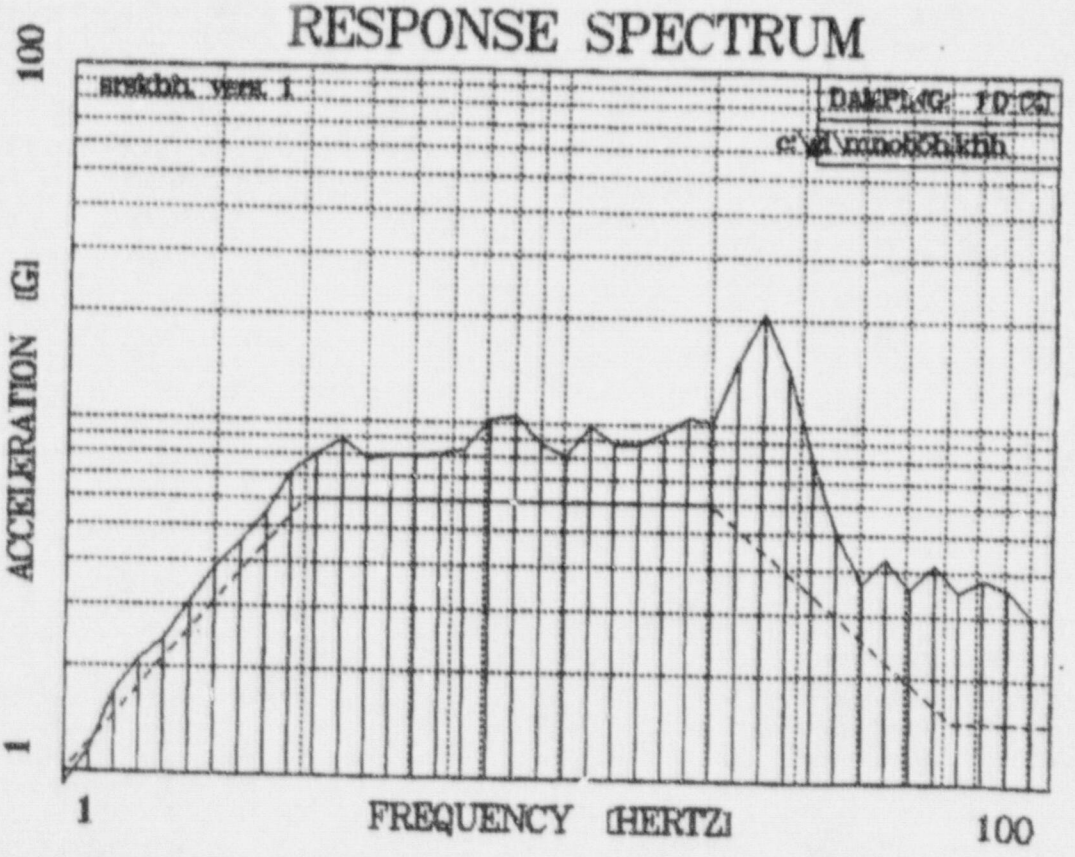
71.84	3.80
80.63	3.60
90.51	3.01



Analysis Code: SRSKHH Version 1

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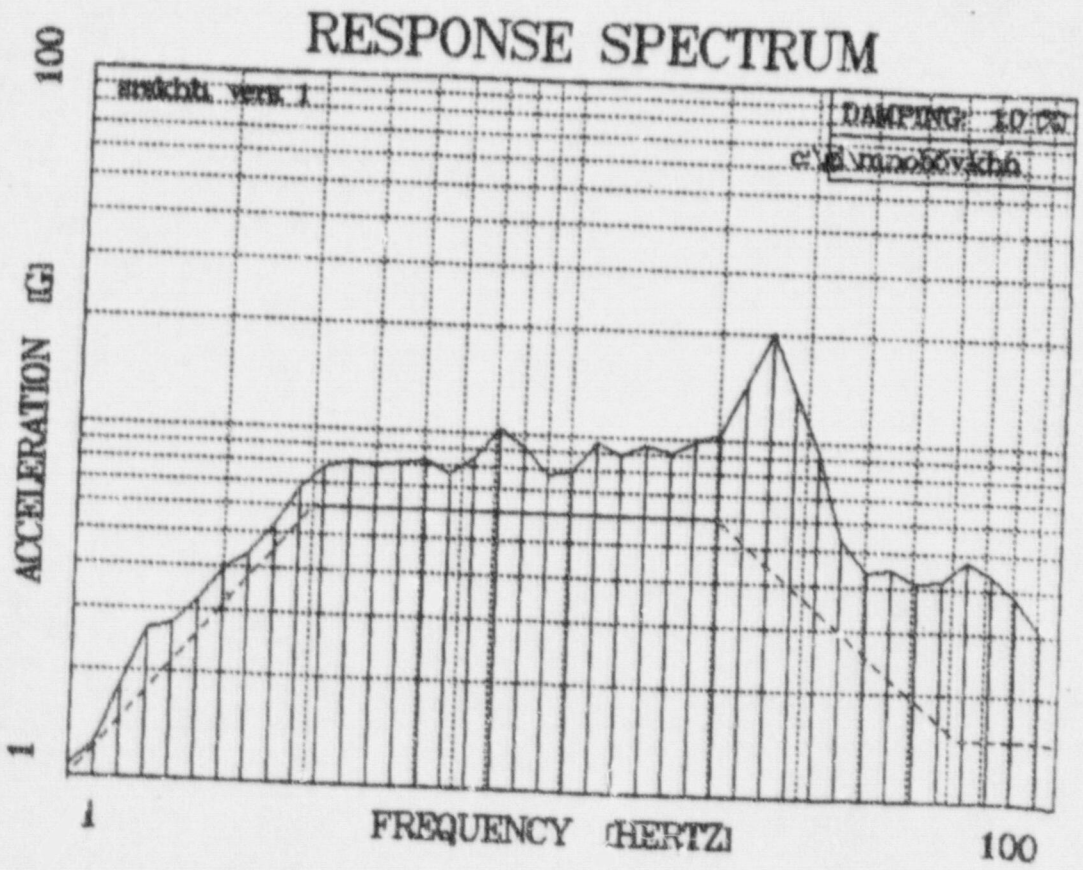
1.12	1.25
1.26	1.83
1.41	2.62
1.59	2.71
1.78	3.20
2.00	3.95
2.24	4.37
2.52	5.30
2.83	6.78
3.17	7.76
3.56	8.13
4.00	7.95
4.49	8.14
5.04	8.34
5.66	7.66
6.35	8.54
7.13	10.41
8.00	9.23
8.98	7.79
10.08	7.95
11.31	9.62
12.70	8.89
14.25	9.56
16.00	9.13
17.96	9.83
20.16	10.33
22.63	14.41
25.40	20.11
28.51	13.70
32.00	9.29
35.92	5.36
40.32	4.38
45.25	4.49
50.80	4.13
57.02	4.16
64.00	4.80
71.84	4.36
80.63	3.81
90.51	3.04



Analysis Code: SRSKHK Version 1

DATA FILE c:\gl\mnss1h.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
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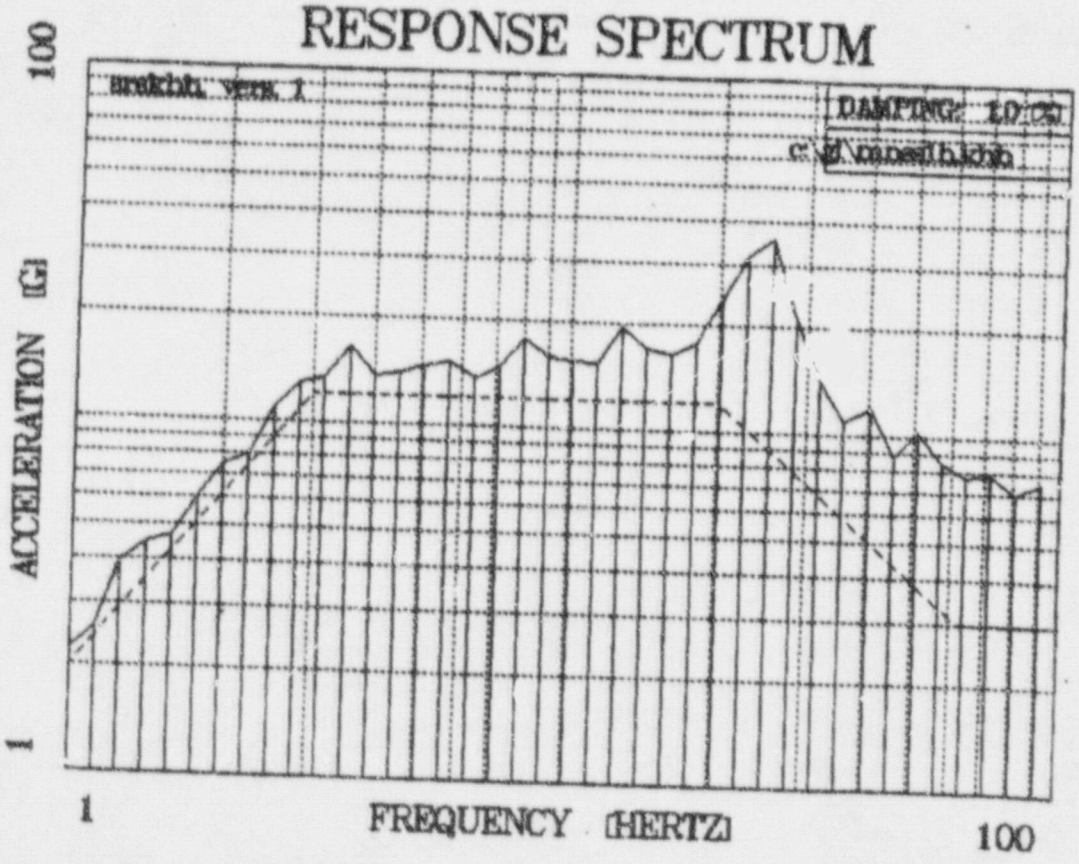
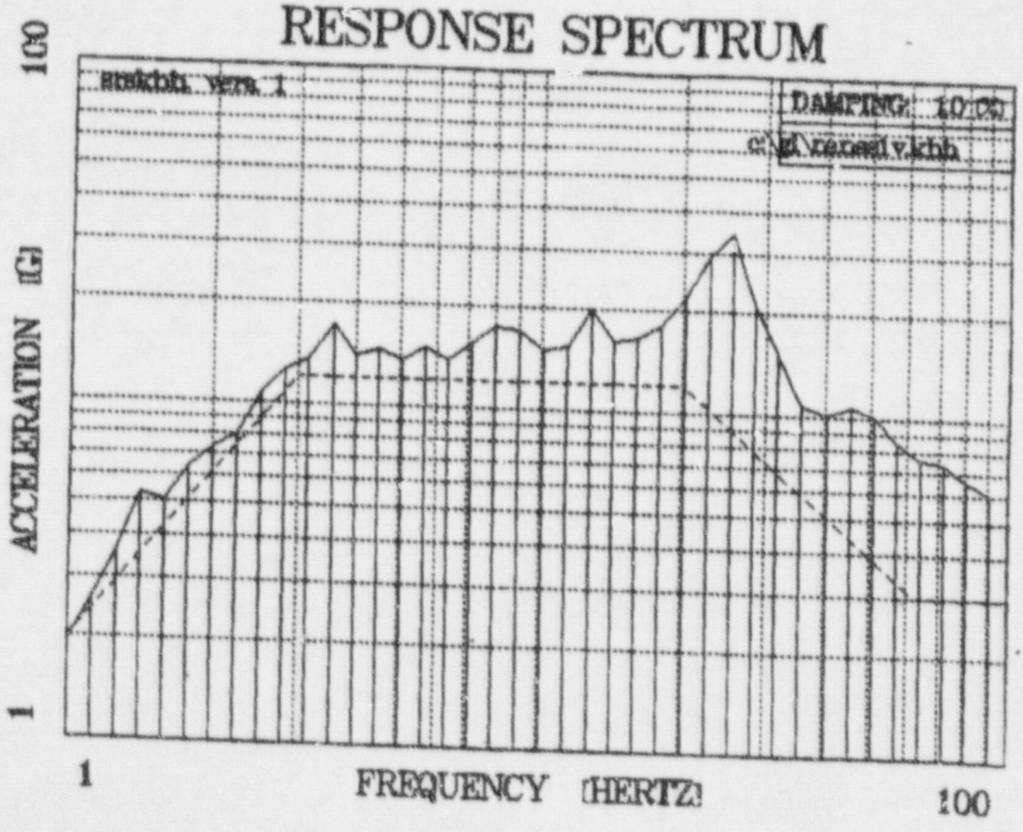
1.12	2.57
1.26	3.93
1.41	4.47
1.59	4.65
1.78	6.06
2.00	7.47
2.24	8.08
2.52	10.93
2.83	12.95
3.17	13.29
3.56	16.50
4.00	13.70
4.49	13.94
5.04	14.62
5.66	15.18
6.35	13.66
7.13	14.73
8.00	17.76
8.98	15.83
10.08	15.41
11.31	15.26
12.70	19.52
14.25	17.00
16.00	16.41
17.96	17.73
20.16	23.65
22.63	31.77
25.40	35.31
28.51	21.23
32.00	14.08
35.92	11.02
40.32	11.82
45.25	8.84
50.80	10.40
57.02	8.47
64.00	7.72
71.84	7.96
80.63	7.01
90.51	7.54



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnss1v.khh DAMPING 1.00 [%]

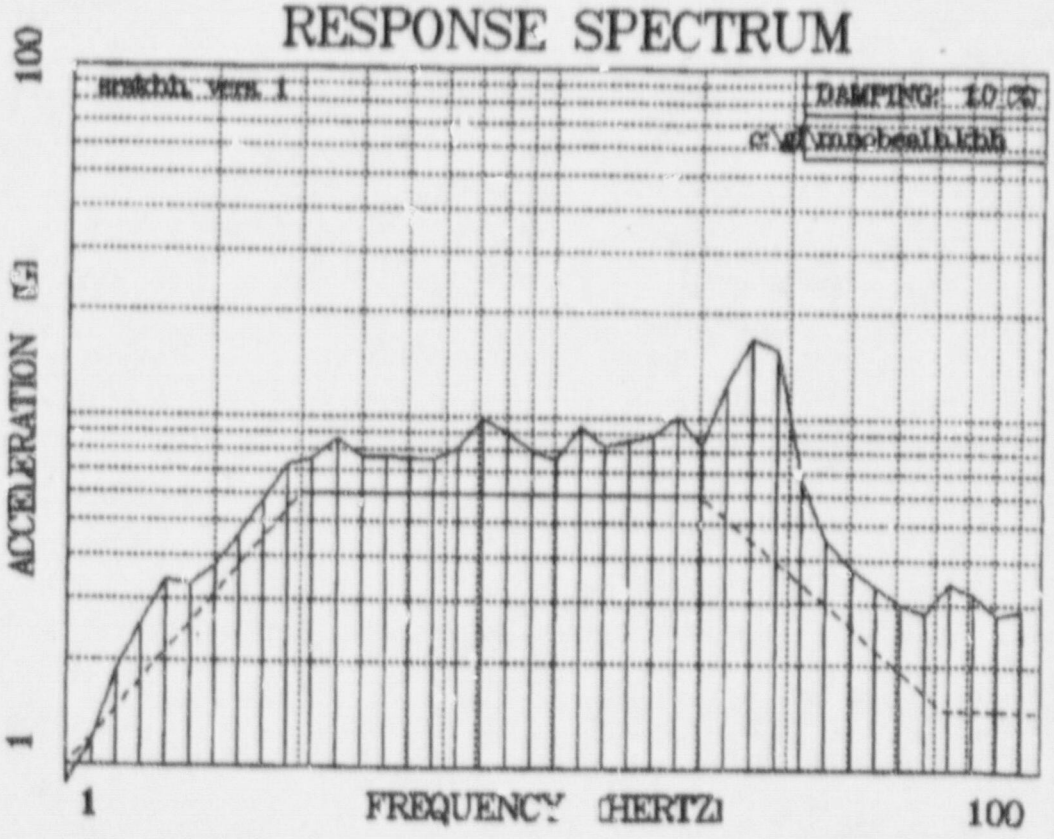
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.95
1.12	2.56
1.26	3.58
1.41	5.30
1.59	5.06
1.78	6.41
2.00	7.31
2.24	8.02
2.52	10.71
2.83	12.63
3.17	13.47
3.56	17.18
4.00	13.94
4.49	14.55
5.04	13.67
5.66	14.92
6.35	13.74
7.13	15.40
8.00	17.34
8.98	17.00
10.08	14.97
11.31	15.27
12.70	19.96
14.25	15.95
16.00	16.35
17.96	18.07
20.16	21.81
22.63	29.16
25.40	34.29
28.51	20.82
32.00	15.11
35.92	10.72
40.32	10.12
45.25	10.71
50.80	10.10
57.02	8.54
64.00	7.56
71.84	7.39
80.63	6.62
90.51	6.11



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobealh.khh DAMPING 1.00 [%]

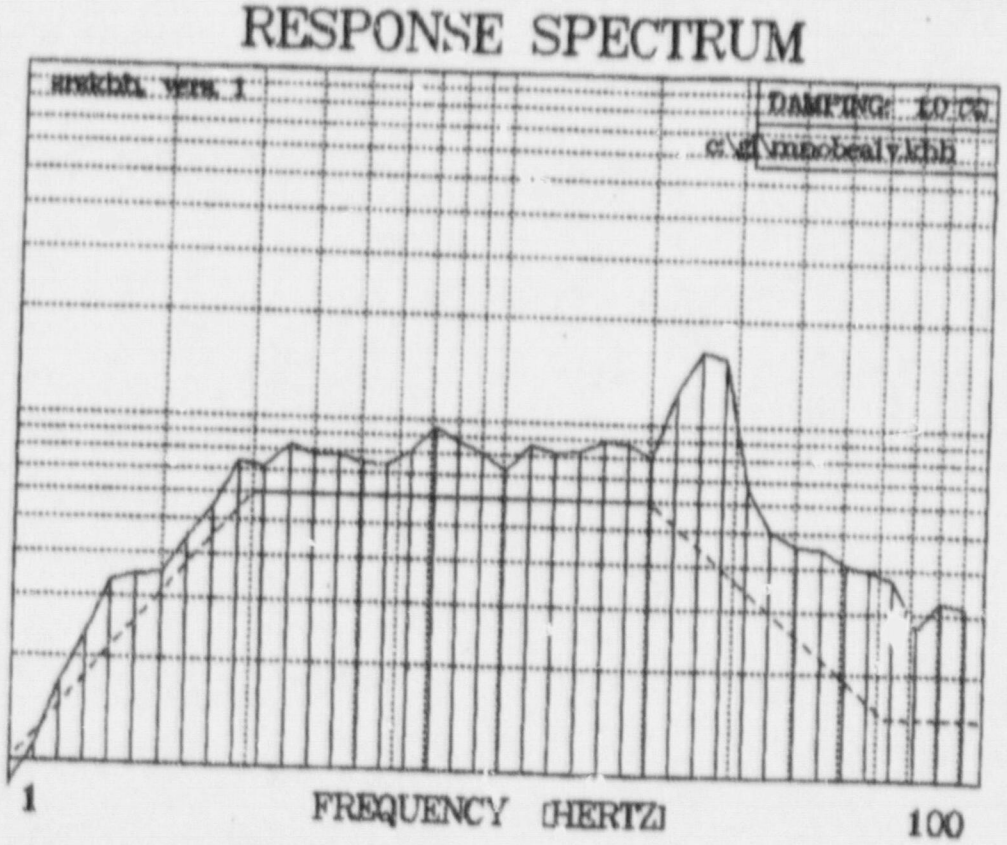
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.88
1.12	1.18
1.26	1.89
1.41	2.54
1.59	3.37
1.78	3.30
2.00	3.72
2.24	4.55
2.52	5.73
2.83	7.21
3.17	7.56
3.56	8.65
4.00	7.65
4.49	7.71
5.04	7.61
5.66	7.60
6.35	8.15
7.13	9.89
8.00	9.04
8.98	8.02
10.09	7.59
11.31	9.39
12.70	8.29
14.25	8.60
16.00	8.91
17.96	10.14
20.16	8.44
22.63	12.56
25.40	16.79
28.51	15.74
32.00	6.65
35.92	4.53
40.32	3.74
45.25	3.35
50.80	2.99
57.02	2.82
64.00	3.43
71.84	3.19
80.63	2.79
90.51	2.90



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobealv.khh DAMPING 1.00 [%]

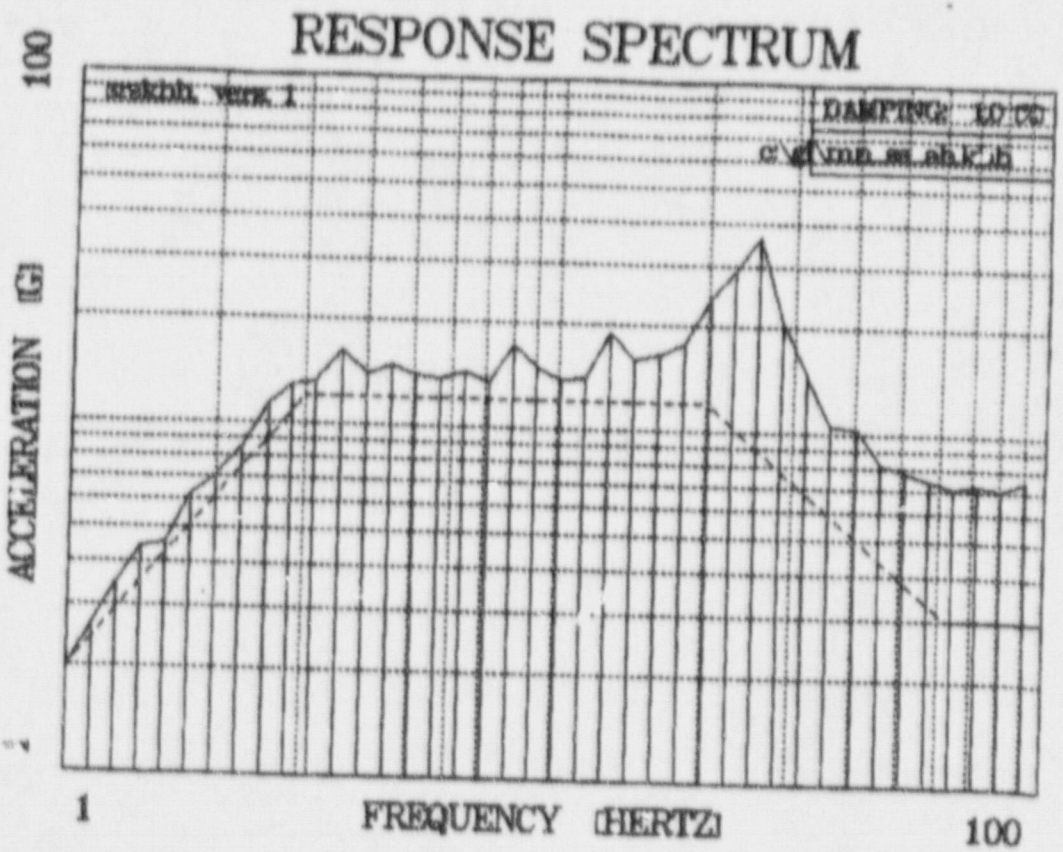
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.86
1.12	1.10
1.26	1.70
1.41	2.31
1.59	3.32
1.78	3.49
2.00	3.51
2.24	4.41
2.52	5.52
2.83	7.37
3.17	7.16
3.56	8.33
4.00	7.82
4.49	7.83
5.04	7.46
5.66	7.43
6.35	8.15
7.13	9.52
8.00	8.73
8.98	8.10
10.08	7.22
11.31	8.65
12.70	8.23
14.25	8.29
16.00	8.87
17.96	8.84
20.16	8.02
22.63	12.46
25.40	16.21
28.51	15.54
32.00	6.75
35.92	5.10
40.32	4.60
45.25	4.50
50.80	4.05
57.02	3.91
64.00	3.73
71.84	2.68
80.63	3.25
90.51	3.14



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mn_ss_ah.khh DAMPING 1.00 [%]

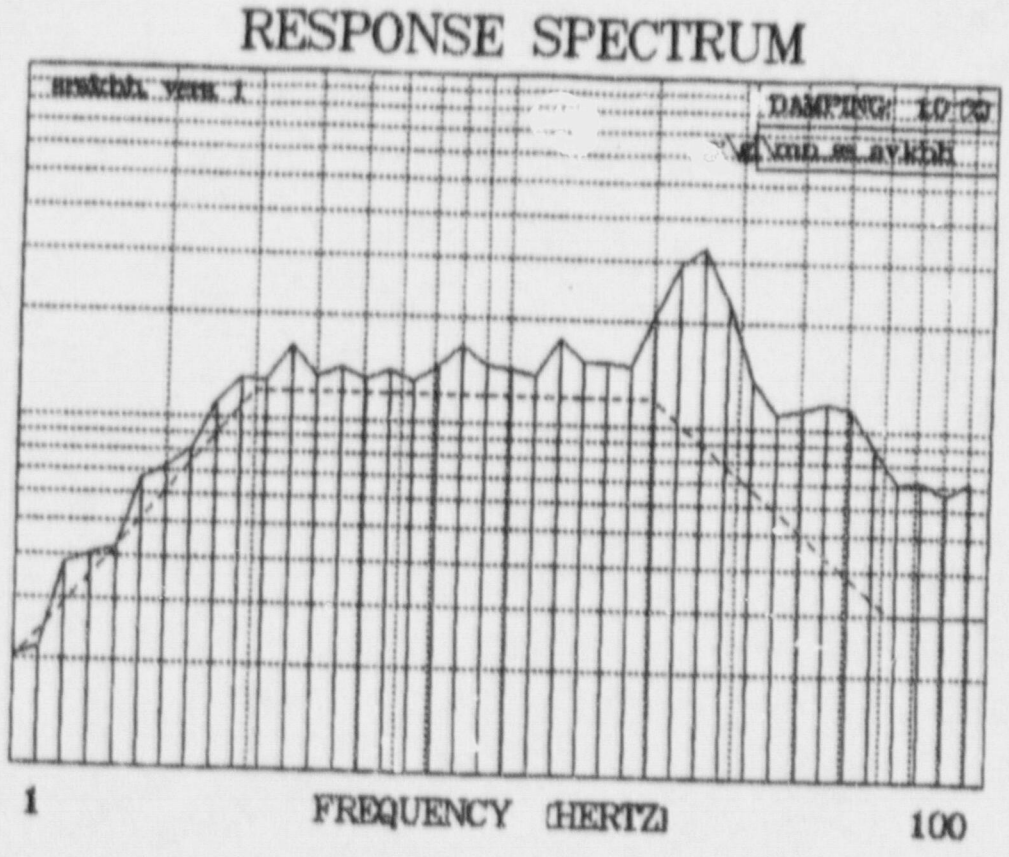
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.98
1.12	2.62
1.26	3.46
1.41	4.44
1.59	4.51
1.78	6.25
2.00	7.07
2.24	8.48
2.52	11.40
2.83	12.88
3.17	13.15
3.56	16.17
4.00	14.00
4.49	14.71
5.04	13.94
5.66	13.59
6.35	14.36
7.13	13.51
8.00	17.09
8.98	14.92
10.08	13.88
11.31	13.97
12.70	18.77
14.25	15.83
16.00	16.43
17.96	17.79
20.16	23.87
22.63	28.74
25.40	36.26
28.51	20.62
32.00	14.55
35.92	10.43
40.32	10.38
45.25	8.22
50.80	7.86
57.02	7.45
64.00	7.10
71.84	7.21
80.63	7.12
90.51	7.47



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mn_ss_av.khh DAMPING 1.00 [%]

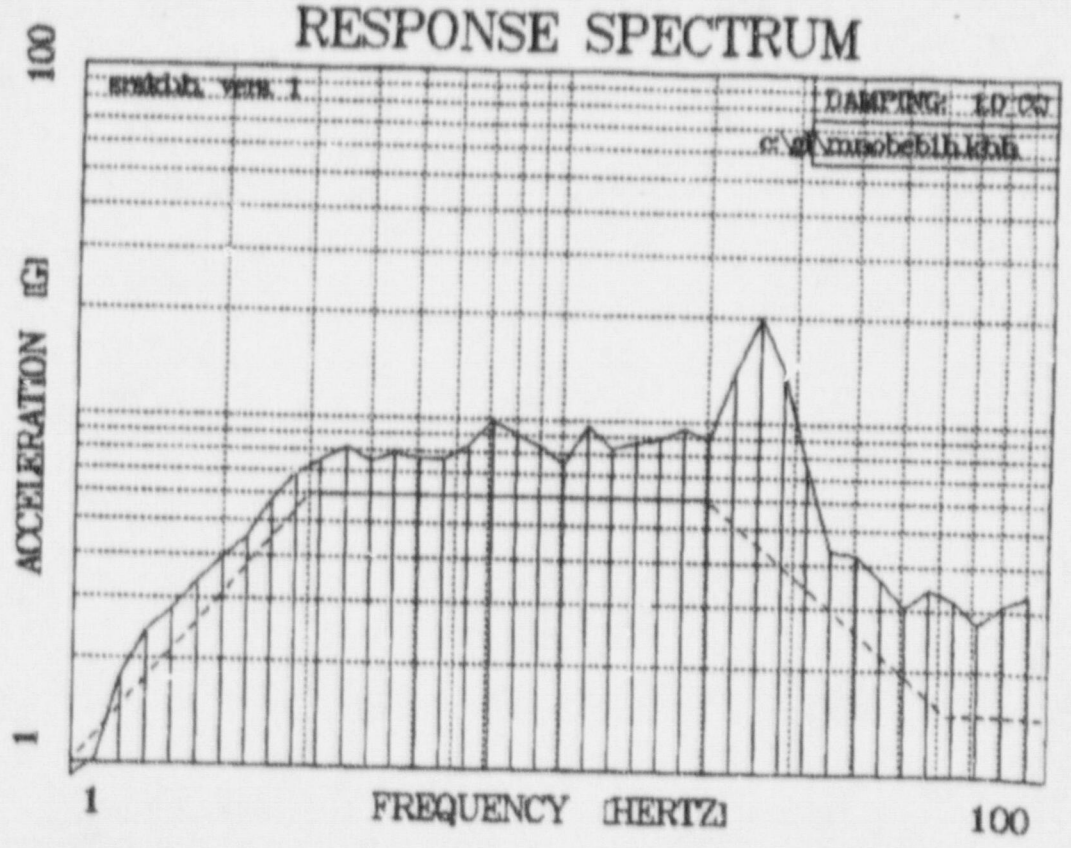
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.03
1.12	2.16
1.26	3.80
1.41	4.04
1.59	4.21
1.78	6.66
2.00	7.23
2.24	8.08
2.52	11.05
2.83	11.05
3.17	12.82
3.56	16.23
4.00	13.33
4.49	14.06
5.04	13.24
5.66	14.01
6.35	13.10
7.13	14.53
8.00	16.52
8.98	14.70
10.08	14.29
11.31	13.74
12.70	17.63
14.25	15.19
16.00	15.10
17.96	14.75
20.16	21.03
22.63	28.99
25.40	32.84
28.51	22.96
32.00	13.73
35.92	10.98
40.32	11.34
45.25	11.90
50.80	11.53
57.02	8.89
64.00	7.09
71.84	7.21
80.63	6.57
90.51	7.26



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobeb1h.khh DAMPING 1.00 [%]

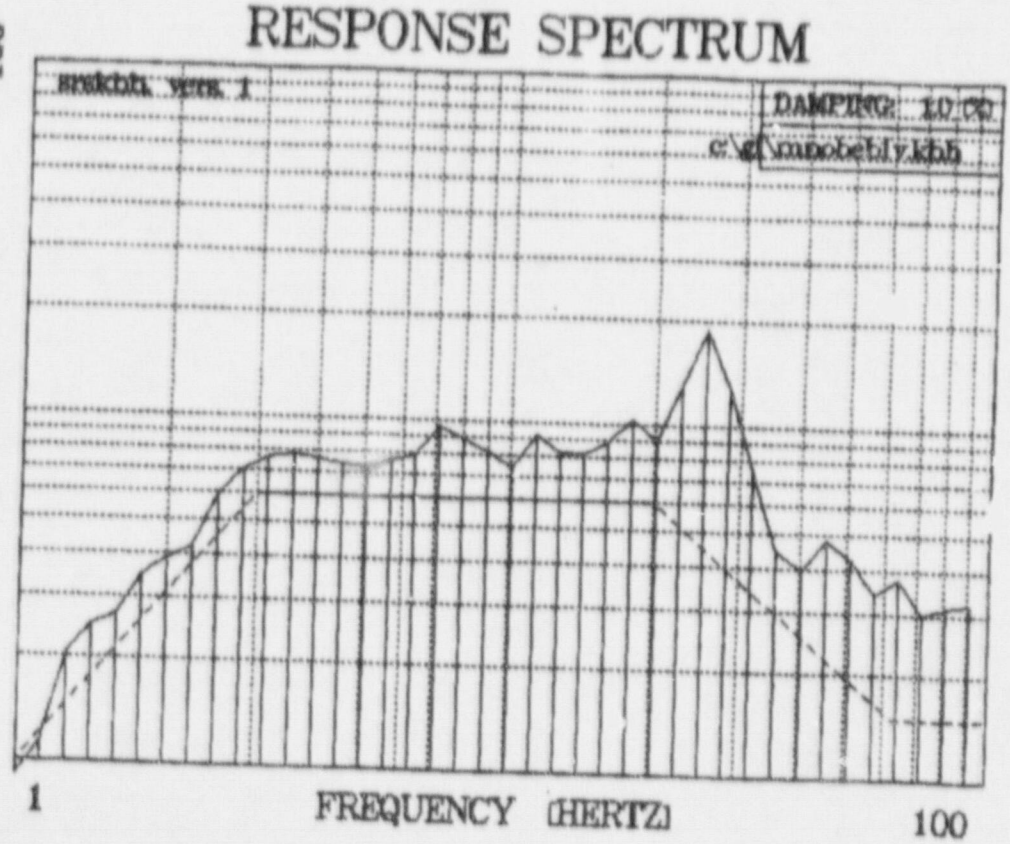
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.91
1.12	1.02
1.26	1.77
1.41	2.39
1.59	2.78
1.78	3.34
2.00	3.93
2.24	4.52
2.52	5.72
2.83	6.91
3.17	7.48
3.56	8.27
4.00	7.52
4.49	7.93
5.04	7.67
5.66	7.64
6.35	8.39
7.13	9.87
8.00	9.12
8.98	8.42
10.08	7.54
11.31	9.67
12.70	8.34
14.25	8.67
16.00	8.96
17.96	9.60
20.16	8.87
22.63	14.00
25.40	19.93
28.51	14.17
32.00	7.60
35.92	4.36
40.33	4.24
45.25	3.65
50.80	3.01
57.02	3.42
64.00	3.19
71.84	2.73
80.63	3.11
90.51	3.32



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobeb1v.khh DAMPING 1.00 [%]

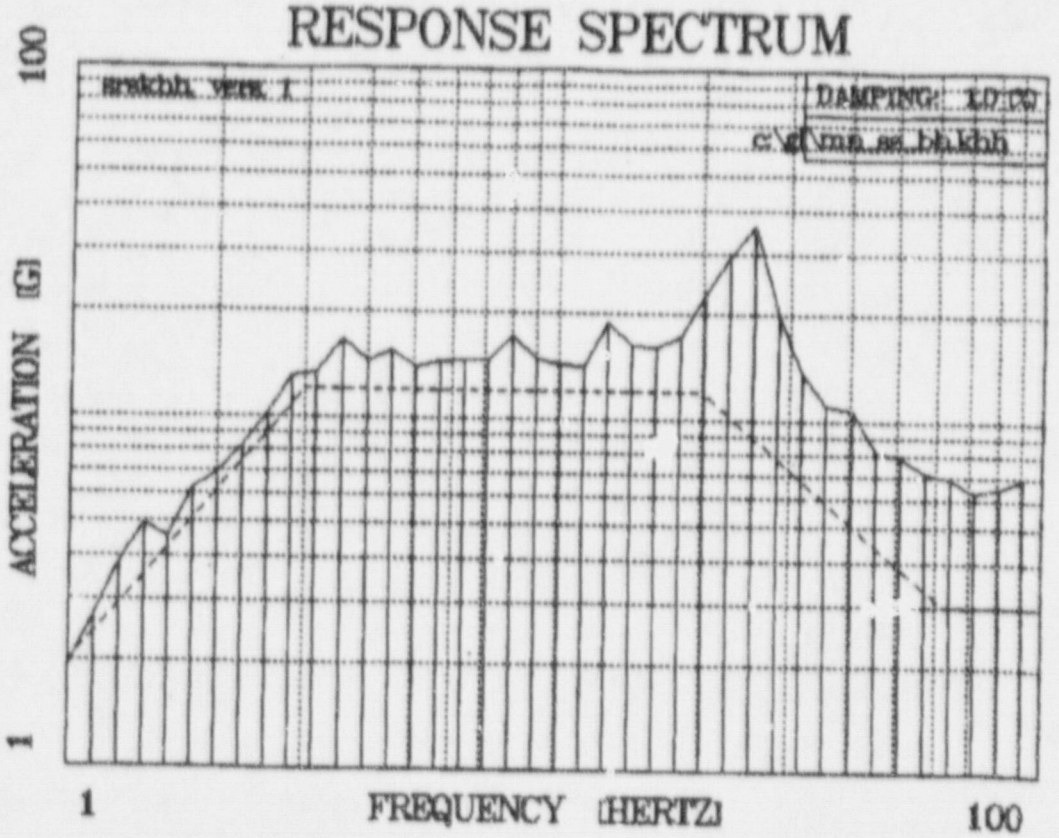
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.91
1.12	1.13
1.26	2.05
1.41	2.47
1.59	2.66
1.78	3.48
2.00	3.87
2.24	4.21
2.52	5.94
2.83	7.11
3.17	7.65
3.56	7.89
4.00	7.70
4.49	7.44
5.04	7.26
5.66	7.63
6.35	7.97
7.13	9.63
8.00	8.87
8.98	8.23
10.08	7.38
11.31	9.20
12.70	8.23
14.25	8.25
16.00	8.88
17.96	10.40
20.16	9.02
22.63	12.98
25.40	18.75
28.51	12.86
32.00	7.56
35.92	4.49
40.32	3.91
45.25	4.85
50.80	4.24
57.02	3.37
64.00	3.78
71.84	2.98
80.63	3.12
90.51	3.22



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mn_ss_bh.khh DAMPING 1.00 [%]

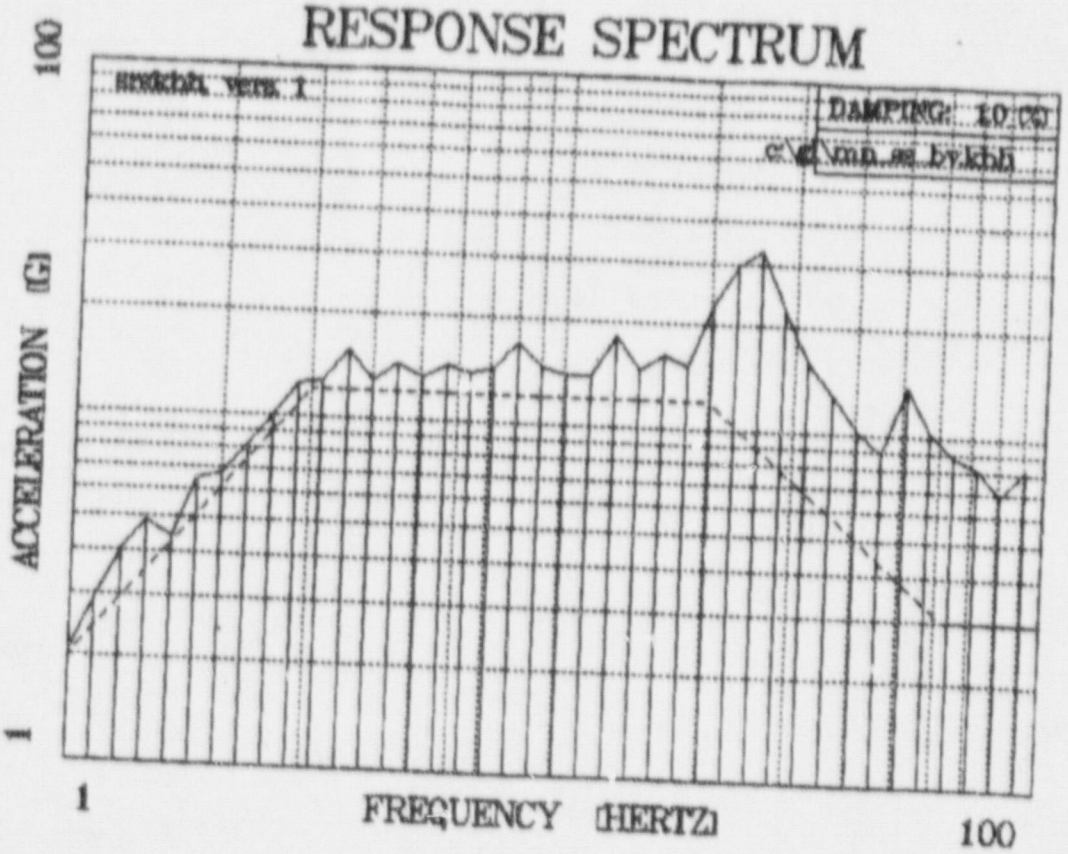
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.91
1.12	2.68
1.26	3.83
1.41	4.93
1.59	4.54
1.78	6.27
2.00	6.93
2.24	8.22
2.52	10.26
2.83	13.08
3.17	13.38
3.56	16.58
4.00	14.43
4.49	15.57
5.04	14.02
5.66	14.51
6.35	14.66
7.13	14.70
8.00	17.15
8.98	14.87
10.08	14.26
11.31	14.10
12.70	18.94
14.25	16.26
16.00	16.04
17.96	17.17
20.16	22.64
22.63	29.04
25.40	35.93
28.51	19.85
32.00	13.61
35.92	11.06
40.32	10.67
45.25	8.19
50.80	7.95
57.02	7.16
64.00	6.88
71.84	6.28
80.63	6.55
90.51	6.93



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mn_ss_bv.khh DAMPING 1.00 [%]

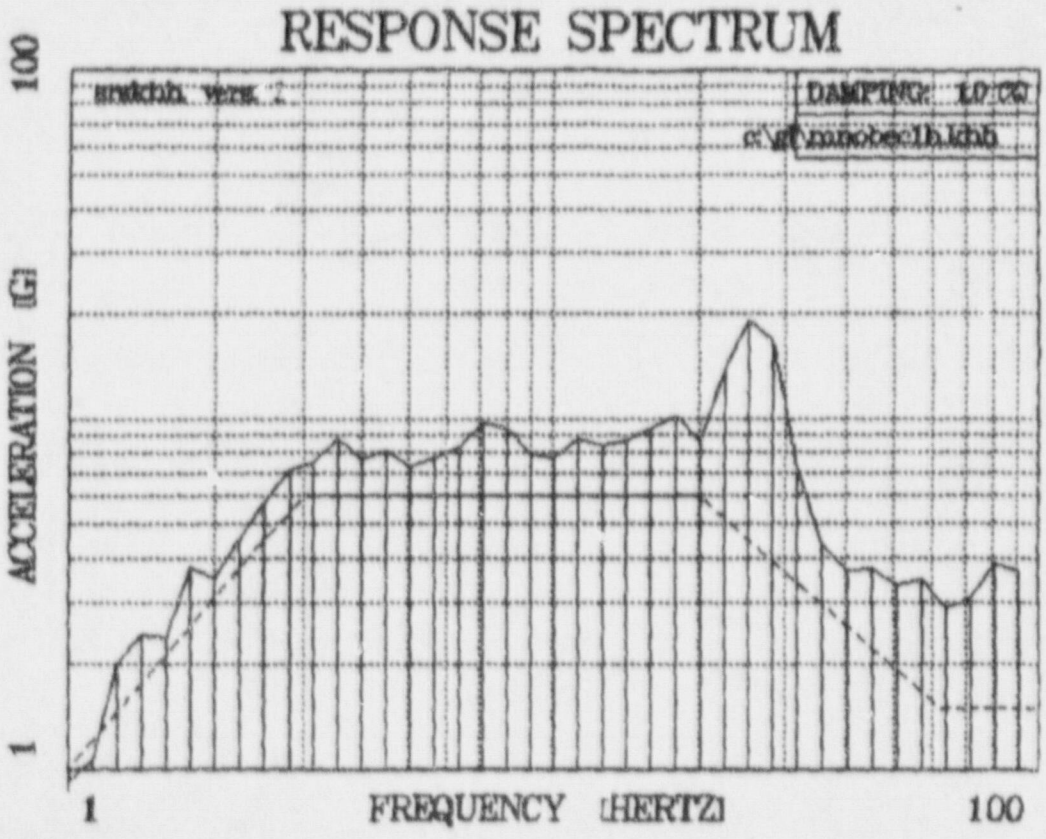
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.03
1.12	2.88
1.26	4.04
1.41	4.87
1.59	4.43
1.78	6.56
2.00	6.74
2.24	8.25
2.52	10.03
2.83	12.52
3.17	12.80
3.56	15.64
4.00	12.95
4.49	14.42
5.04	13.31
5.66	14.42
6.35	13.86
7.13	14.21
8.00	16.99
8.98	14.65
10.08	13.98
11.31	13.95
12.70	18.20
14.25	14.66
16.00	16.17
17.96	15.05
20.16	22.58
22.63	29.60
25.40	32.62
28.51	22.37
32.00	15.86
35.92	12.93
40.32	10.23
45.25	8.87
50.80	13.77
57.02	10.29
64.00	8.82
71.84	8.19
80.63	6.82
90.51	8.23



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobec1h.khh DAMPING 1.00 (%)

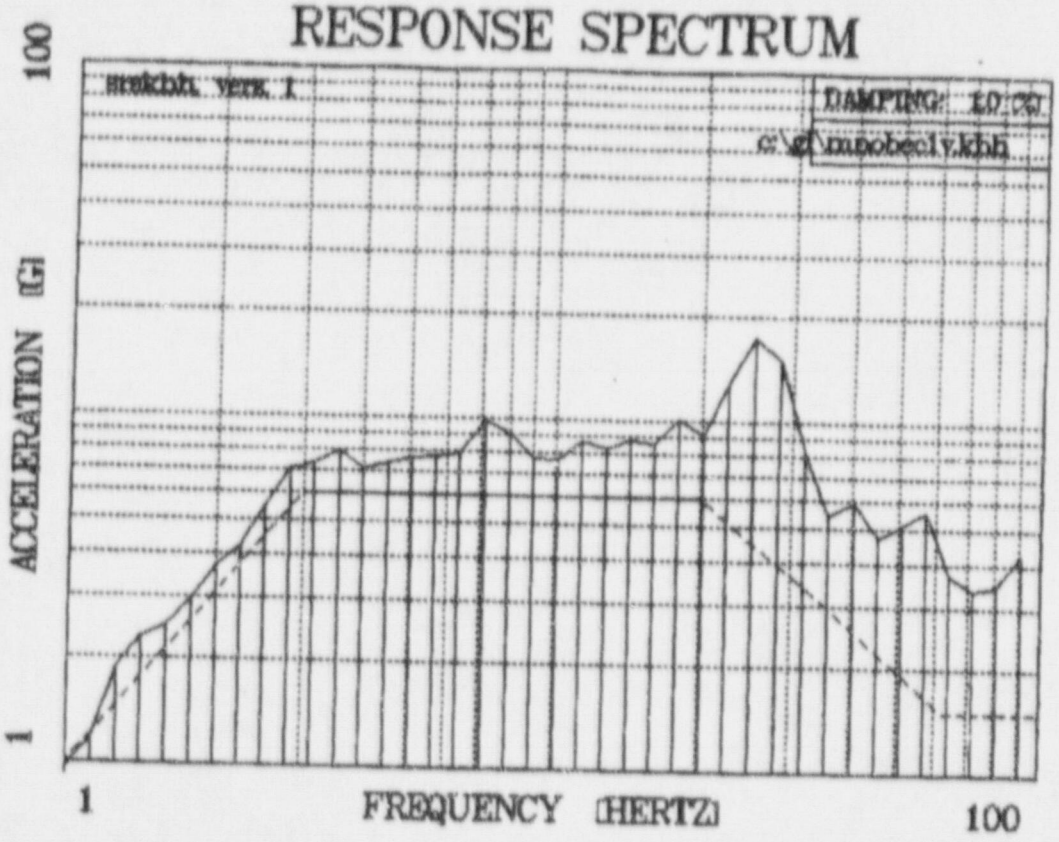
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.92
1.12	1.06
1.26	2.01
1.41	2.44
1.59	2.36
1.78	3.75
2.00	3.51
2.24	4.51
2.52	5.75
2.83	7.14
3.17	7.49
3.56	8.77
4.00	7.70
4.49	8.09
5.04	7.29
5.66	7.72
6.35	8.31
7.13	9.81
8.00	9.49
8.98	7.90
10.08	7.76
11.31	8.80
12.70	8.40
14.25	8.73
16.00	9.48
17.96	10.23
20.16	8.57
22.63	13.93
25.40	19.04
28.51	16.80
32.00	7.24
35.92	4.37
40.32	3.68
45.25	3.71
50.80	3.33
57.02	3.48
64.00	2.89
71.84	3.05
80.63	3.85
90.51	3.67



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobec1v.khh DAMPING 1.00 [%]

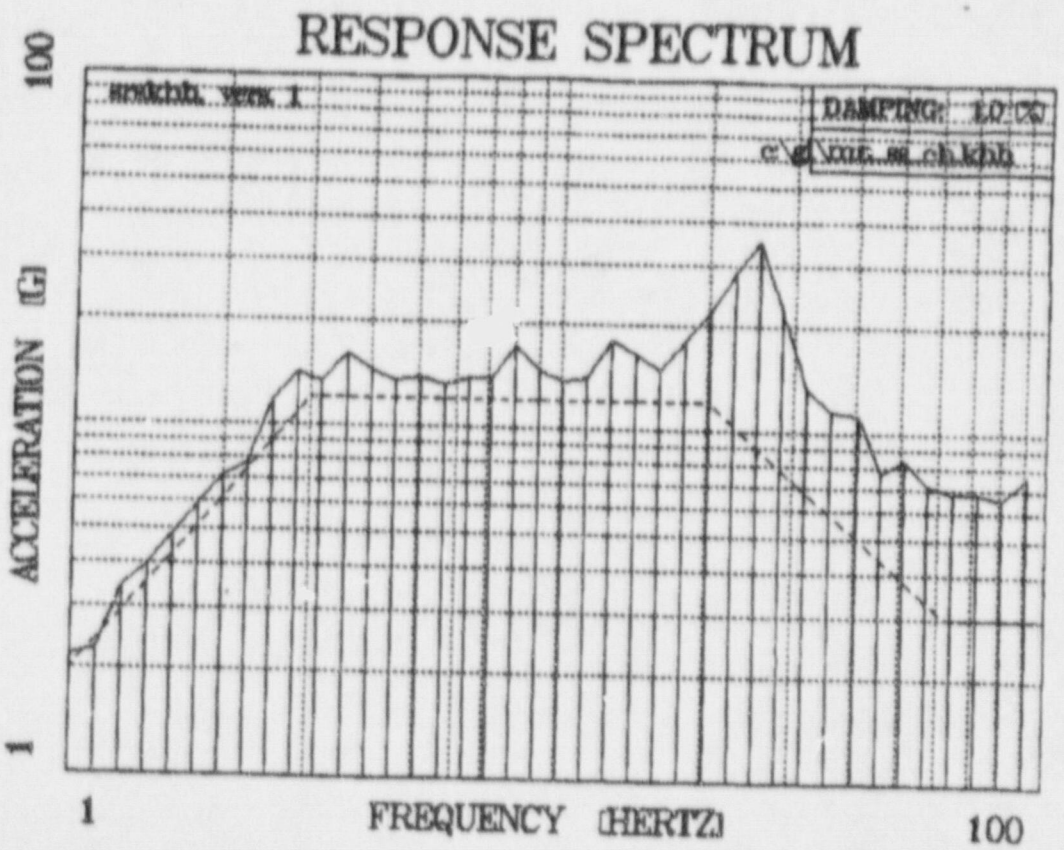
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.97
1.12	1.18
1.26	1.88
1.41	2.30
1.59	2.48
1.78	2.96
2.00	3.67
2.24	4.22
2.52	5.47
2.83	7.09
3.17	7.36
3.56	8.01
4.00	7.10
4.49	7.39
5.04	7.72
5.66	7.72
6.35	7.91
7.13	9.93
8.00	9.07
8.98	7.74
10.08	7.70
11.31	8.72
12.70	8.36
14.25	8.86
16.00	8.58
17.96	10.16
20.16	9.15
22.63	12.93
25.40	17.42
28.51	14.92
32.00	8.33
35.92	5.41
40.32	5.95
45.25	4.74
50.80	5.15
57.02	5.64
64.00	3.71
71.84	3.33
80.63	3.45
90.51	4.25



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mn_ss_ch.khh DAMPING 1.00 [%]

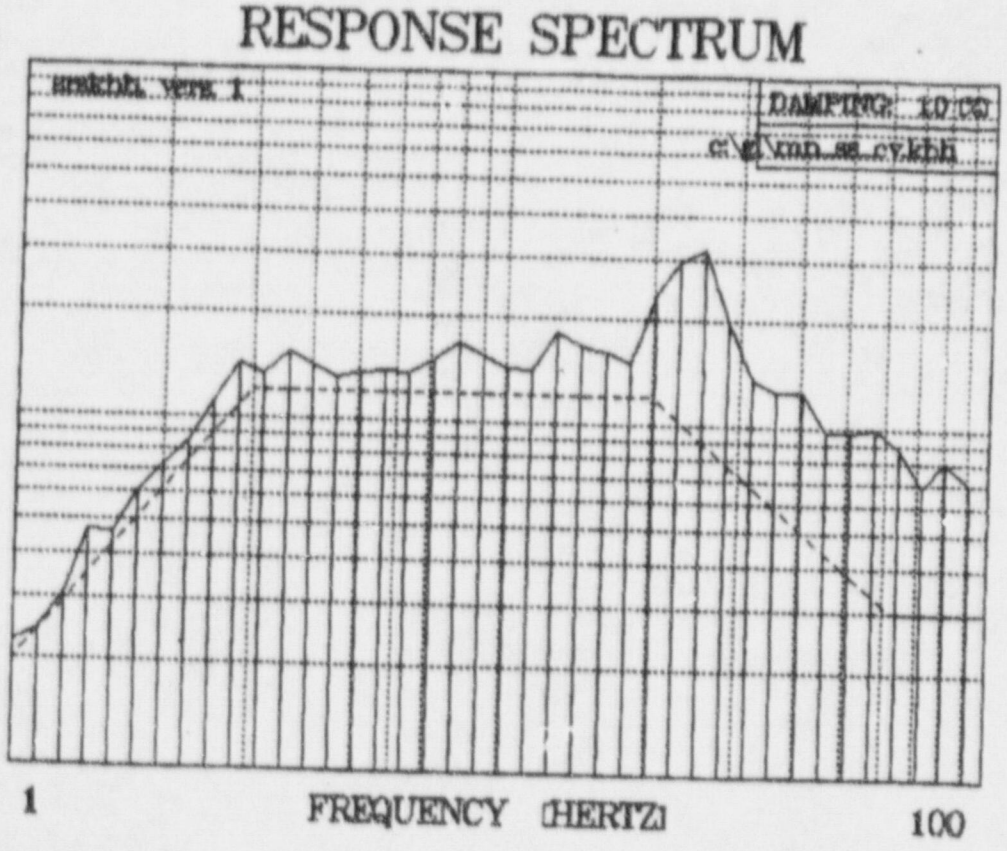
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.17
1.12	2.27
1.26	3.42
1.41	3.93
1.59	4.82
1.78	5.89
2.00	7.13
2.24	7.80
2.52	11.80
2.83	14.05
3.17	13.28
3.56	16.10
4.00	14.52
4.49	13.54
5.04	13.82
5.66	13.20
6.35	13.85
7.13	13.79
8.00	17.13
8.98	14.67
10.08	13.69
11.31	13.90
12.70	18.05
14.25	16.37
16.00	14.86
17.96	17.97
20.16	21.86
22.63	28.65
25.40	34.97
28.51	22.20
32.00	13.34
35.92	11.44
40.32	11.24
45.25	7.77
50.80	8.42
57.02	7.20
64.00	6.87
71.84	6.82
80.63	6.55
90.51	7.63



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mn_ss_cv.khh DAMPING 1.00 [%]

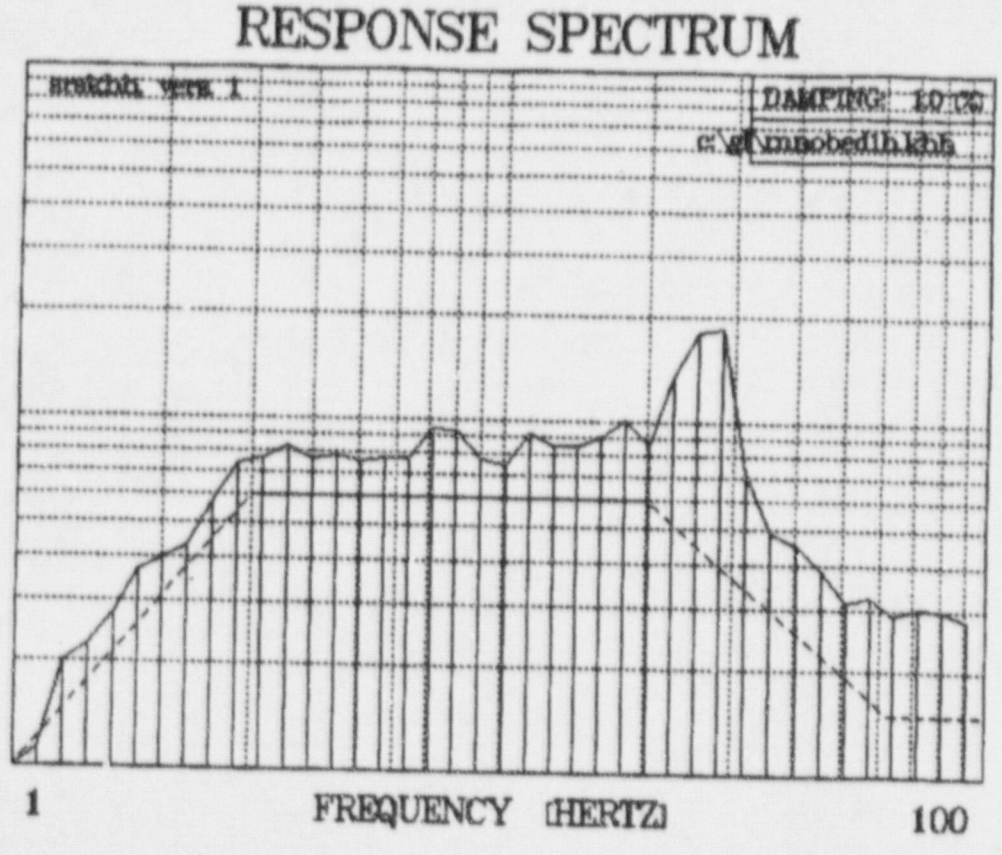
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.25
1.12	2.43
1.26	3.07
1.41	4.68
1.59	4.60
1.78	6.09
2.00	7.22
2.24	8.53
2.52	11.11
2.83	14.28
3.17	13.29
3.56	15.50
4.00	14.31
4.49	13.21
5.04	13.68
5.66	13.85
6.35	13.57
7.13	14.98
8.00	16.75
8.98	15.50
10.08	14.31
11.31	14.12
12.70	18.23
14.25	16.61
16.00	16.01
17.96	15.02
20.16	23.51
22.63	29.47
25.40	32.12
28.51	19.64
32.00	13.68
35.92	12.60
40.32	12.65
45.25	9.77
50.80	9.78
57.02	10.02
64.00	8.77
71.84	6.87
80.63	8.16
90.51	7.02



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobed1h.khh DAMPING 1.00 [%]

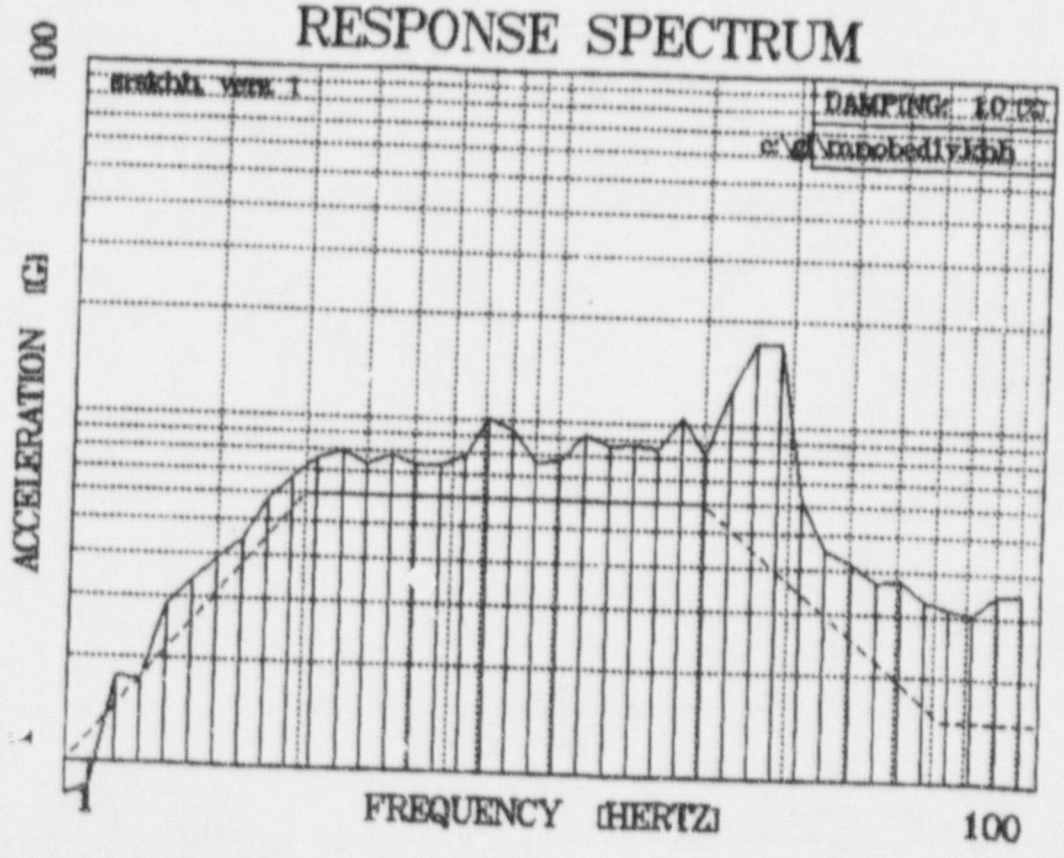
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.00
1.12	1.12
1.26	2.01
1.41	2.25
1.59	2.77
1.78	3.69
2.00	4.00
2.24	4.30
2.52	5.73
2.83	7.38
3.17	7.67
3.56	8.33
4.00	7.64
4.49	7.82
5.04	7.58
5.66	7.78
6.35	7.81
7.13	9.46
8.00	9.30
8.98	7.77
10.08	7.52
11.31	9.22
12.70	8.47
14.25	8.50
16.00	9.00
17.96	10.09
20.16	8.57
22.63	13.49
25.40	18.05
28.51	18.37
32.00	7.23
35.92	4.91
40.32	4.50
45.25	3.84
50.80	3.14
57.02	3.23
64.00	2.87
71.84	3.01
80.63	3.00
90.51	2.79



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobed1v.khh DAMPING 1.00 [%]

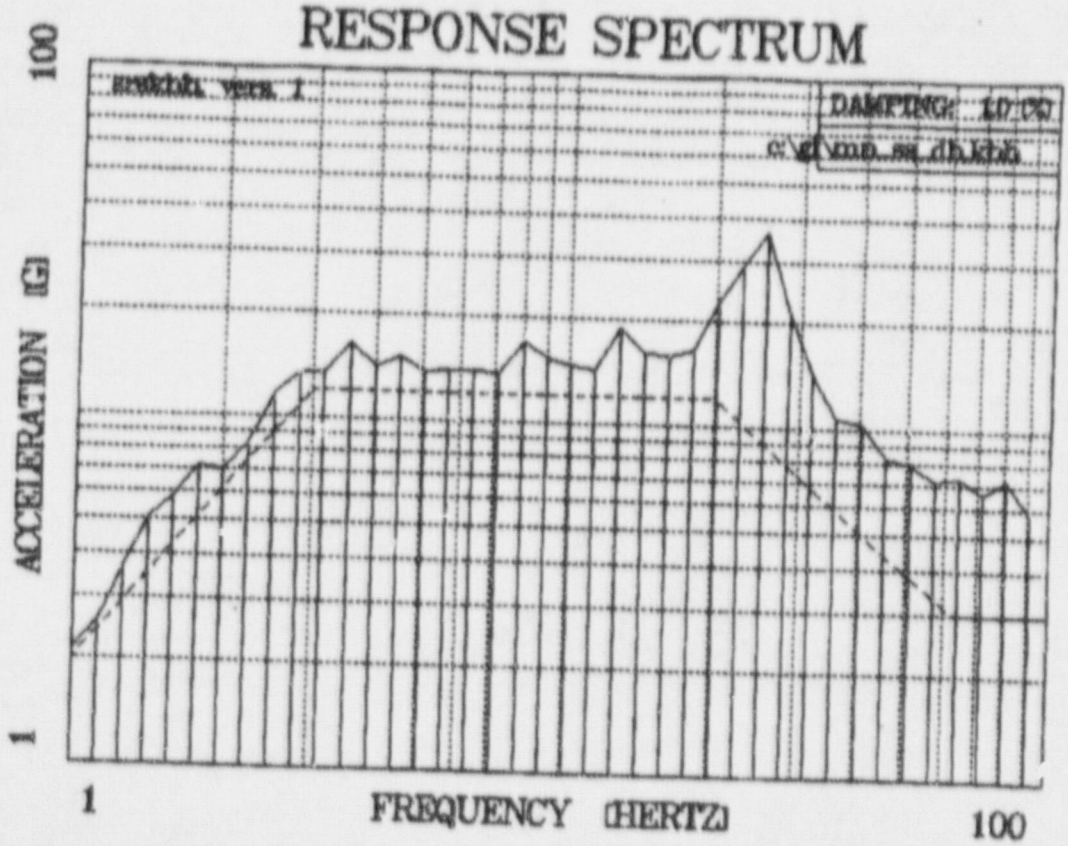
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.81
1.12	0.85
1.26	1.76
1.41	1.75
1.59	2.84
1.78	3.36
2.00	3.90
2.24	4.40
2.52	5.72
2.83	6.72
3.17	7.56
3.56	8.00
4.00	7.37
4.49	7.86
5.04	7.45
5.66	7.46
6.35	7.81
7.13	10.12
8.00	9.43
8.98	7.69
10.08	7.75
11.31	9.23
12.70	8.63
14.25	8.68
16.00	8.51
17.96	10.53
20.16	8.24
22.63	12.72
25.40	17.09
28.51	17.18
32.00	6.24
35.92	4.52
40.32	4.16
45.25	3.67
50.80	3.76
57.02	3.28
64.00	3.13
71.84	3.03
80.63	3.45
90.51	3.47



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mn_ss_dh.khh DAMPING 1.00 [%]

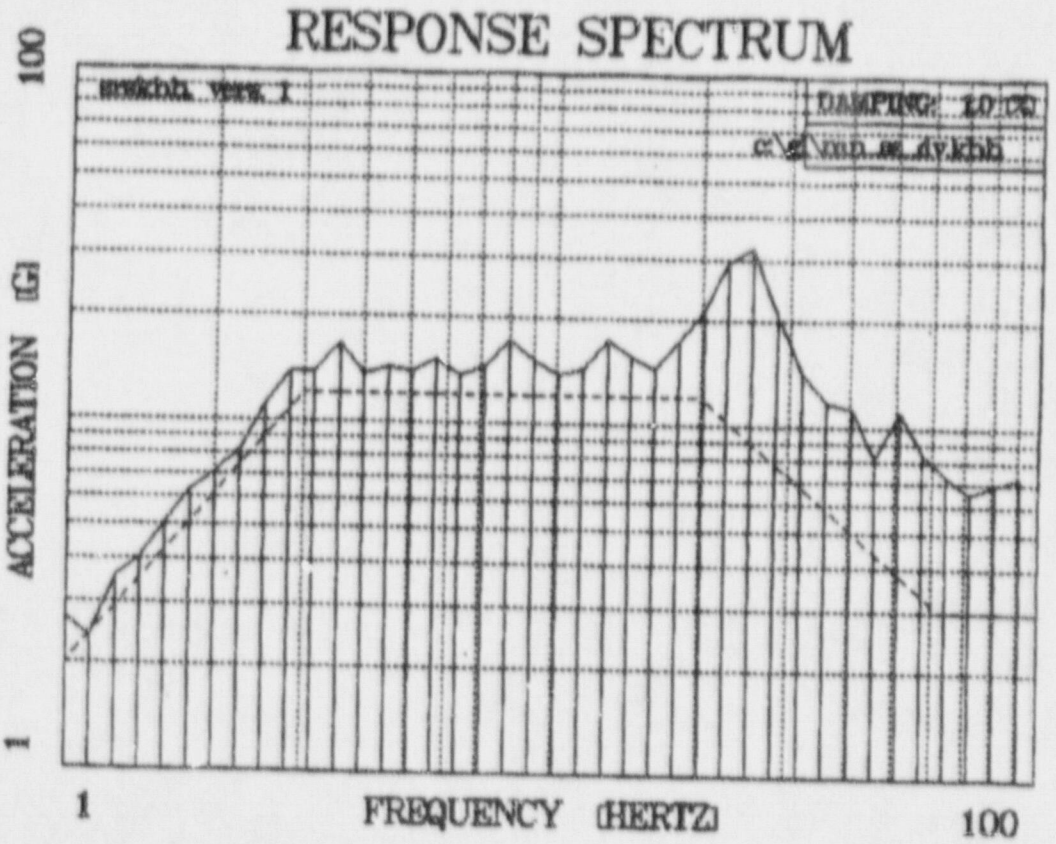
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.12
1.12	2.55
1.26	3.65
1.41	5.07
1.59	5.82
1.78	7.14
2.00	6.98
2.24	8.34
2.52	11.63
2.83	13.43
3.17	13.47
3.56	16.34
4.00	14.10
4.49	15.16
5.04	13.80
5.66	14.01
6.35	13.92
7.13	13.86
8.00	16.98
8.98	15.25
10.08	14.59
11.31	14.29
12.70	18.94
14.25	16.05
16.00	15.91
17.96	16.34
20.16	22.69
22.63	28.97
25.40	36.27
28.51	21.13
32.00	14.29
35.92	10.72
40.32	10.35
45.25	8.28
50.80	7.91
57.02	7.15
64.00	7.31
71.84	6.59
80.63	7.23
90.51	5.82



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mn_ss_dv.khh DAMPING 1.00 [%]

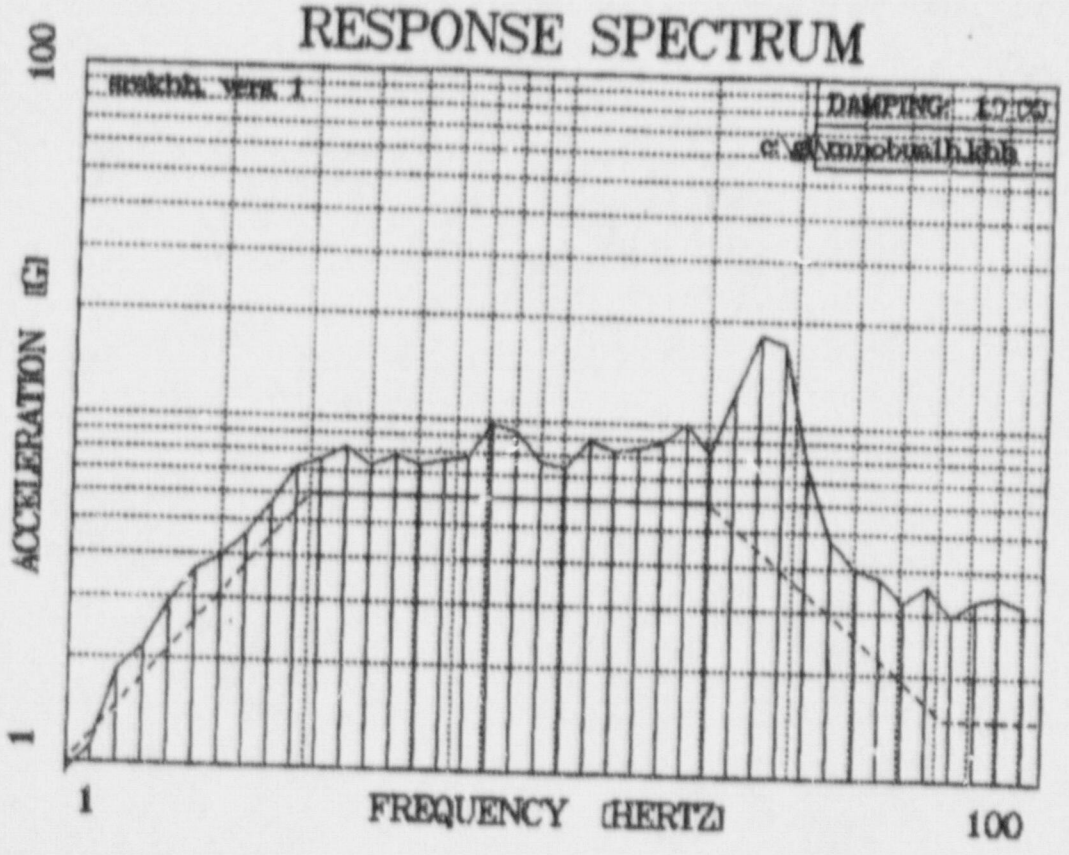
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.68
1.12	2.37
1.26	3.56
1.41	4.04
1.59	5.10
1.78	6.33
2.00	7.09
2.24	8.21
2.52	11.15
2.83	13.80
3.17	13.86
3.56	16.50
4.00	13.71
4.49	14.33
5.04	13.95
5.66	15.17
6.35	13.64
7.13	14.41
8.00	17.18
8.98	15.11
10.08	13.73
11.31	14.25
12.70	17.45
14.25	15.64
16.00	14.47
17.96	17.34
20.16	21.18
22.63	29.08
25.40	32.34
28.51	20.65
32.00	14.09
35.92	11.79
40.32	11.20
45.25	8.20
50.80	11.04
57.02	8.51
64.00	7.35
71.84	6.53
80.63	6.91
90.51	7.28



Analysis Code: SRSKEH Version 1

DATA FILE c:\gl\mnobualh.khh DAMPING 1.00 [%]

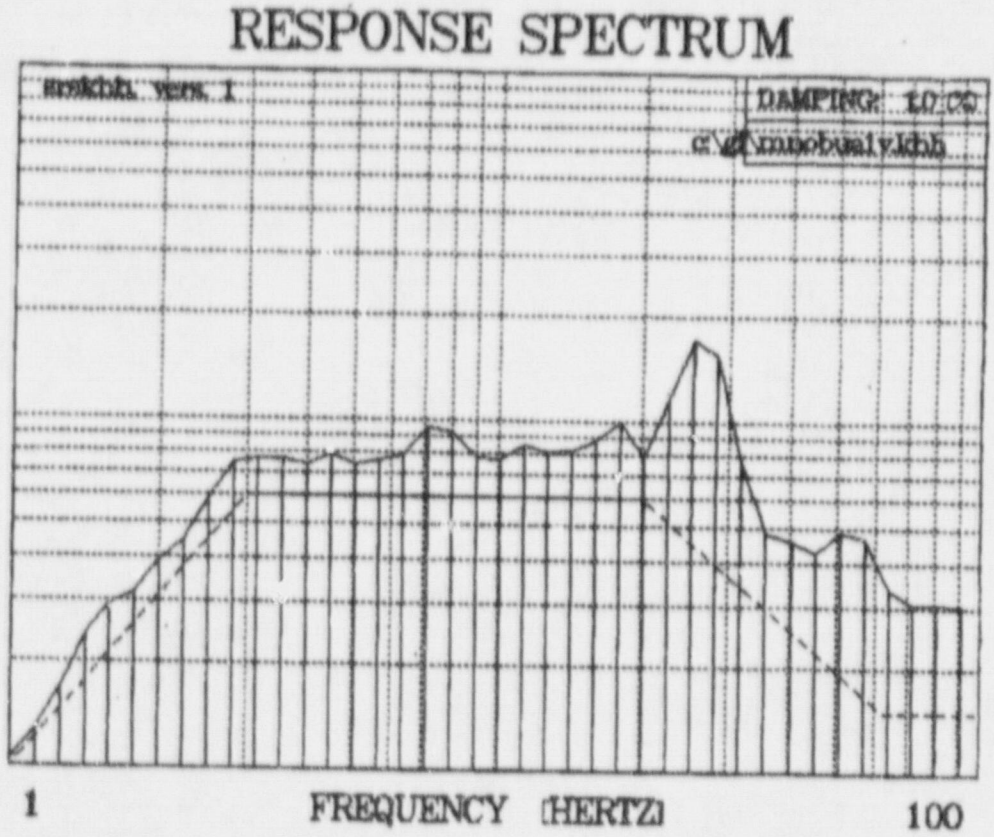
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.95
1.12	1.10
1.26	1.85
1.41	2.17
1.59	2.91
1.78	3.59
2.00	3.92
2.24	4.59
2.52	5.60
2.83	7.14
3.17	7.62
3.56	8.25
4.00	7.34
4.49	7.82
5.04	7.40
5.66	7.66
6.35	7.84
7.13	9.77
8.00	9.32
8.98	7.71
10.08	7.39
11.31	8.88
12.70	8.36
14.25	8.53
16.00	8.90
17.96	10.16
20.16	8.30
22.63	12.44
25.40	18.14
28.51	17.10
32.00	7.75
35.92	4.81
40.32	4.00
45.25	3.74
50.80	3.20
57.02	3.58
64.00	2.95
71.84	3.28
80.63	3.38
90.51	3.18



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobualv.khh DAMPING 1.00 [%]

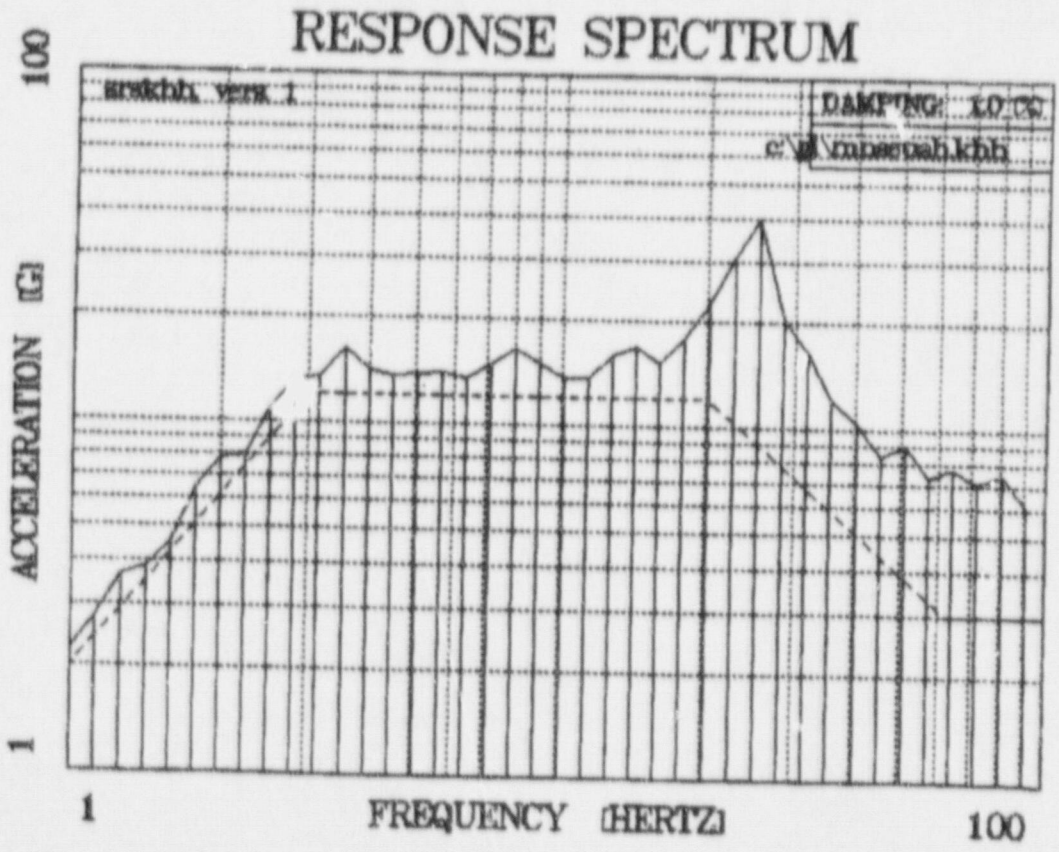
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.05
1.12	1.28
1.26	1.68
1.41	2.40
1.59	2.91
[illegible]	3.17
2.00	3.88
2.24	4.47
2.52	5.92
2.83	7.49
3.17	7.72
3.56	7.68
4.00	7.40
4.49	7.96
5.04	7.43
5.66	7.68
6.35	7.92
7.13	9.55
8.00	9.23
8.98	7.86
10.08	7.80
11.31	8.55
12.70	8.09
14.25	8.22
16.00	8.80
17.96	9.95
20.16	7.96
22.63	11.65
25.40	17.23
28.51	15.44
32.00	7.75
35.92	4.83
40.32	4.60
45.25	4.28
50.80	4.90
57.02	4.68
64.00	3.33
71.84	3.05
80.63	3.04
90.51	3.02



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssuah.khh DAMPING 1.00 [%]

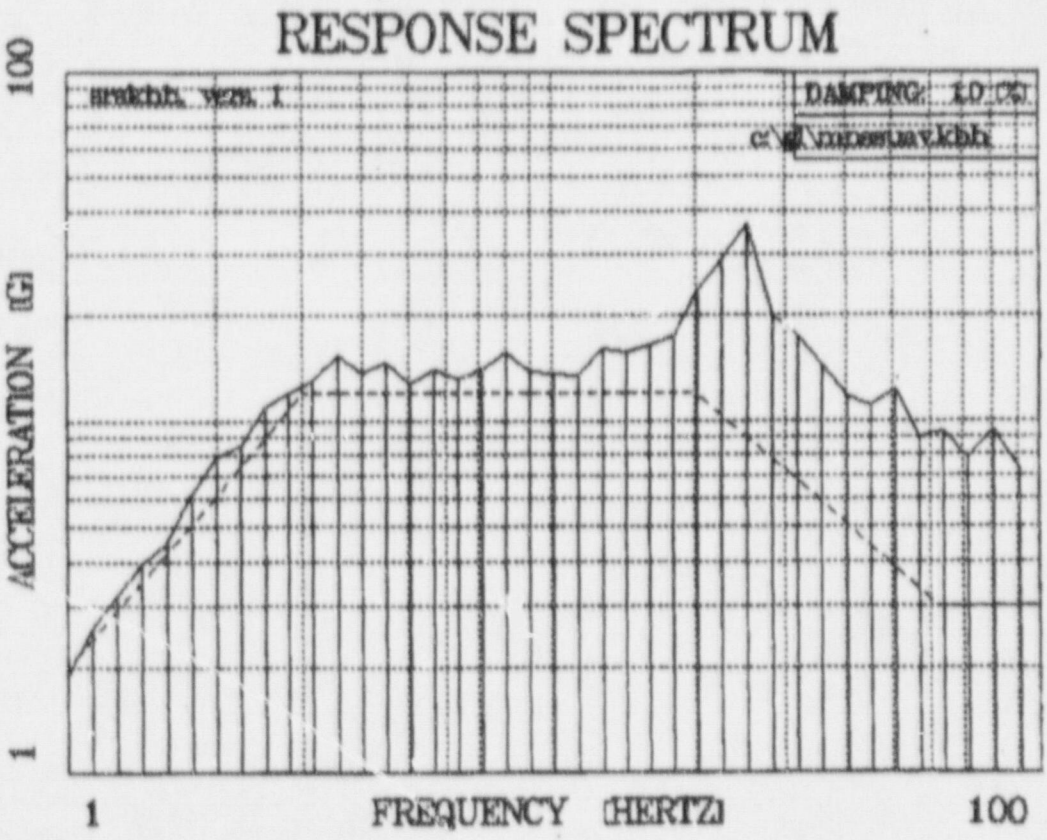
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.21
1.12	2.75
1.26	3.64
1.41	3.86
1.59	4.51
1.78	6.45
2.00	7.82
2.24	8.05
2.52	10.97
2.83	13.19
3.17	13.49
3.56	16.27
4.00	14.07
4.49	13.68
5.04	13.88
5.66	13.92
6.35	13.55
7.13	14.81
8.00	16.50
8.98	14.89
10.08	13.61
11.31	13.62
12.70	15.89
14.25	16.85
16.00	15.18
17.96	17.73
20.16	22.27
22.63	30.75
25.40	39.70
28.51	20.42
32.00	16.46
35.92	12.18
40.32	10.31
45.25	8.42
50.80	8.98
57.02	7.32
64.00	7.77
71.84	7.05
80.63	7.46
90.51	6.17



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssuav.khh DAMPING 1.00 [%]

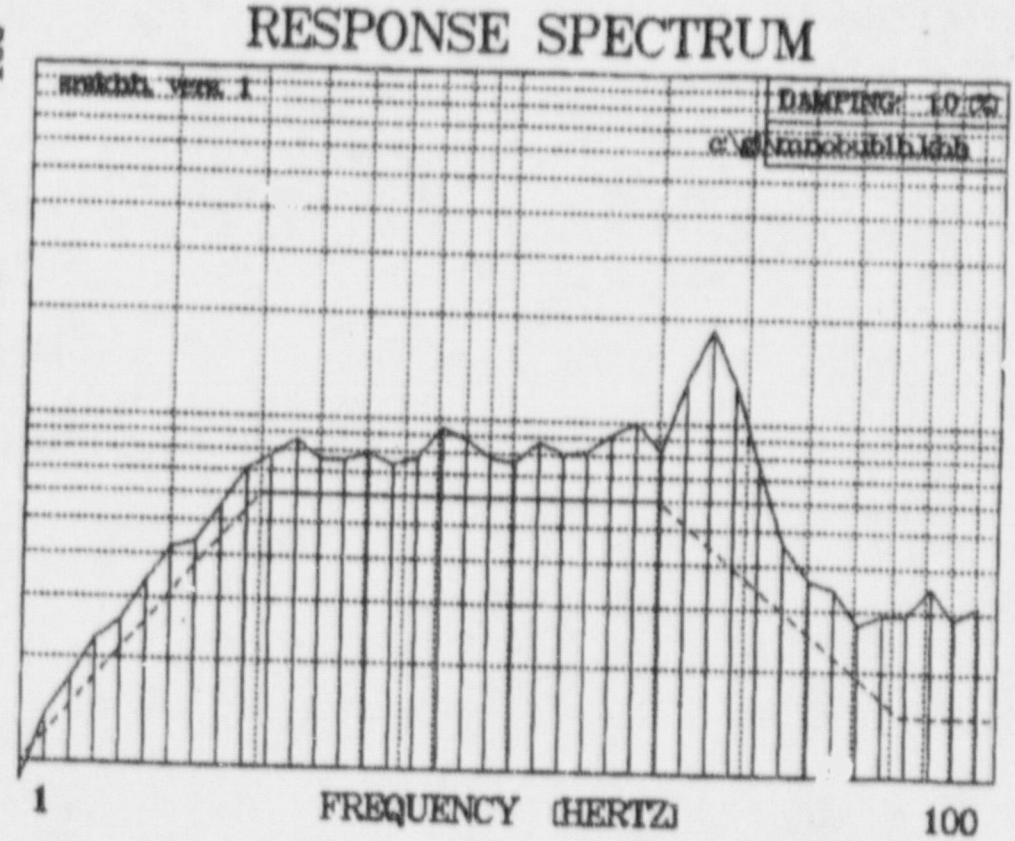
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.91
1.12	2.57
1.26	3.20
1.41	3.96
1.59	4.50
1.78	6.23
2.00	7.98
2.24	8.55
2.52	11.02
2.83	12.05
3.17	13.10
3.56	15.35
4.00	13.66
4.49	14.68
5.04	12.74
5.66	13.91
6.35	13.21
7.13	14.04
8.00	15.65
8.98	13.75
10.08	13.72
11.31	13.51
12.70	15.96
14.25	15.75
16.00	16.46
17.96	17.39
20.16	23.57
22.63	26.93
25.40	36.46
28.51	20.01
32.00	17.29
35.92	14.46
40.32	11.76
45.25	11.12
50.80	12.29
57.02	9.05
64.00	9.33
71.84	7.83
80.63	9.47
90.51	7.35



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobub1h.khh DAMPING 1.00 [%]

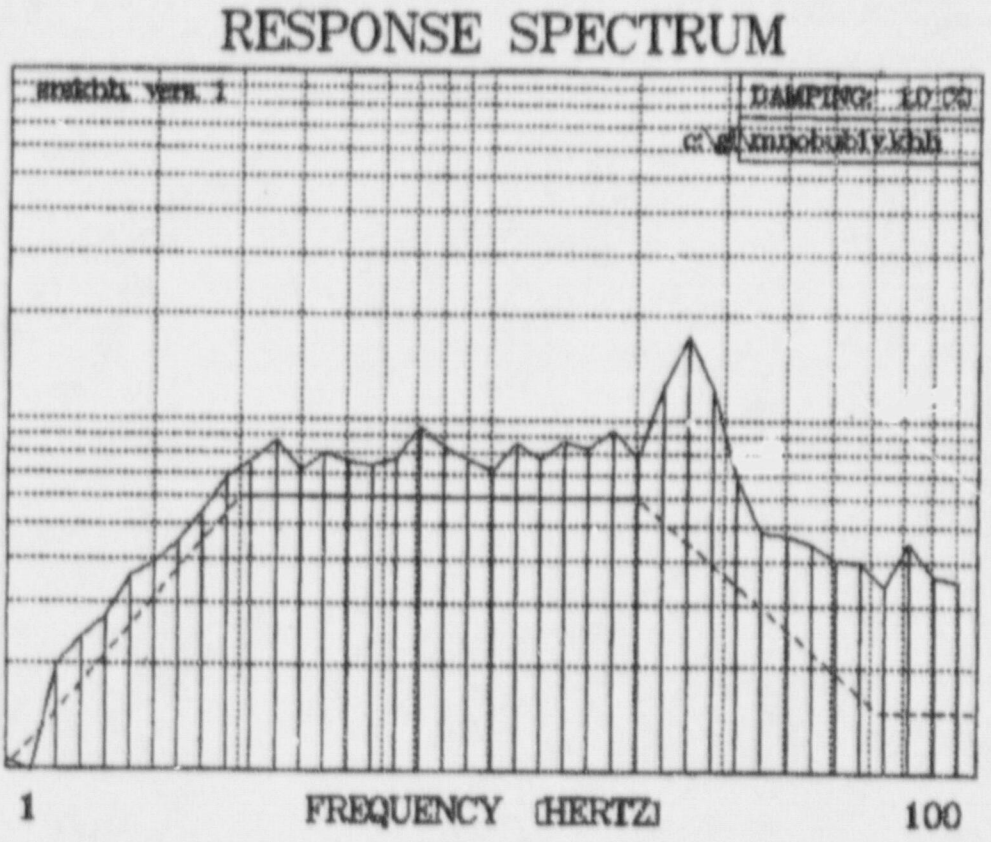
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.88
1.12	1.37
1.26	1.74
1.41	2.27
1.59	2.57
1.78	3.35
2.00	4.17
2.24	4.36
2.52	5.59
2.83	7.07
3.17	7.75
3.56	8.57
4.00	7.57
4.49	7.61
5.04	7.96
5.66	7.44
6.35	7.74
7.13	9.46
8.00	8.84
8.98	7.82
10.08	7.63
11.31	8.70
12.70	8.10
14.25	8.22
16.00	9.26
17.96	10.01
20.16	8.31
22.63	13.12
25.40	18.62
28.51	13.09
32.00	7.70
35.92	4.64
40.32	3.64
45.25	3.44
50.80	2.73
57.02	2.91
64.00	2.91
71.84	3.50
80.63	2.85
90.51	3.13



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobub1v.khh DAMPING 1.00 [%]

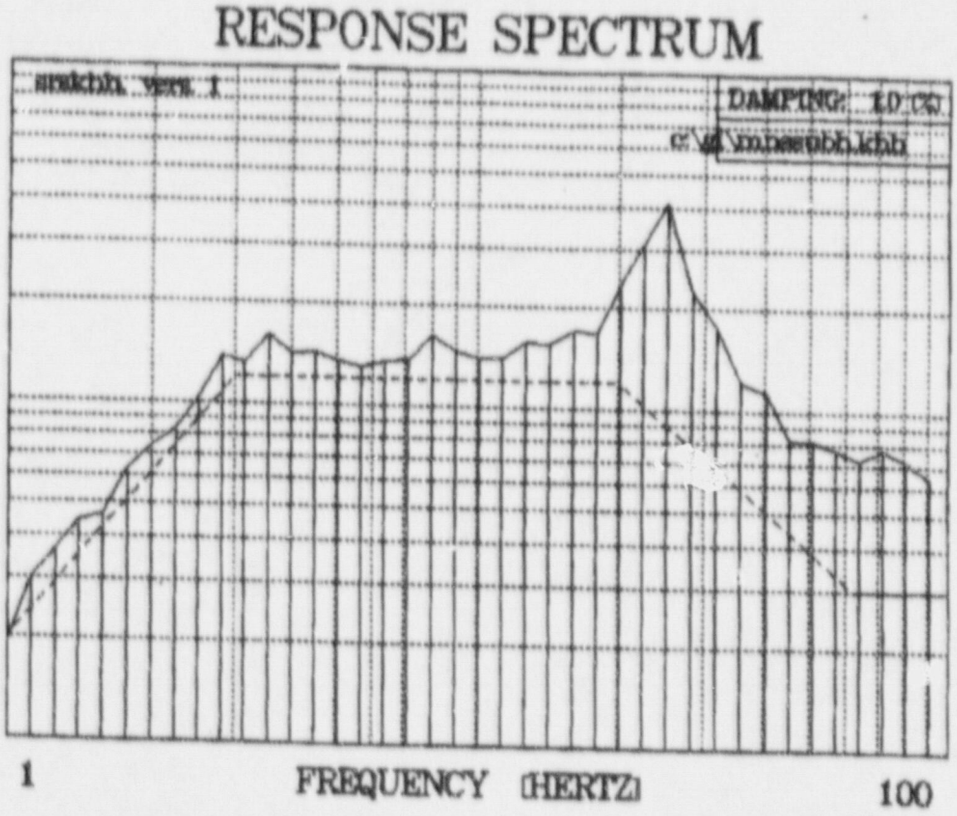
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.06
1.12	0.98
1.26	1.98
1.41	2.38
1.59	2.71
1.78	3.53
2.00	3.88
2.24	4.47
2.52	5.43
2.83	6.86
3.17	7.55
3.56	8.69
4.00	7.18
4.49	8.01
5.04	7.56
5.66	7.40
6.35	7.73
7.13	9.56
8.00	8.41
8.98	7.72
10.08	7.20
11.31	8.59
12.70	7.78
14.25	8.68
16.00	8.32
17.96	9.35
20.16	7.83
22.63	12.43
25.40	17.42
28.51	12.27
32.00	6.89
35.92	4.83
40.32	4.74
45.25	4.48
50.80	4.04
57.02	3.98
64.00	3.40
71.84	4.52
80.63	3.64
90.51	3.50



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssubh.khh DAMPING 1.00 [%]

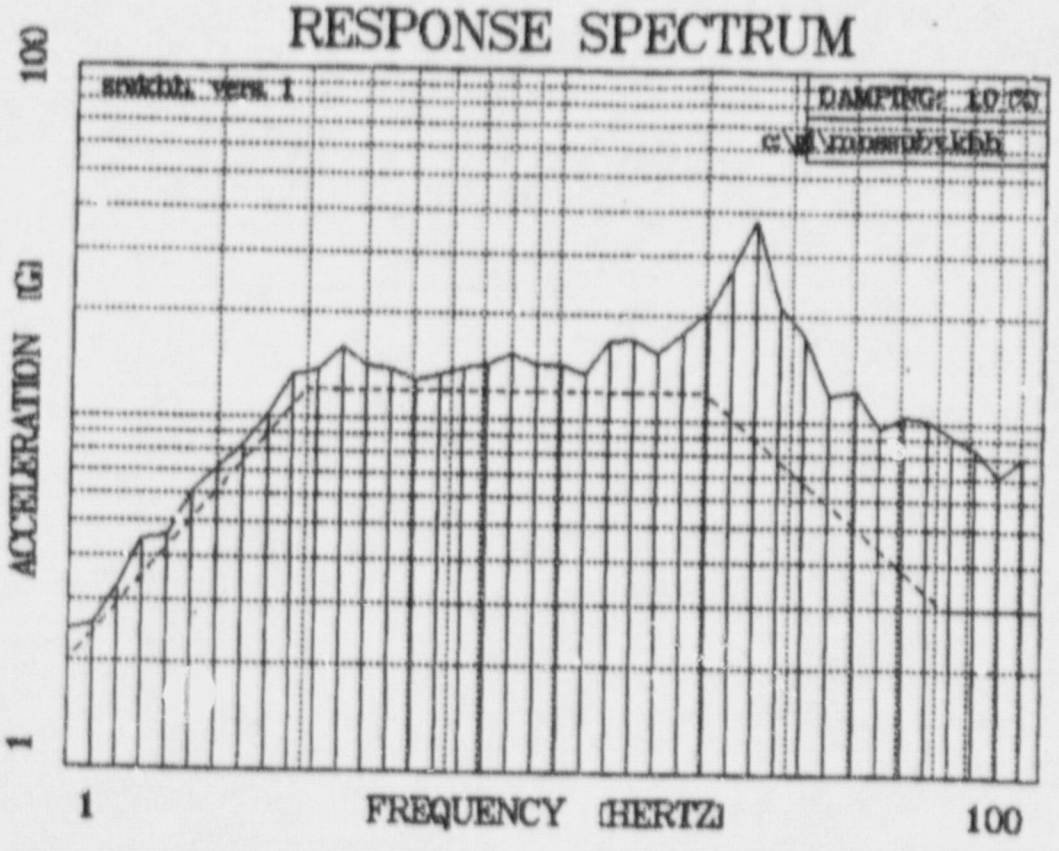
FREQUENCY (HERTZ)	ACCELERATION (G)
1.00	1.94
1.12	2.97
1.26	3.64
1.41	4.41
1.59	4.63
1.78	6.29
2.00	7.43
2.24	8.36
2.52	10.40
2.83	13.80
3.17	13.12
3.56	16.11
4.00	14.19
4.49	14.21
5.04	13.49
5.66	13.01
6.35	13.50
7.13	13.58
8.00	16.24
8.98	14.55
10.08	13.91
11.31	13.93
12.70	15.64
14.25	15.51
16.00	16.90
17.96	16.69
20.16	23.37
22.63	30.96
25.40	41.32
28.51	22.26
32.00	17.53
35.92	12.20
40.32	11.29
45.25	8.18
50.80	8.23
57.02	7.77
64.00	7.22
71.84	7.77
80.63	7.23
90.51	6.45



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssubv.khh DAMPING 1.00 [%]

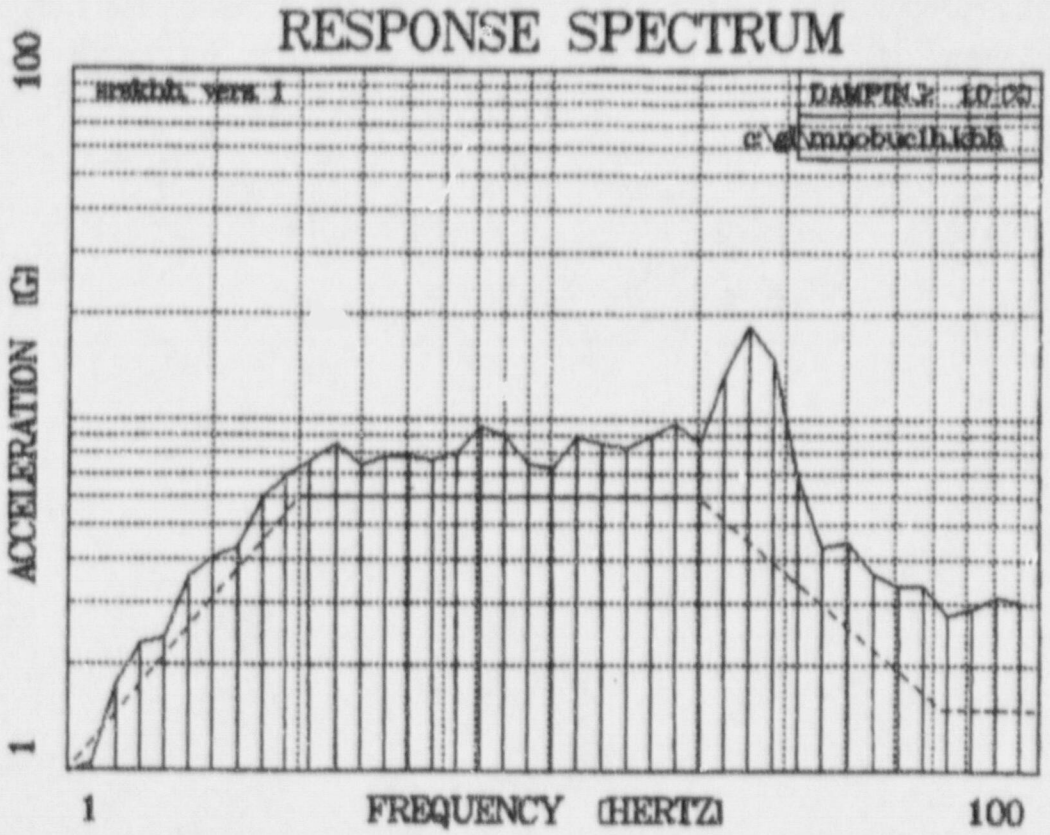
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.47
1.12	2.55
1.26	3.29
1.41	4.46
1.59	4.55
1.78	6.09
2.00	7.20
2.24	8.34
2.52	10.26
2.83	13.20
3.17	13.68
3.56	15.91
4.00	14.17
4.49	13.80
5.04	12.83
5.66	13.37
6.35	14.03
7.13	14.27
8.00	15.37
8.98	14.30
10.08	14.29
11.31	13.43
12.70	16.83
14.25	17.00
16.00	15.57
17.96	17.71
20.16	20.48
22.63	27.17
25.40	37.51
28.51	21.43
32.00	17.62
35.92	11.87
40.32	12.29
45.25	9.66
50.80	10.43
57.02	10.19
64.00	9.28
71.84	8.53
80.63	7.10
90.51	7.99



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mv\obuc1h.khh DAMPING 1.00 [%]

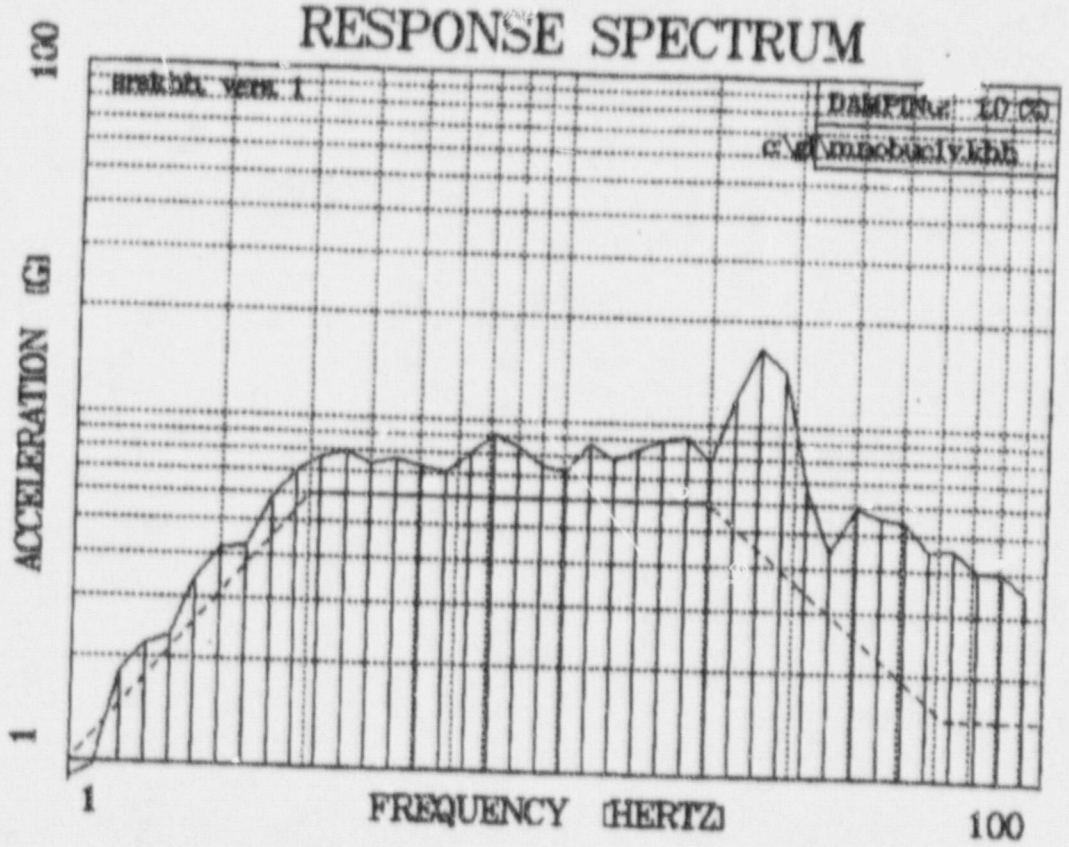
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.99
1.12	1.04
1.26	1.76
1.41	2.28
1.59	2.38
1.78	3.56
2.00	4.03
2.24	4.33
2.52	5.97
2.83	6.95
3.17	7.61
3.56	8.19
4.00	7.44
4.49	7.89
5.04	7.84
5.66	7.67
6.35	8.05
7.13	9.54
8.00	9.00
8.98	7.49
10.08	7.22
11.31	8.94
12.70	8.50
14.25	8.31
16.00	8.99
17.96	9.74
20.16	8.56
22.63	13.28
25.40	18.47
28.51	14.94
32.00	6.91
35.92	4.32
40.32	4.48
45.25	3.64
50.80	3.35
57.02	3.34
64.00	2.75
71.84	2.87
80.63	3.14
90.51	3.01



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobuc1v.khh DAMPING 1.00 [%]

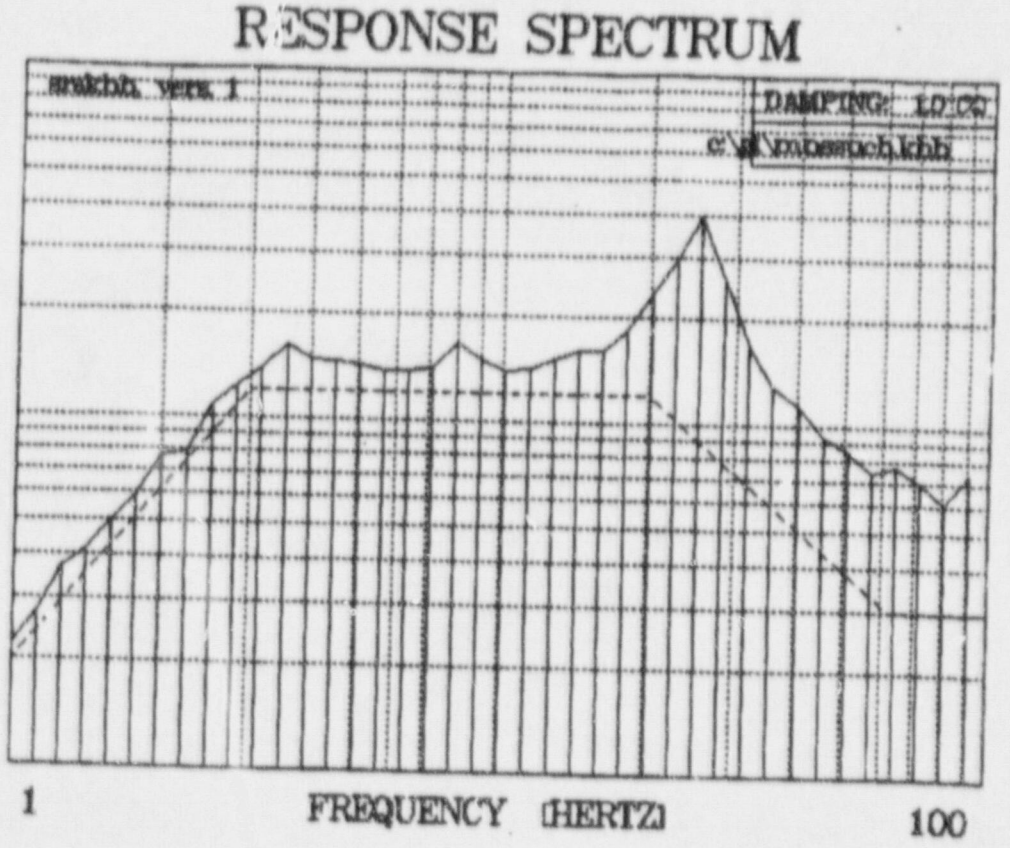
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	0.91
1.12	0.97
1.26	1.83
1.41	2.19
1.59	2.32
1.78	3.40
2.00	4.16
2.24	4.22
2.52	5.82
2.83	7.00
3.17	7.67
3.56	8.04
4.00	7.44
4.49	7.66
5.04	7.36
5.66	7.10
6.35	8.03
7.13	9.16
8.00	8.50
8.98	7.48
10.09	7.21
11.31	8.68
12.70	7.84
14.25	8.39
16.00	9.06
17.96	9.19
20.16	7.81
22.63	12.00
25.40	16.54
28.51	14.36
32.00	6.87
35.92	4.41
40.32	5.95
45.25	5.57
50.80	5.41
57.02	4.53
64.00	4.56
71.84	3.98
80.63	4.00
90.51	3.46



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssuch.khh DAMPING 1.00 [%]

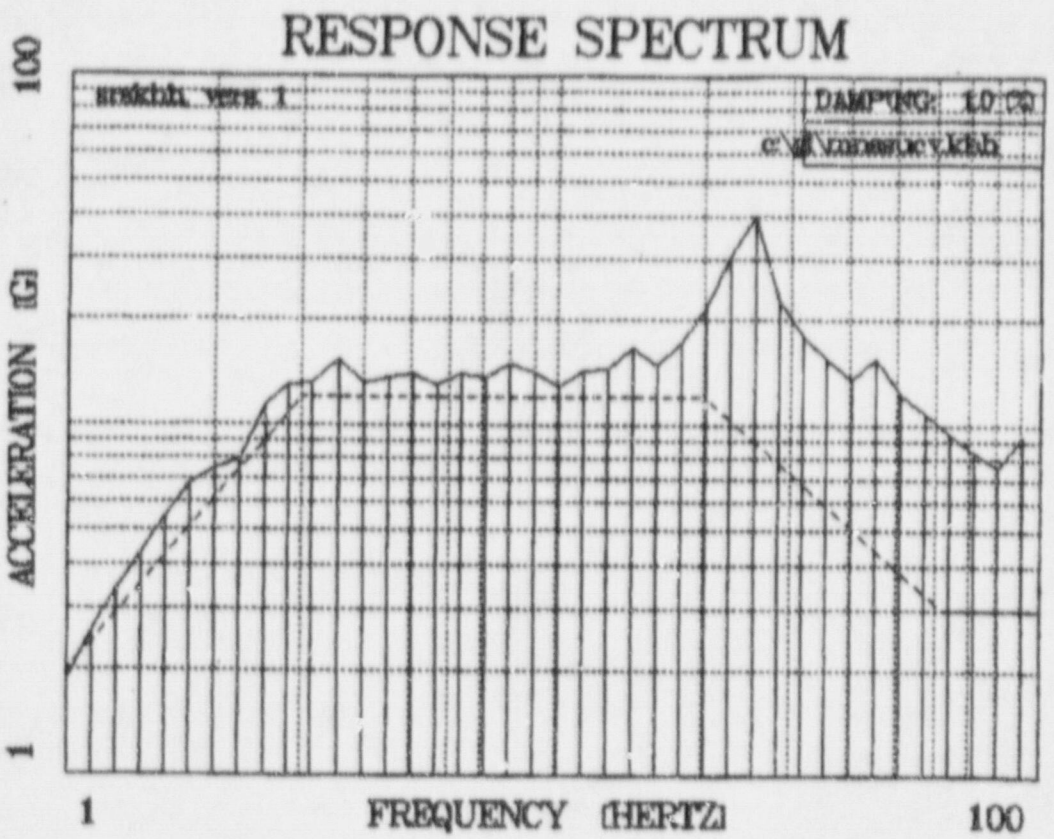
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.22
1.12	2.71
1.26	3.67
1.41	4.12
1.59	5.03
1.78	5.90
2.00	7.65
2.24	7.99
2.52	10.84
2.83	12.32
3.17	13.86
3.56	16.18
4.00	14.77
4.49	14.70
5.04	14.32
5.66	13.84
6.35	13.80
7.13	14.07
8.00	16.61
8.98	14.98
10.08	13.89
11.31	14.08
12.70	15.18
14.25	16.10
16.00	16.01
17.96	18.41
20.16	23.50
22.63	29.43
25.40	39.46
28.51	26.07
32.00	16.86
35.92	12.82
40.32	11.36
45.25	9.28
50.80	8.56
57.02	7.43
64.00	7.77
71.84	6.98
80.63	6.11
90.51	7.41



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssucv.khh DAMPING 1.00 [%]

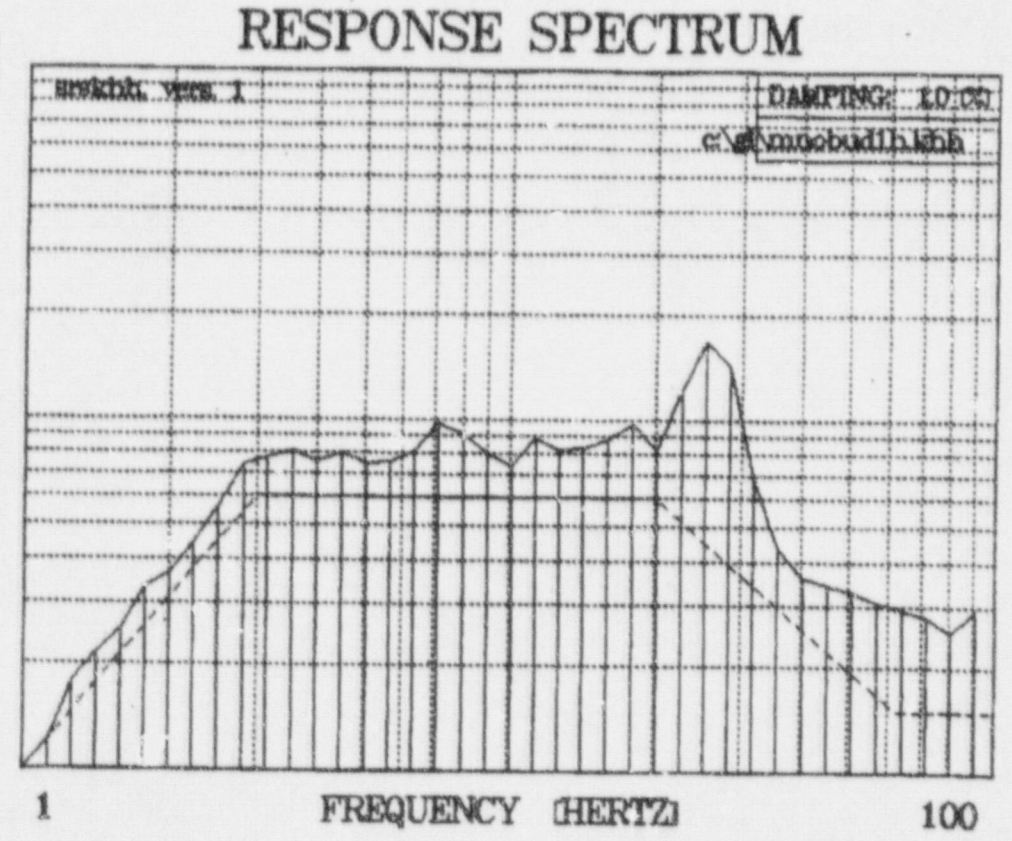
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.85
1.12	2.61
1.26	3.37
1.41	4.32
1.59	5.47
1.78	6.74
2.00	7.50
2.24	7.91
2.52	11.41
2.83	13.00
3.17	13.19
3.56	15.34
4.00	13.13
4.49	13.63
5.04	13.94
5.66	12.97
6.35	14.01
7.13	13.66
8.00	15.04
8.98	14.13
10.08	12.88
11.31	14.36
12.70	14.51
14.25	16.59
16.00	14.80
17.96	17.16
20.16	21.70
22.63	30.48
25.40	39.99
28.51	22.68
32.00	18.03
35.92	15.48
40.32	13.49
45.25	15.44
50.80	12.33
57.02	10.81
64.00	9.39
71.84	8.40
80.63	7.63
90.51	9.38



Analysis Code: SRSKHH Version 1

DATA FILE c:\g1\mnobud1h.khh DAMPING 1.00 [%]

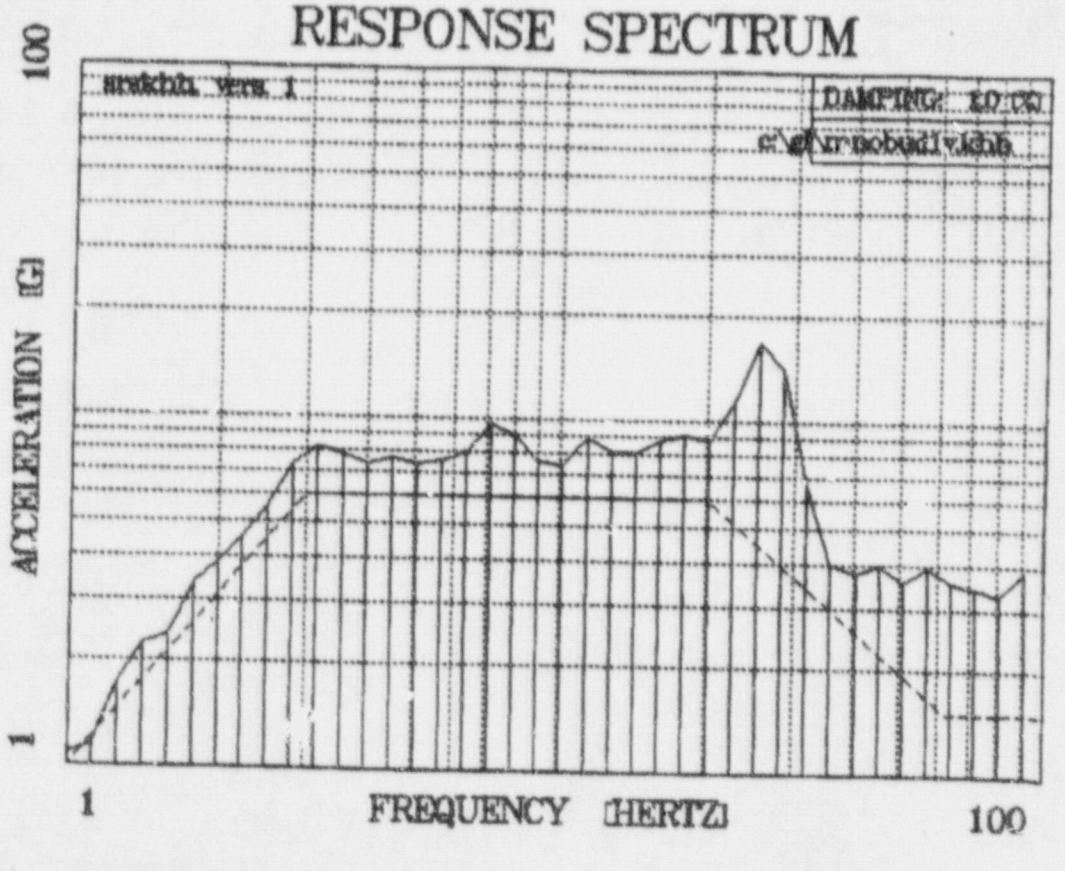
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.00
1.12	1.20
1.25	1.78
1.41	2.14
1.59	2.50
1.78	3.31
2.00	4.65
2.24	5.43
2.52	5.60
2.83	7.39
3.17	7.76
3.56	8.17
4.00	7.58
4.49	6.01
5.04	7.51
5.66	7.57
6.35	8.17
7.13	9.75
8.00	9.08
8.98	8.02
10.08	7.44
11.31	8.95
12.70	8.24
14.25	8.36
16.00	8.84
17.96	9.75
20.16	8.24
22.63	12.36
25.40	16.78
28.51	14.37
32.00	6.89
35.92	4.36
40.32	3.60
45.25	3.45
50.80	3.29
57.02	3.07
64.00	2.90
71.84	2.78
80.63	2.50
90.51	2.91



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnobud1v.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.09
1.12	1.15
1.26	1.72
1.41	2.23
1.59	2.37
1.78	3.36
2.00	3.83
2.24	4.53
2.52	5.53
2.83	7.34
3.17	8.25
3.56	7.82
4.00	7.43
4.49	7.66
5.04	7.42
5.66	7.57
6.35	8.01
7.13	9.6[illegible]
8.00	9.05
8.98	7.58
10.08	7.49
11.31	8.92
12.70	8.16
14.25	8.12
16.00	8.77
17.9[illegible]	9.10
20.16	8.77
22.63	11.35
25.40	16.76
28.51	14.12
32.00	6.70
35.92	3.98
40.32	3.76
45.25	3.98
50.80	3.54
57.02	3.92
64.00	3.57
71.84	3.42
80.63	3.27
90.51	3.85



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssudh.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.99
1.12	2.22
1.26	3.84
1.41	4.68
1.59	5.30
1.78	6.76
2.00	6.92
2.24	8.25
2.52	10.05
2.83	13.68
3.17	13.14
3.56	16.04
4.00	14.48
4.49	14.01
5.04	13.80
5.66	13.23
6.35	13.51
7.13	14.32
8.00	16.57
8.98	14.87
10.08	14.12
11.31	14.22
12.70	15.55
14.25	15.77
16.00	16.00
17.96	18.19
20.16	22.23
22.63	30.07
25.40	39.32
28.51	23.52
32.00	16.57
35.92	11.44
40.32	10.35
45.25	8.45
50.80	8.91
57.02	7.76
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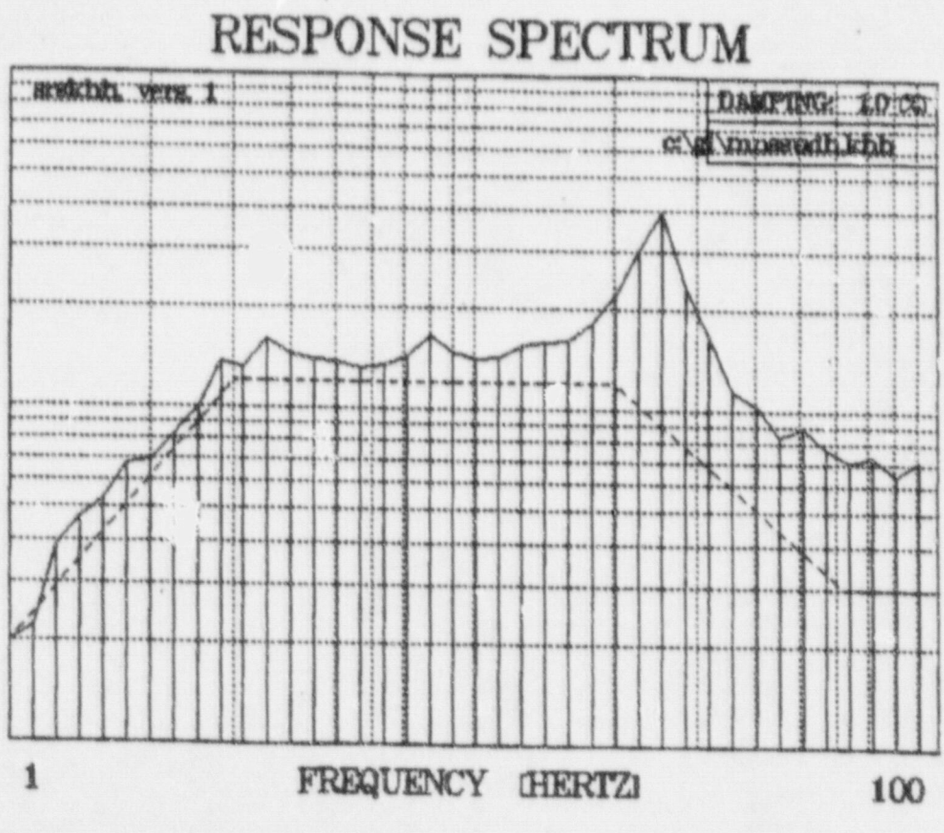
71.84	7.32
80.63	6.45
90.51	7.19



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssudv.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	1.76
1.12	2.54
1.26	2.90
1.41	4.08
1.59	4.91
1.78	6.58
2.00	6.25
2.24	8.01
2.52	10.62
2.83	12.64
3.17	13.05
3.56	16.28
4.00	13.43
4.49	14.54
5.04	13.01
5.66	14.12
6.35	13.03
7.13	14.42
8.00	15.64
8.98	14.59
10.08	13.19
11.31	14.81
12.70	15.85
14.25	14.42
16.00	14.73
17.96	16.95
20.16	21.32
22.63	28.62
25.40	38.09
28.51	23.12
32.00	16.55
35.92	15.05
40.32	12.81
45.25	8.90
50.80	11.46
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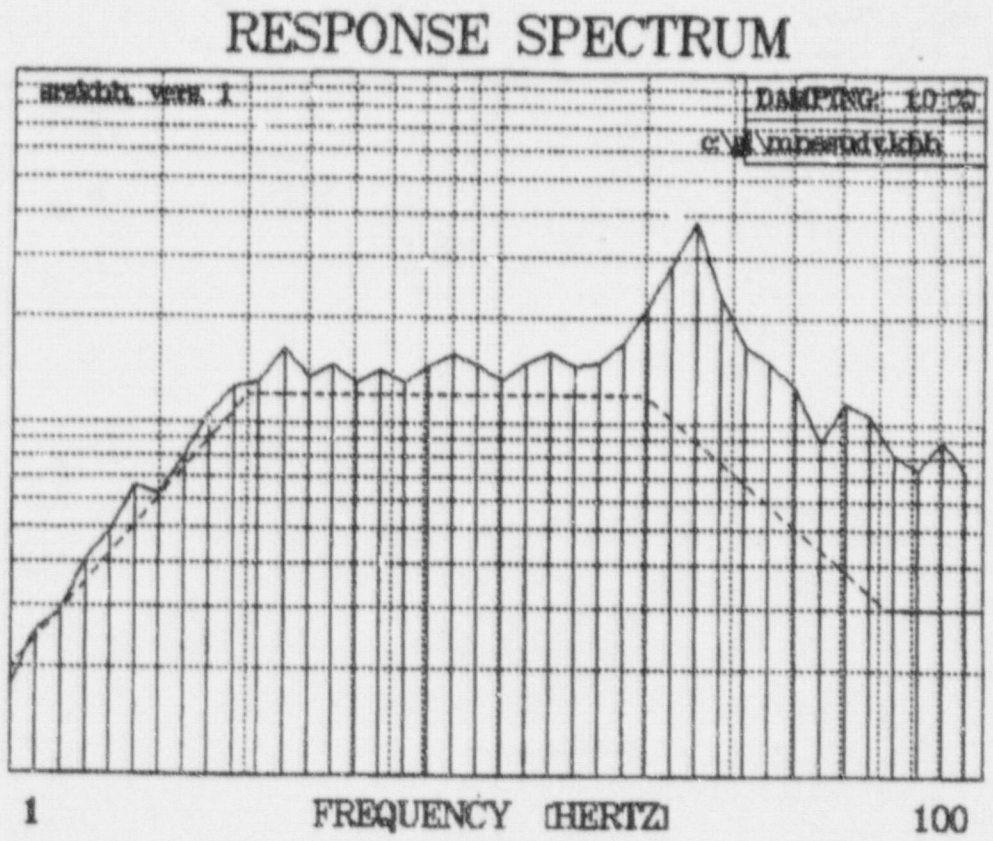
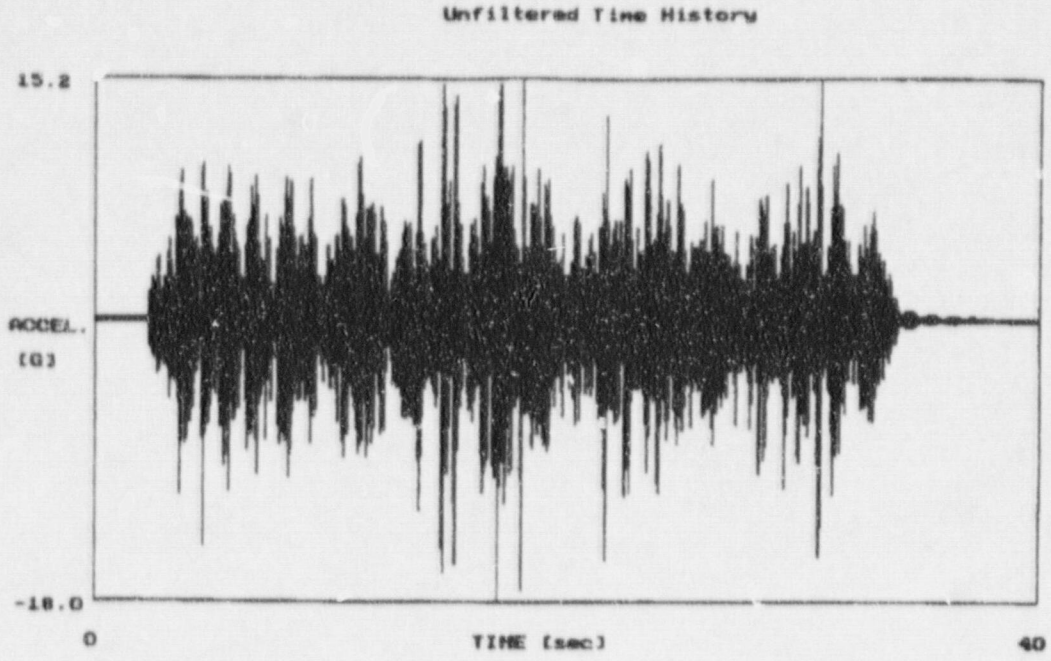
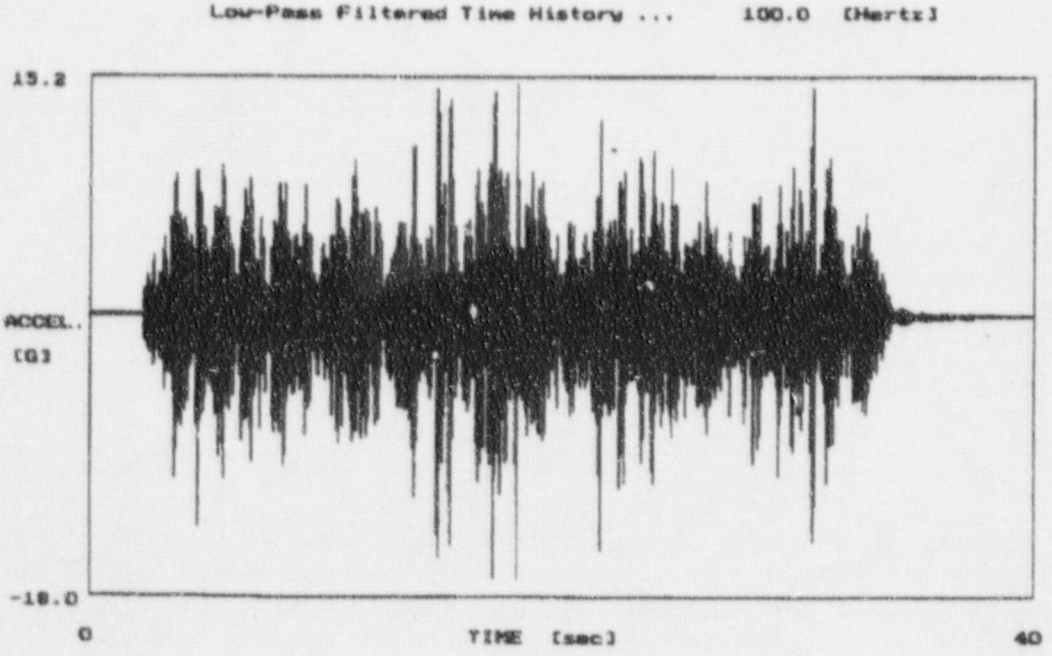
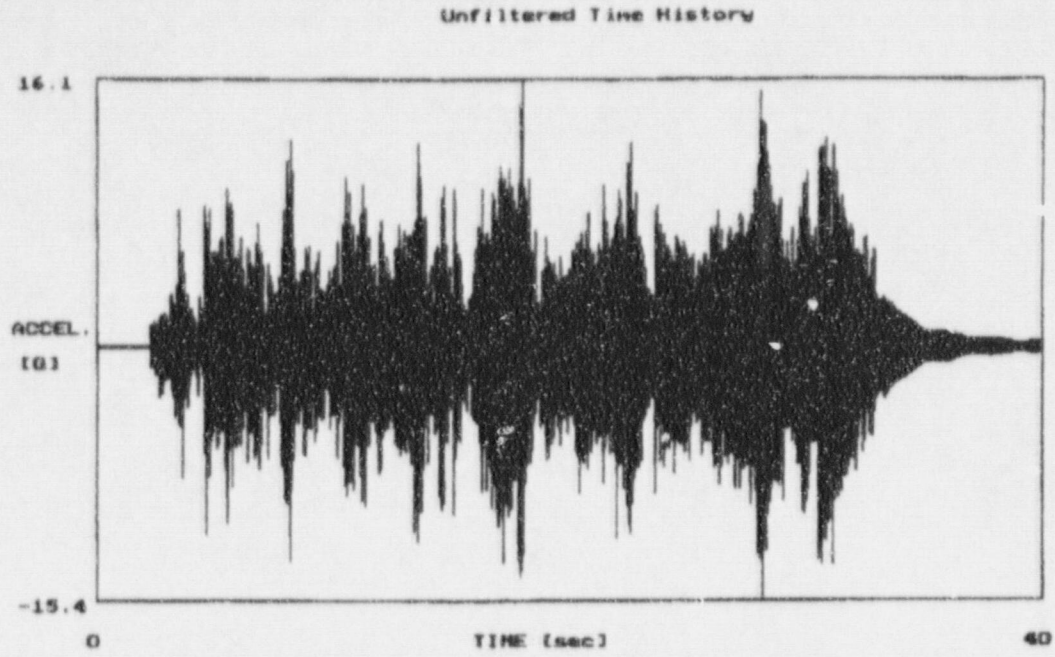
71.84	7.38
80.63	9.01
90.51	7.43

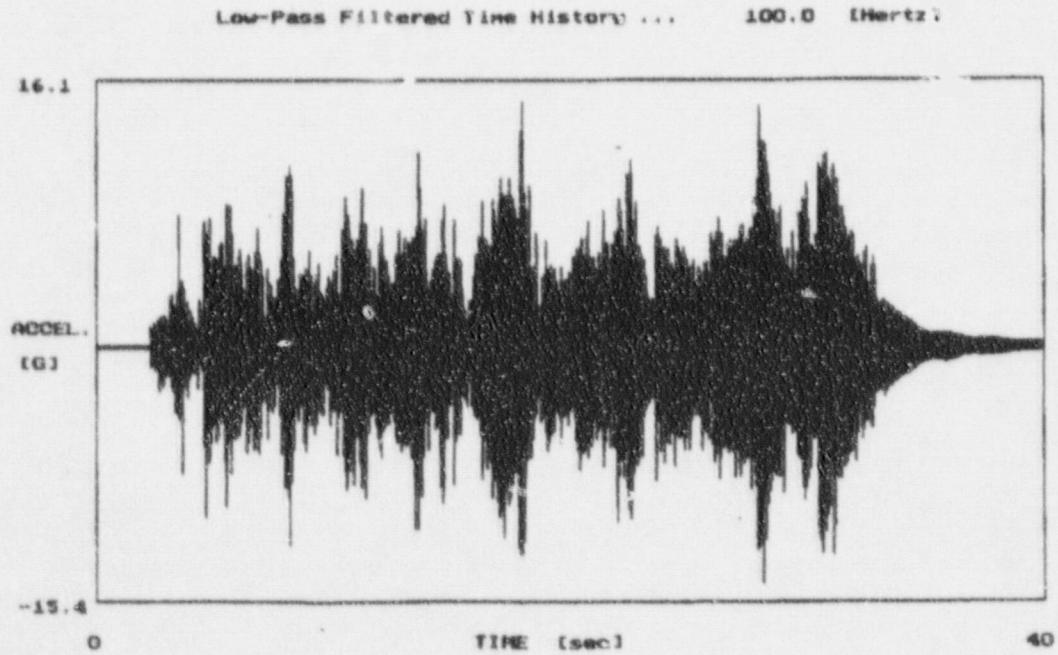




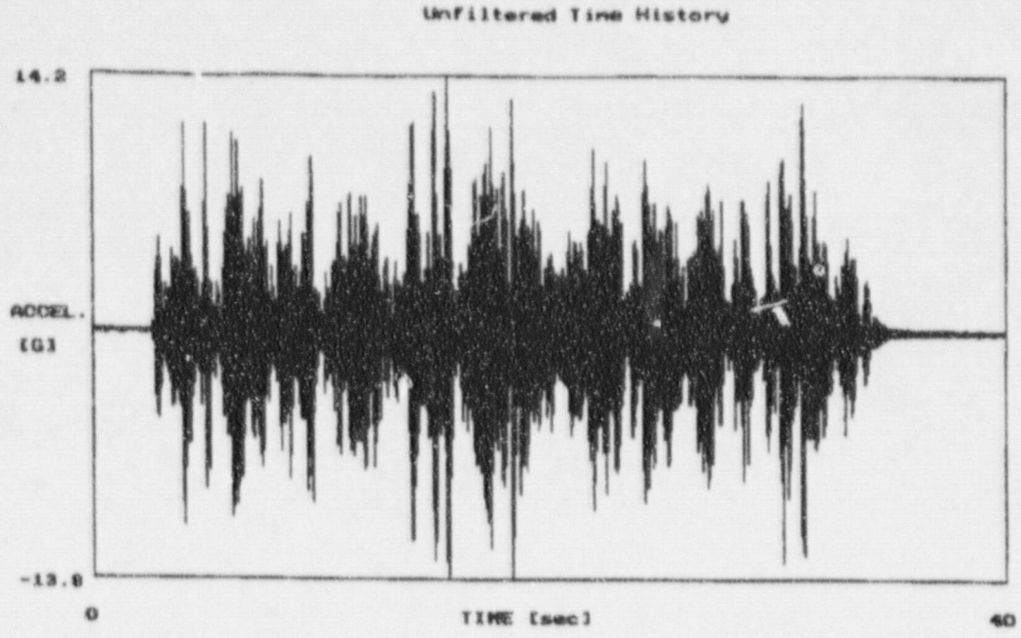


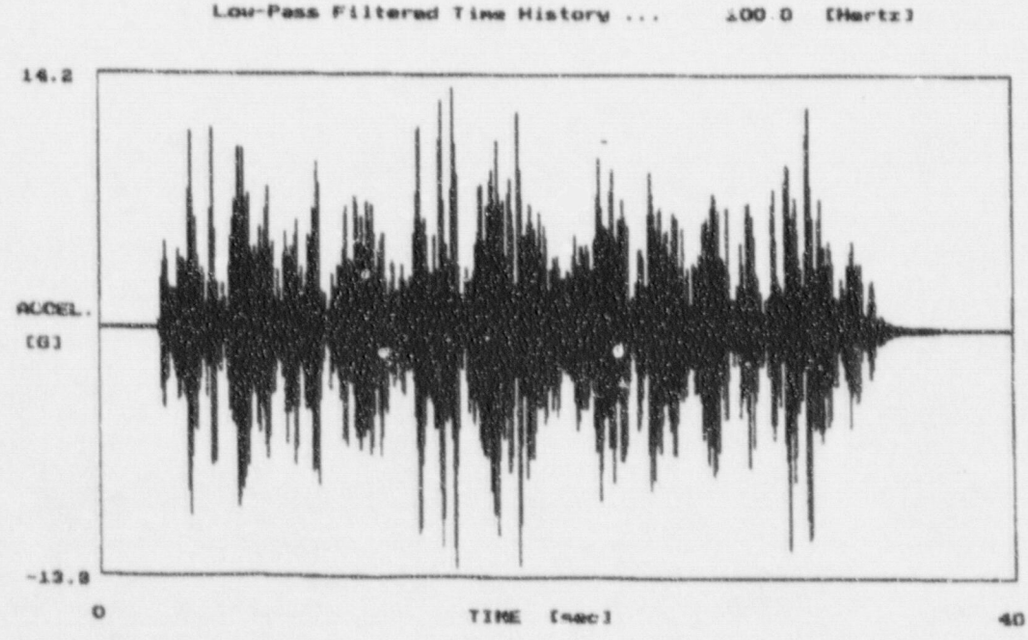
BOTTOM MOUNTED INSTRUMENT NOZZLE, FREE STANDING, SSE EVENT
ORIENTATION A, HORIZONTAL



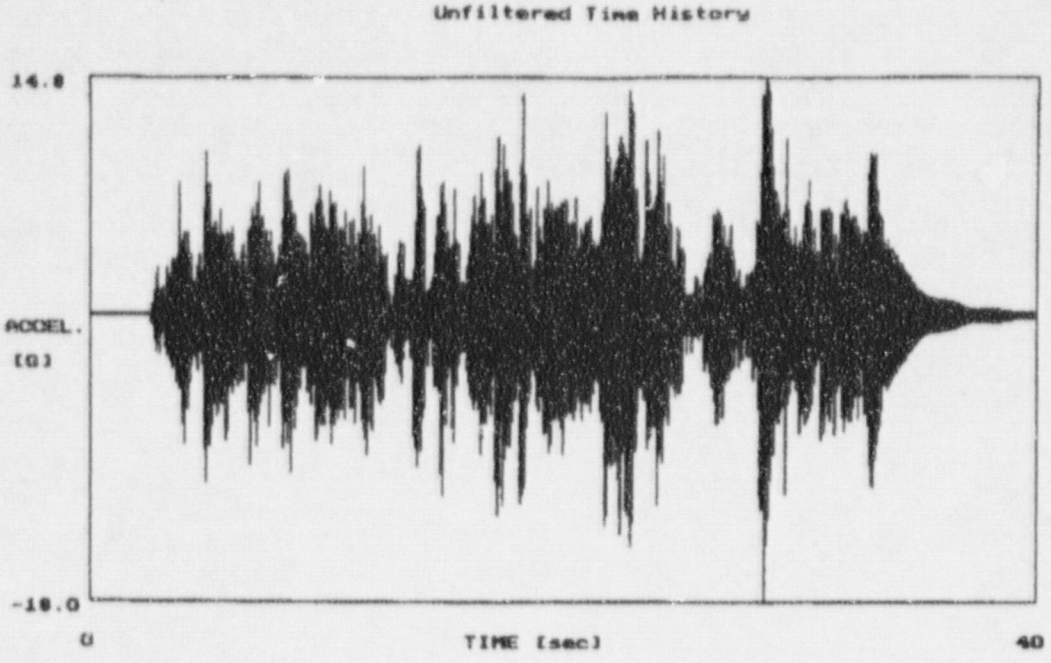


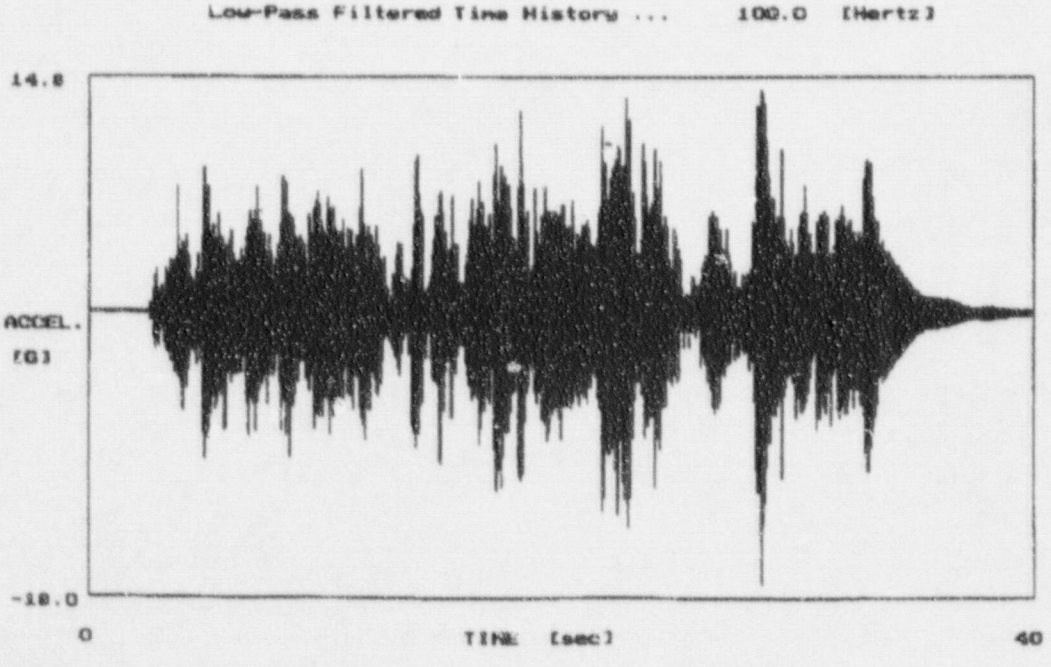
BOTTOM MOUNTED INSTRUMENT NOZZLE, FREE STANDING, SSE EVENT ORIENTATION A, VERTICAL



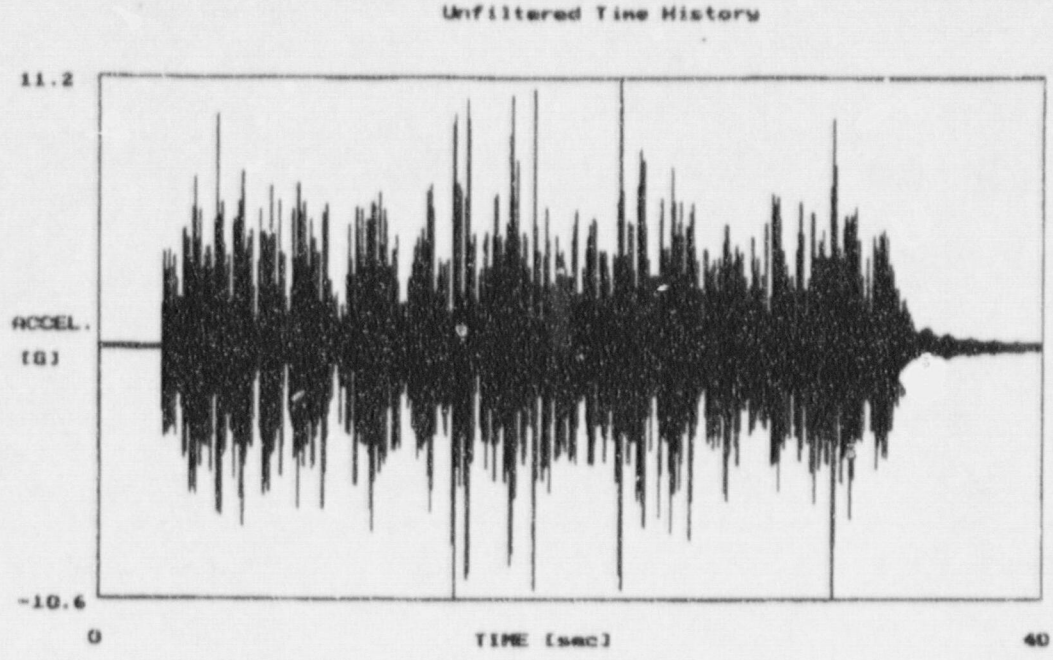


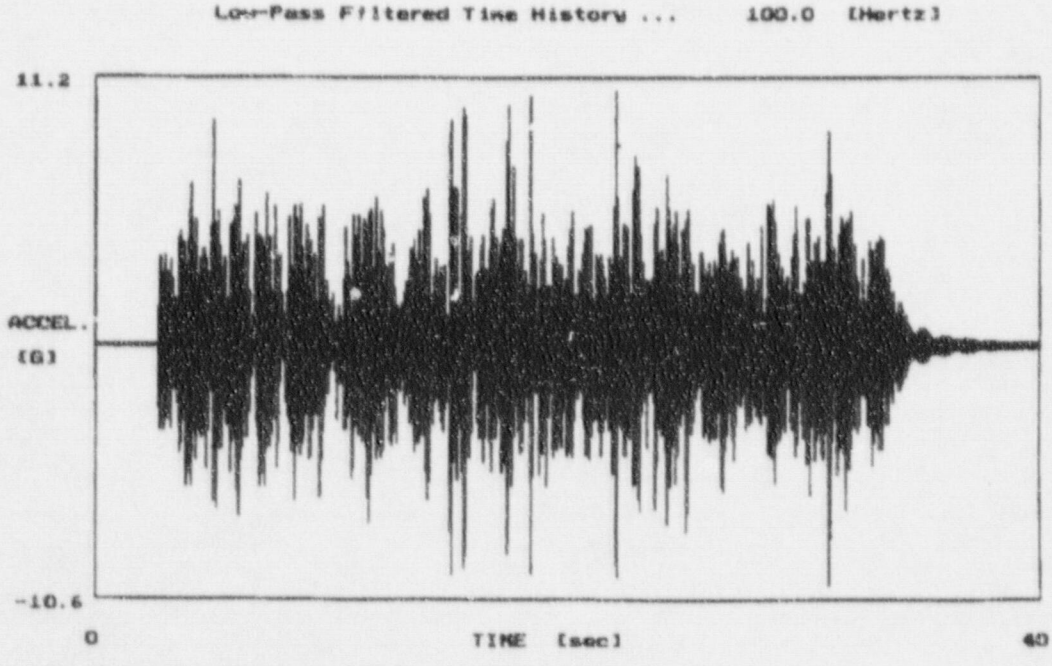
BOTTOM MOUNTED INSTRUMENT NOZZLE, FREE STANDING, SSE EVENT
ORIENTATION B, HORIZONTAL



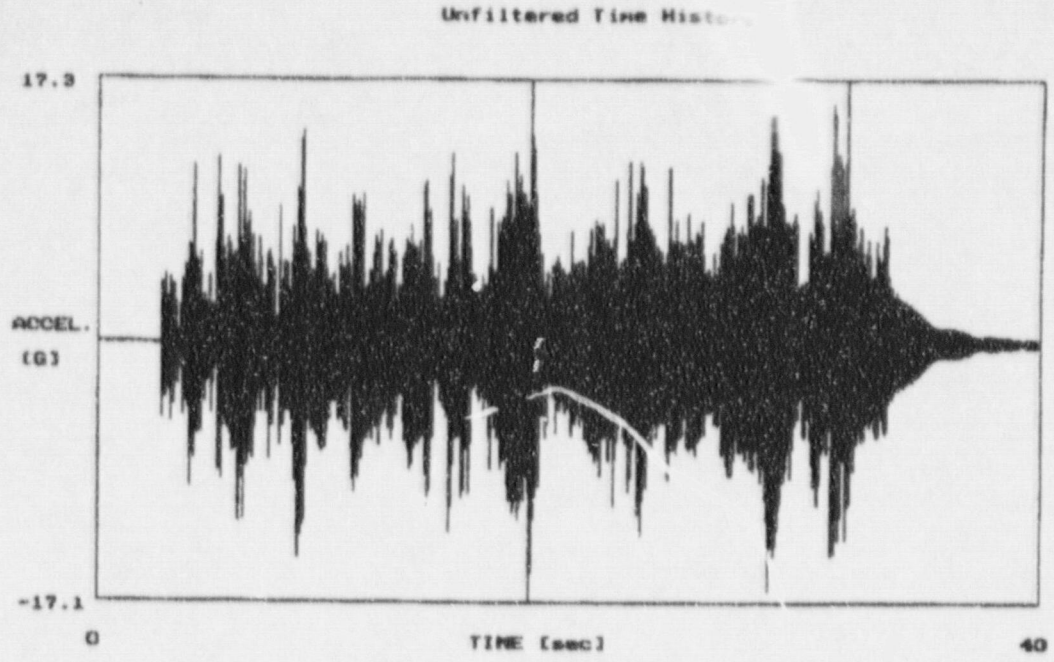


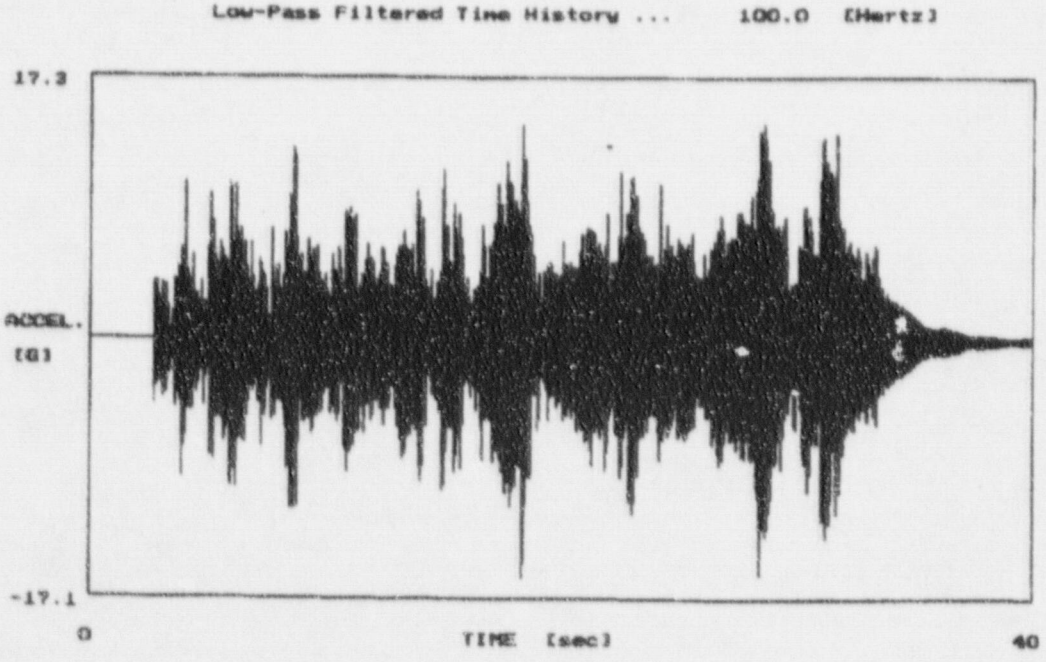
BOTTOM MOUNTED INSTRUMENT NOZZLE, FREE STANDING, SSE EVENT
ORIENTATION B, VERTICAL



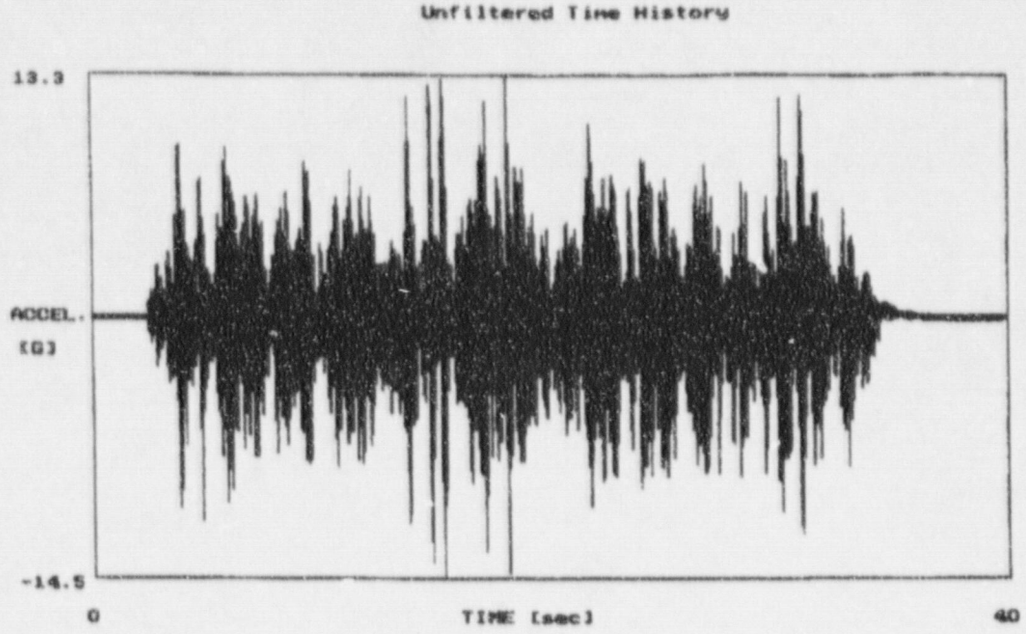


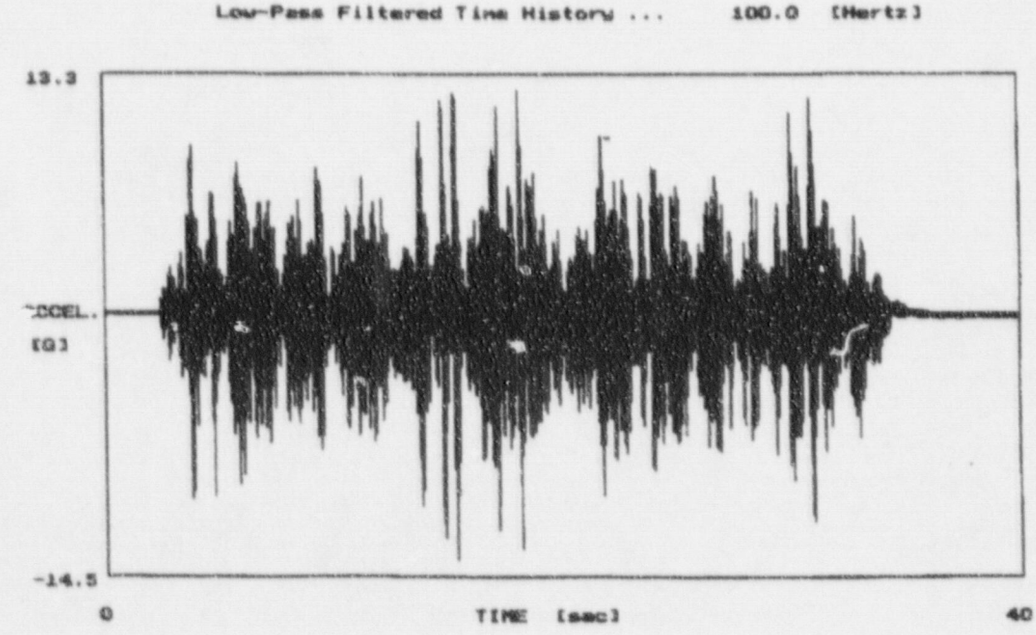
BOTTOM MOUNTED INSTRUMENT NOZZLE, FREE STANDING, SSE EVENT ORIENTATION C, HORIZONTAL



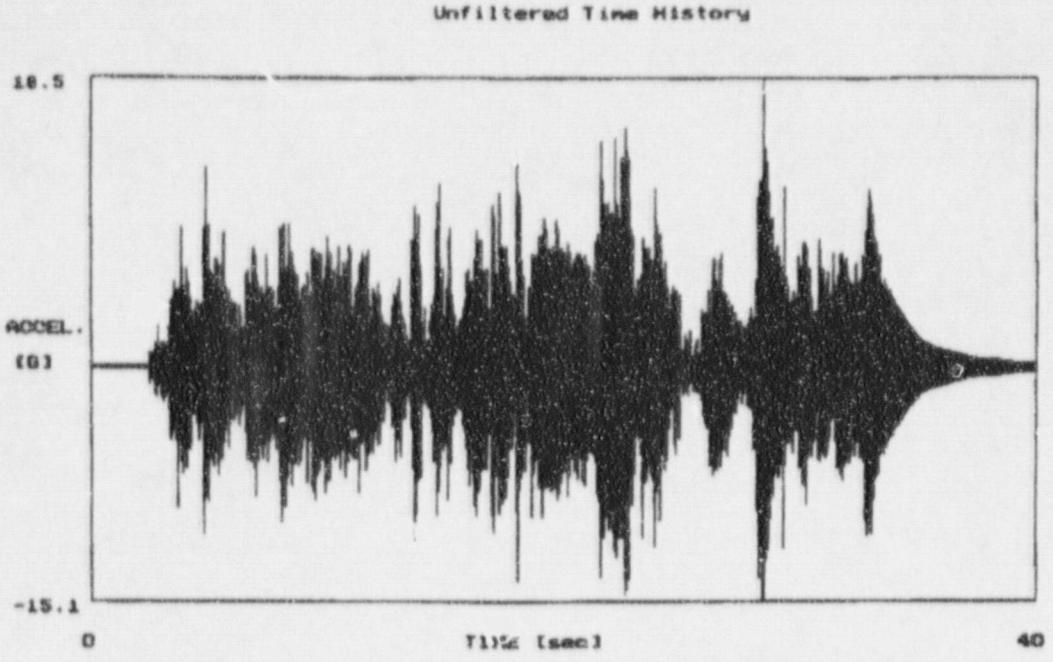


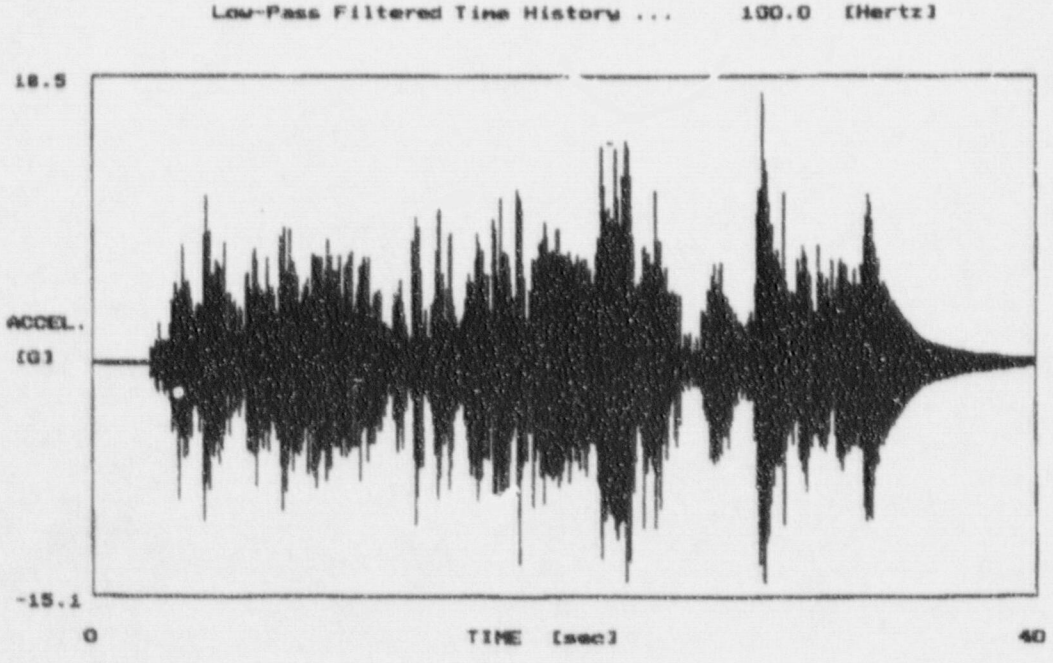
BOTTOM MOUNTED INSTRUMENT NOZZLE, FREE STANDING, SSE EVENT
ORIENTATION C, VERTICAL





BOTTOM MOUNTED INSTRUMENT NOZZLE, FREE STANDING, SSE EVENT
ORIENTATION D, HORIZONTAL





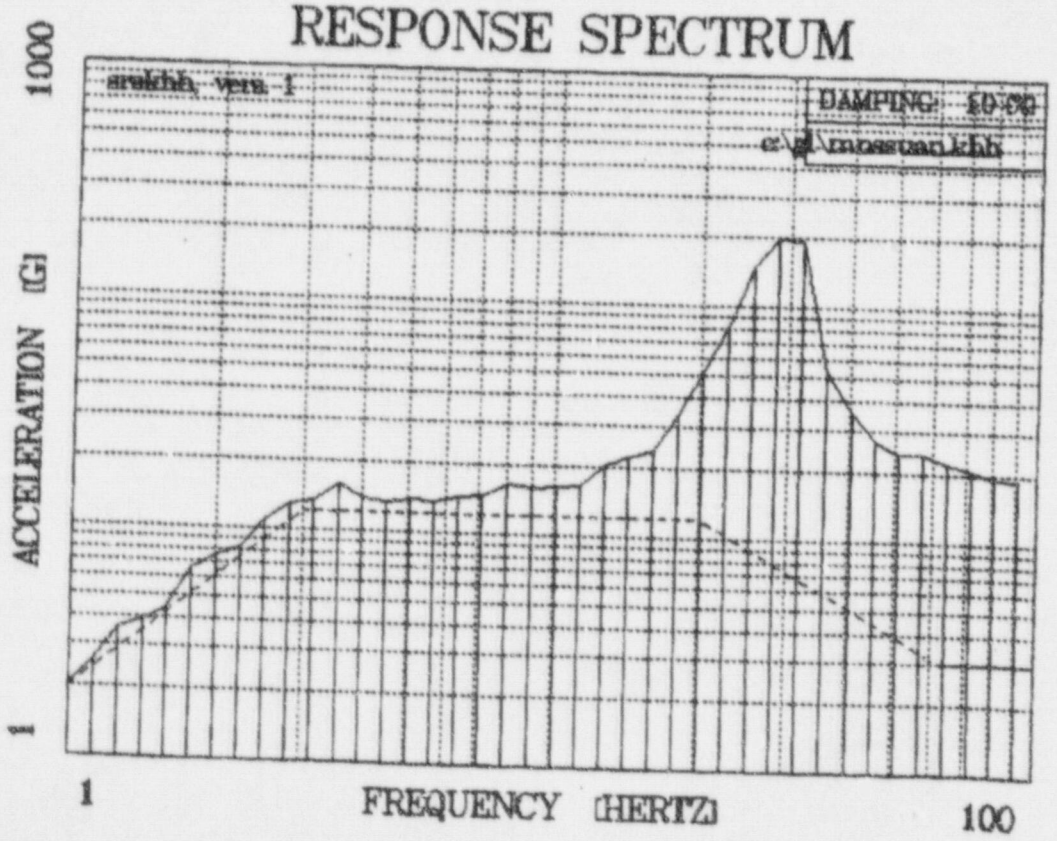
BOTTOM MOUNTED INSTRUMENT NOZZLE, FREE STANDING, SSE EVENT ORIENTATION D, VERTICAL

Analysis Code: SRSKHH Version 1

DATA FILE c:\g1\mnssuan.khh DAMPING 1.00 [%]

REFER TO TABLE 2 FOR FILE IDENTIFICATION

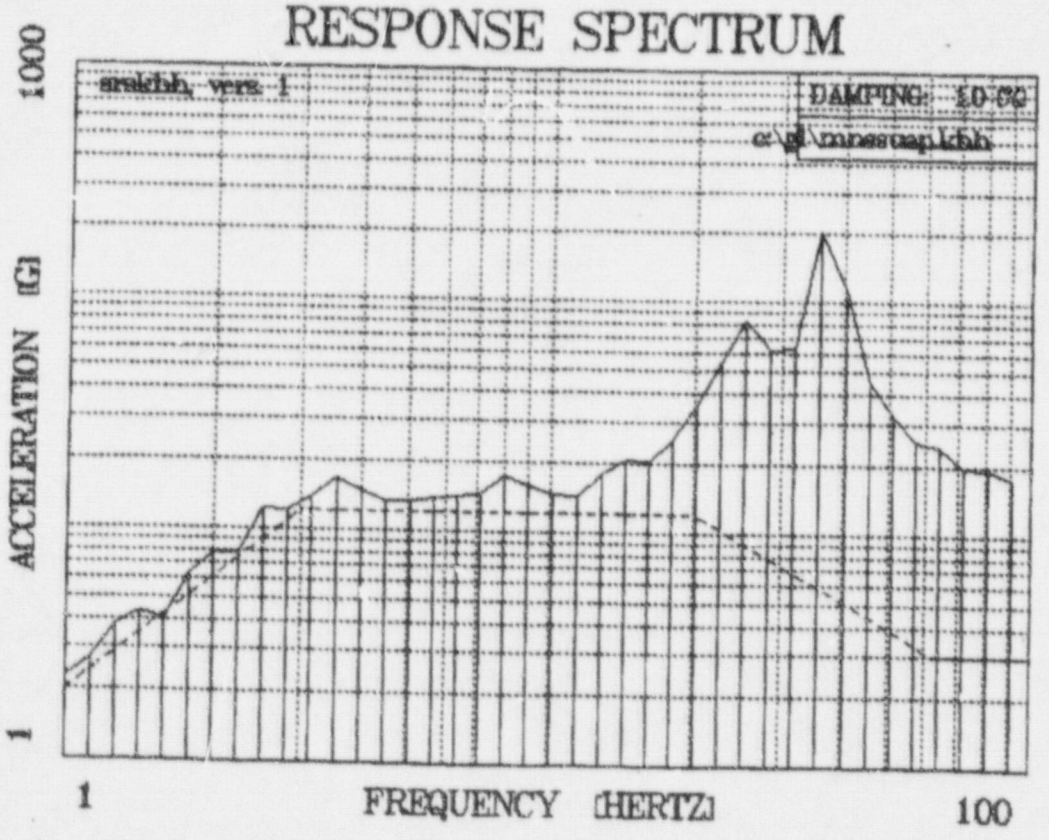
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.04
1.12	2.60
1.26	3.56
1.41	3.89
1.59	4.44
1.78	6.61
2.00	7.53
2.24	8.29
2.52	10.86
2.83	12.87
3.17	13.27
3.56	15.83
4.00	13.72
4.49	13.38
5.04	13.80
5.66	13.64
6.35	14.36
7.13	14.64
8.00	16.50
8.98	15.94
10.08	16.10
11.31	16.35
12.70	20.13
14.25	21.89
16.00	23.59
17.96	33.61
20.16	52.09
22.63	81.26
25.40	150.68
28.51	197.33
32.00	193.98
35.92	53.01
40.32	35.49
45.25	27.09
50.80	24.12
57.02	23.83
64.00	21.88
71.84	20.55
80.63	19.18
90.51	18.85



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssuap.khh DAMPING 1.00 [%]

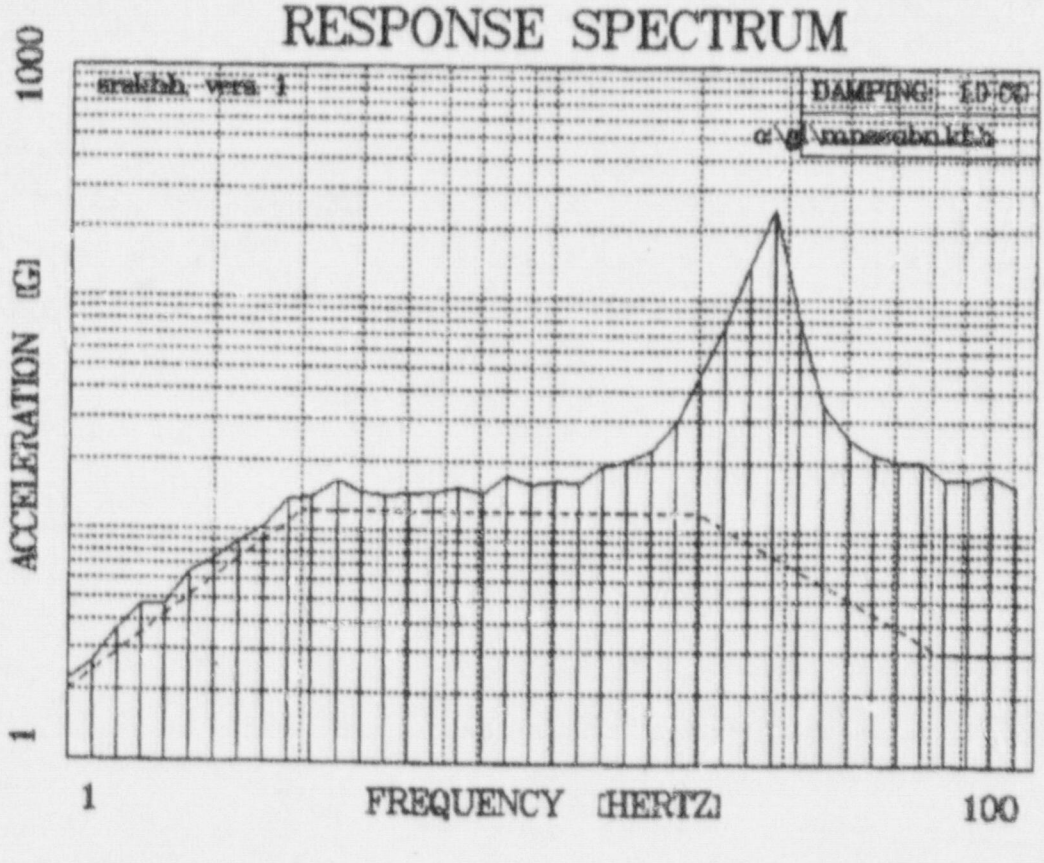
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.26
1.12	2.74
1.26	3.78
1.41	4.32
1.59	4.07
1.78	6.35
2.00	7.75
2.24	7.76
2.52	12.23
2.83	12.02
3.17	13.88
3.56	16.60
4.00	14.86
4.49	13.27
5.04	13.28
5.66	13.90
6.35	14.12
7.13	14.48
8.00	17.16
8.98	15.93
10.08	14.44
11.31	14.30
12.70	18.02
14.25	20.53
16.00	20.12
17.96	25.39
20.16	35.
22.63	54.
25.40	82.74
28.51	62.00
32.00	62.75
35.92	204.20
40.32	112.89
45.25	45.11
50.80	32.66
57.02	25.34
64.00	23.86
71.84	19.34
80.63	19.13
90.51	17.69



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssubn.khh DAMPING 1.00 [%]

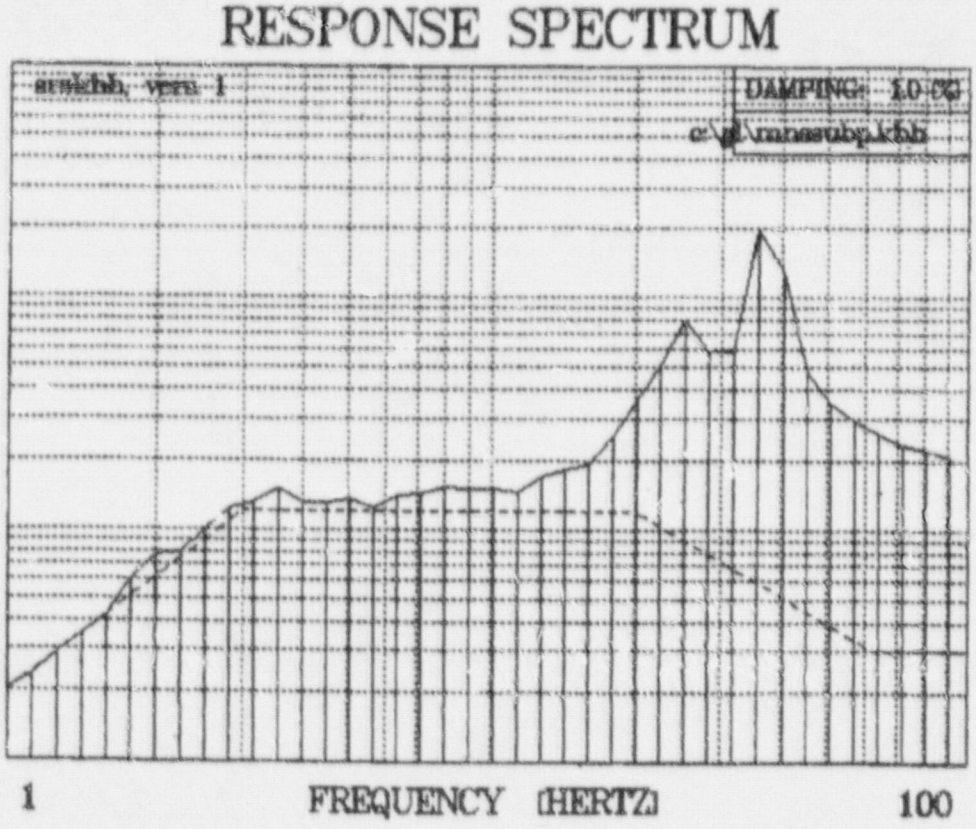
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.23
1.12	2.62
1.26	3.66
1.41	4.64
1.59	4.67
1.78	6.50
2.00	7.37
2.24	8.88
2.52	10.33
2.83	13.67
3.17	13.70
3.56	16.32
4.00	14.53
4.49	13.97
5.04	14.19
5.66	14.60
6.35	15.24
7.13	14.53
8.00	17.30
8.98	15.92
10.08	16.37
11.31	16.23
12.70	19.20
14.25	20.12
16.00	22.39
17.96	29.72
20.16	46.94
22.63	78.06
25.40	142.59
28.51	248.86
32.00	80.09
35.92	35.05
40.32	25.33
45.25	21.56
50.80	20.11
57.02	20.11
64.00	17.11
71.84	16.84
80.63	17.92
90.51	15.97



Analysis Code: SRSKH□ Version 1

DATA FILE c:\gl\mnssubp.khh DAMPING 1.00 [%]

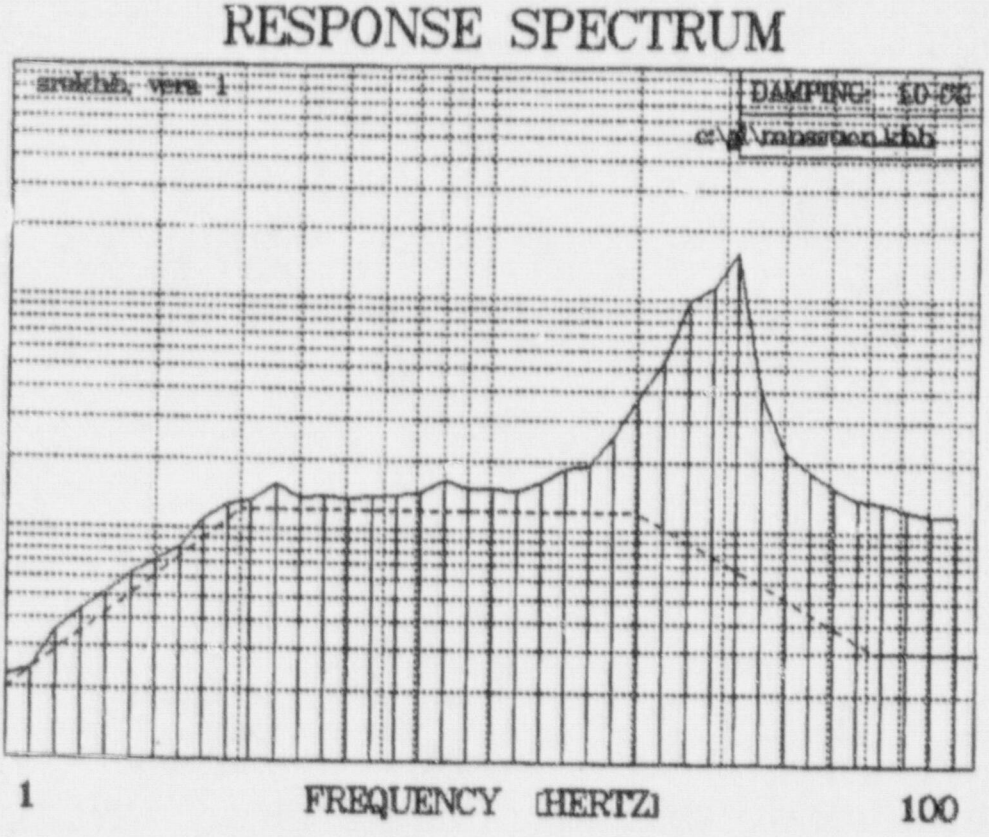
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.06
1.12	2.33
1.26	2.90
1.41	3.53
1.59	4.16
1.78	6.06
2.00	7.66
2.24	7.91
2.52	9.86
2.83	12.21
3.17	13.01
3.56	14.93
4.00	13.02
4.49	13.19
5.04	13.62
5.66	12.53
6.35	13.95
7.13	14.17
8.00	15.21
8.98	15.09
10.08	15.08
11.31	14.52
12.70	17.13
14.25	18.34
16.00	19.04
17.96	25.11
20.16	36.21
22.63	51.20
25.40	79.91
28.51	58.75
32.00	58.63
35.92	195.79
40.32	131.23
45.25	47.70
50.80	35.19
57.02	29.74
64.00	25.96
71.84	23.33
80.63	21.91
90.51	20.54



Analysis Code: SRSKHH Version 1

DATA FILE c:\gl\tmssucn.khh DAMPING 1.00 [%]

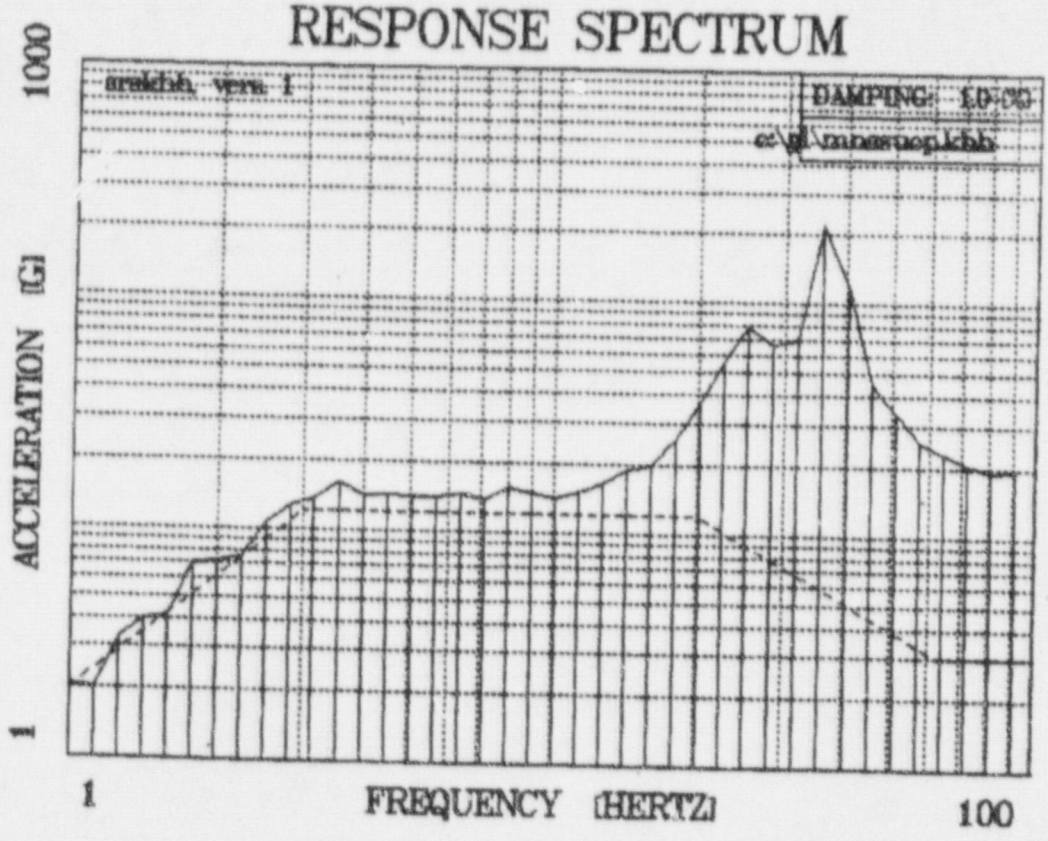
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.24
1.12	2.40
1.26	3.55
1.41	4.34
1.59	5.13
1.78	6.21
2.00	7.21
2.24	8.21
2.52	10.79
2.83	12.65
3.17	13.13
3.56	15.64
4.00	13.66
4.49	13.88
5.04	13.49
5.66	13.79
6.35	14.01
7.13	14.50
8.00	16.38
8.98	15.17
10.08	15.16
11.31	14.88
12.70	16.13
14.25	18.55
16.00	19.30
17.96	25.62
20.16	37.44
22.63	53.65
25.40	99.20
28.51	113.85
32.00	161.23
35.92	40.08
40.32	21.97
45.25	18.08
50.80	15.58
57.02	13.88
64.00	13.34
71.84	12.49
80.63	11.91
90.51	11.92



Analysis code: SRSKHH Version 1

DATA FILE c:\gl\mnssucp.khh DAMPING 1.00 [%]

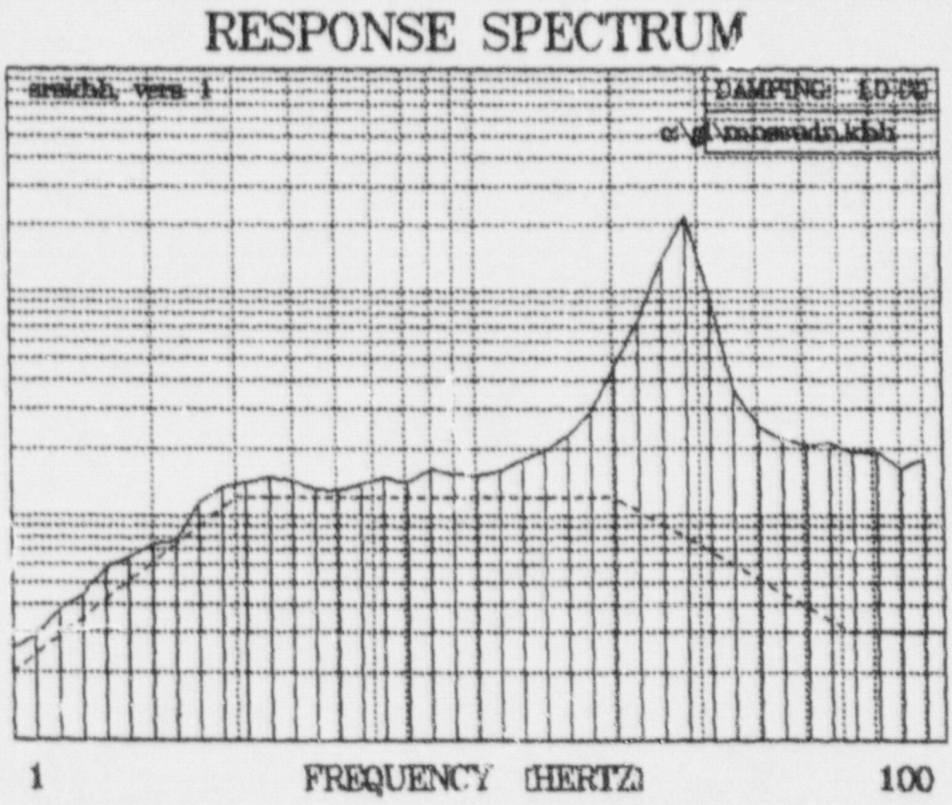
FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.08
1.12	1.99
1.26	3.28
1.41	3.97
1.59	4.15
1.78	7.01
2.00	7.21
2.24	7.53
2.52	10.74
2.83	12.65
3.17	13.57
3.56	16.07
4.00	14.02
4.49	14.34
5.04	14.14
5.66	14.11
6.35	14.44
7.13	13.89
8.00	15.63
8.98	14.85
10.08	14.14
11.31	15.18
12.70	16.29
14.25	18.98
16.00	19.69
17.96	25.82
20.16	36.63
22.63	56.32
25.40	79.08
28.51	66.33
32.00	69.62
35.92	216.95
40.32	118.53
45.25	45.50
50.80	33.91
57.02	25.55
64.00	22.81
71.84	20.43
80.63	19.30
90.51	19.61



Anal/sis Code: SRSKHH Version 1

DATA FILE c:\gl\mnssudn.klh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.53
1.12	2.91
1.26	3.78
1.41	4.40
1.59	5.81
1.78	6.48
2.00	7.47
2.24	7.63
2.52	11.51
2.83	13.22
3.17	13.96
3.56	14.73
4.00	14.36
4.49	13.21
5.04	12.96
5.66	13.85
6.35	14.69
7.13	14.05
8.00	16.06
8.98	15.28
10.08	15.09
11.31	15.83
12.70	17.90
14.25	19.40
16.00	22.66
17.96	28.78
20.16	45.09
22.63	73.88
25.40	139.94
28.51	218.58
32.00	96.32
35.92	36.36
40.32	24.76
45.25	22.16
50.80	20.45
57.02	20.85
64.00	19.00
71.84	19.16
80.63	16.15
90.51	17.77



Analysis Code: SRSKHH Version 1

DATA FILE c:\gi\mnssudp.khh DAMPING 1.00 [%]

FREQUENCY [HERTZ]	ACCELERATION [G]
1.00	2.08
1.12	2.59
1.26	3.13
1.41	4.19
1.59	5.10
1.78	7.41
2.00	6.20
2.24	7.80
2.52	10.27
2.83	12.31
3.17	13.38
3.56	15.37
4.00	13.50
4.49	12.96
5.04	13.28
5.66	13.41
6.35	14.25
7.13	14.26
8.00	16.60
8.98	15.43
10.08	14.69
11.31	15.30
12.70	17.27
14.25	18.15
16.00	20.34
17.96	25.93
20.16	35.69
22.63	53.99
25.40	80.14
28.51	60.92
32.00	60.60
35.92	203.69
40.32	136.17
45.25	49.09
50.80	35.56
57.02	28.71
64.00	26.39
71.84	23.22
80.63	22.14
90.51	21.37