

SEISMIC QUALIFICATION TEST PLAN
OF
SEVEN (7) CABINETS FOR STRUCTURAL VERIFICATION
Logstrup

Prepared for

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Customer Approval: _____

Date: _____

The specimen(s) described in Section 3.0 will be placed on the Seismic Simulator. The specimen will be oriented such that the specimens principal horizontal axes are parallel with the horizontal axes of excitation.

The appropriate monitoring equipment will be installed on the specimen.

The appropriate initial inspection and baseline test will be conducted and documented.

10.4 Resonance Search Test

Not required during this program of structural verification.

10.5 Full Level Qualification Test

The seismic qualification for the subject equipment will be performed by using an independent triaxial random motion simulator. Testing will be performed with the test specimens principal horizontal axes positioned parallel with the test table motion.

Thus, each horizontal axis will be excited separately, but simultaneously with the vertical axes. The Horizontal East-West, Horizontal North-South, and Vertical input accelerations will be independent of each other during the multi-frequency test. Testing has demonstrated that the Farwell & Hendricks, Inc. triaxis shake table has a coherence of less than 20% between any of the axes.

Independent signal sources for the horizontal and vertical axes shall provide the random input motion. Random motion inputs shall be equalized, if required, before subjecting the specimens to full-level Required Response Spectra.

The specimens shall be subjected to five triaxial seismic events at the Operating Basis Earthquake (OBE) level, followed by one triaxial event at the Safe Shutdown Earthquake (SSE) level.

Each seismic event will consist of random motion which is amplitude controlled in 1/3 octave bandwidths from 1 Hz to the frequency range of interest. The specimen will be subjected to a minimum test duration of 30 seconds for each OBE and for each SSE.

The resulting shake table motion will be analyzed and plotted by a Digital Fourier analyzer using shock response software. This calculation will be performed at the appropriate damping value and frequency interval:

Frequency range of interest: 1 to 40
Damping value: To be determined by the customer
Maximum octave frequency interval: 1/3

The zero period acceleration (ZPA) of the RRS will be exceeded to meet the spectra peaks.

The required response spectra provided by the customer are attached. Ten percent (10%) margin will be added to the RRS unless otherwise defined herein. Thus, the TRS will be greater than 110% of the RRS.

Visual inspections and the functional parameters will be verified as appropriate in accordance with the test operational and acceptance criteria contained herein.

TEST IMPLEMENTATION (Cont.)

CP&L SHEARON HARRIS OBE/RRS-TRS HORIZONTAL SHOCK RESPONSE SPECTRA

(2% DAMPING)

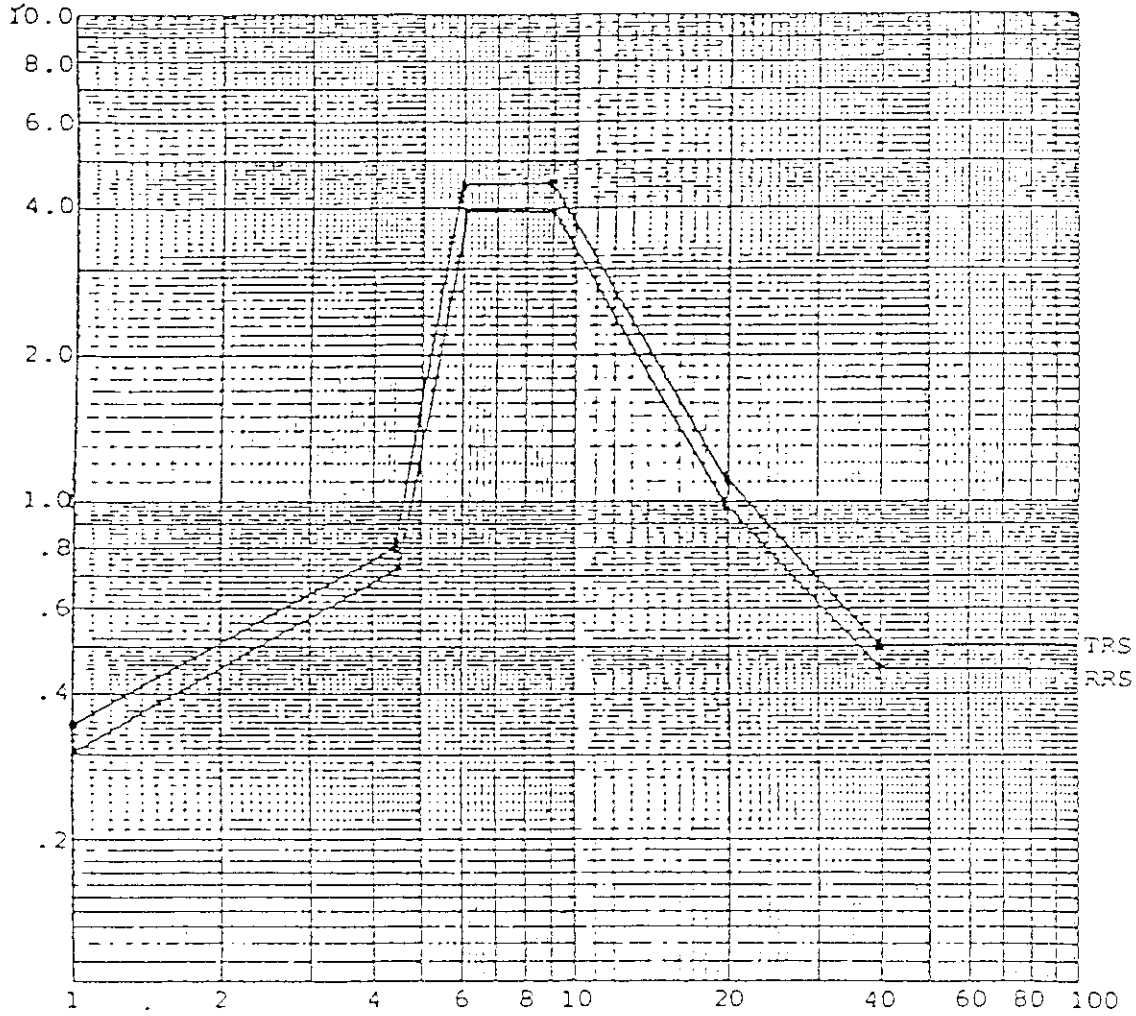


Figure 4-2

THE TRS INCLUDES +10% SAFETY MARGIN REQUIRED TO MEET THE RRS.

TEST IMPLEMENTATION (Cont.)

CP&L SHEARON HARRIS OBE/RRS-TRS VERTICAL SHOCK RESPONSE SPECTRA

(2% DAMPING)

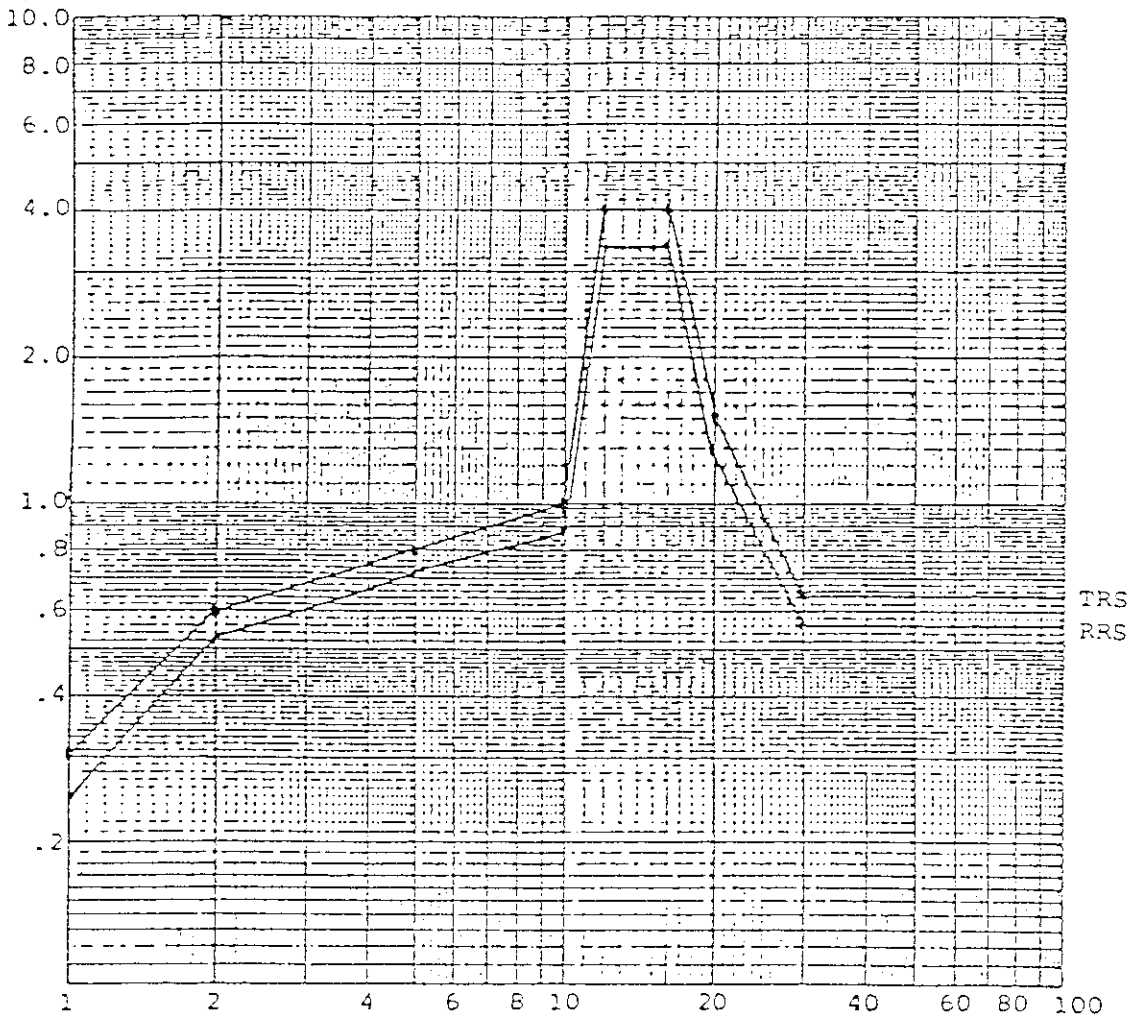


Figure 4-3

THE TRS INCLUDES +10% SAFETY MARGIN REQUIRED TO MEET THE RRS.

TEST IMPLEMENTATION (Cont.)

CP&L SHEARON HARRIS DBE/RRS-TRS HORIZONTAL SHOCK RESPONSE SPECTRA

(3% DAMPING)

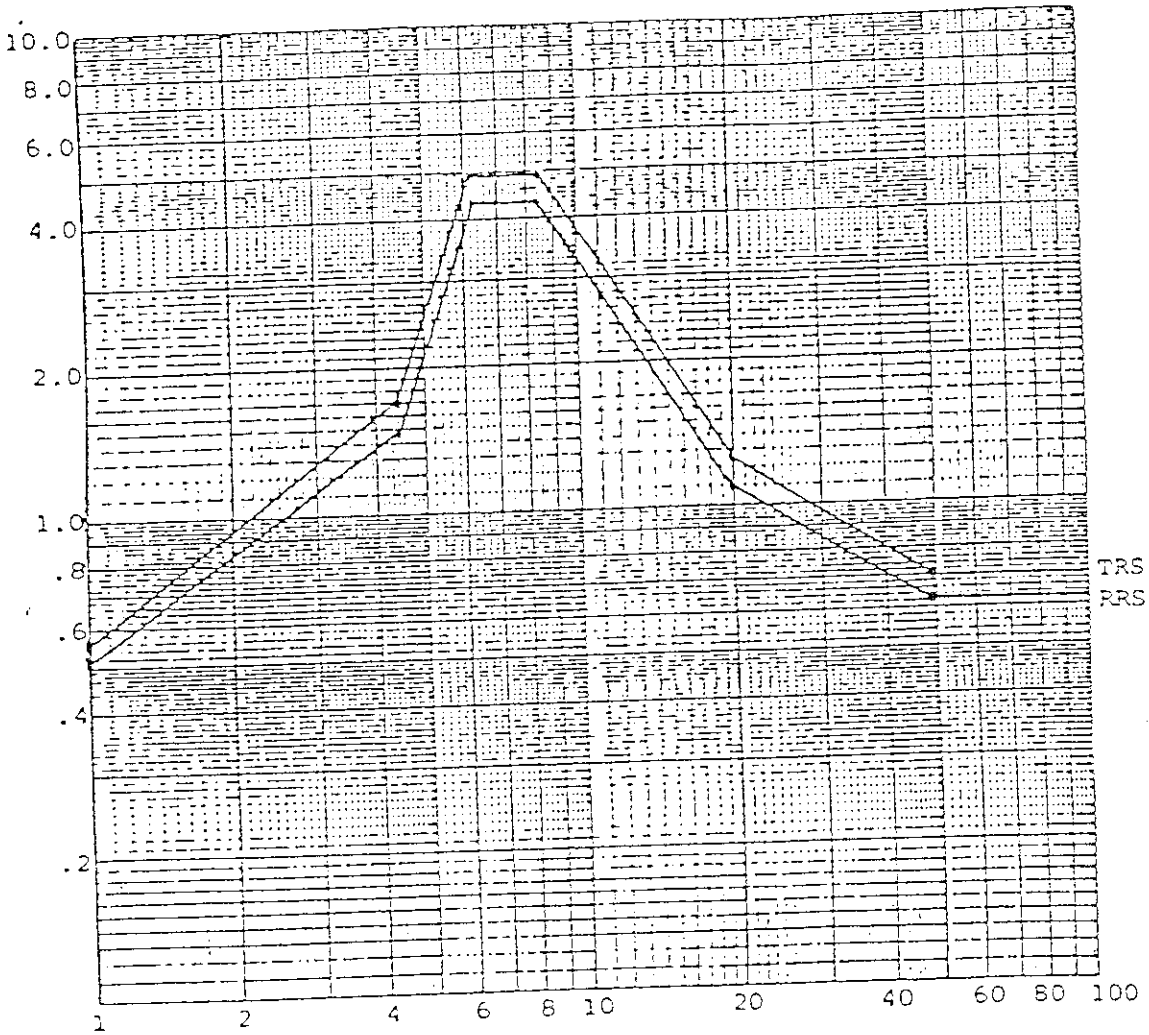


Figure 4-4

THE TRS INCLUDES +10% SAFETY MARGIN REQUIRED TO MEET THE RRS.

TEST IMPLEMENTATION (Cont.)

CP&L SHEARON HARRIS DBE/RRS-TRS VERTICAL SHOCK RESPONSE SPECTRA

(3% DAMPING)

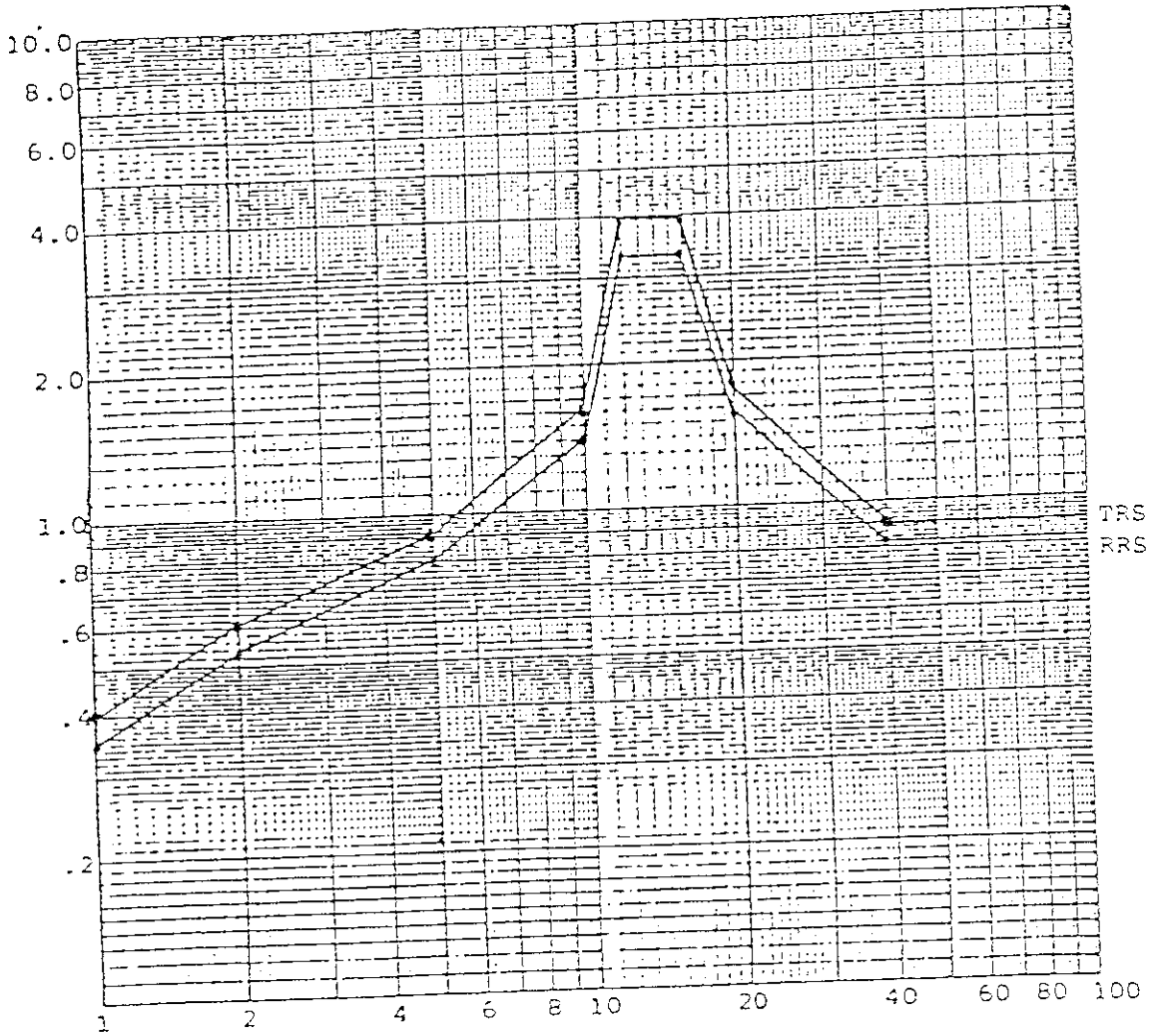
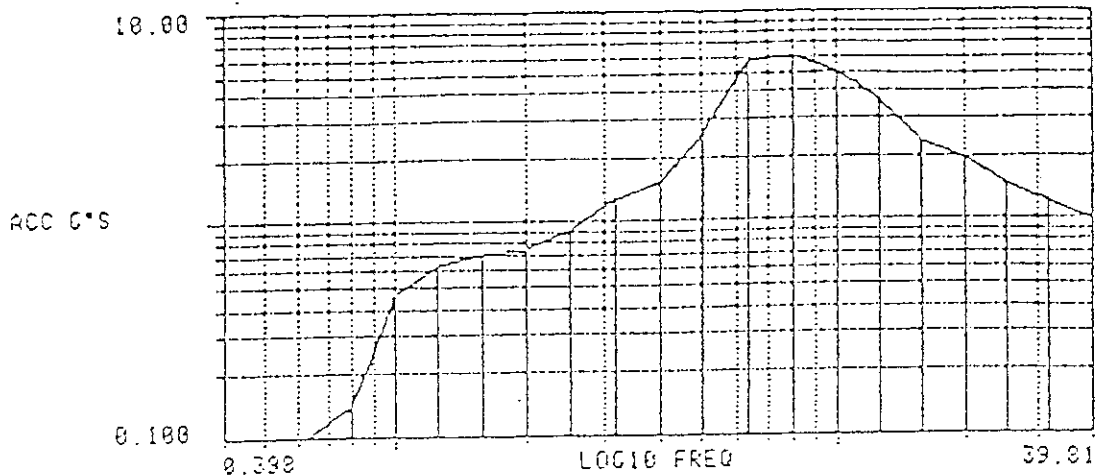


Figure 4-5

THE TRS INCLUDES +10% SAFETY MARGIN REQUIRED TO MEET THE RRS.

CHANNEL - A ZPA= 0.05 Gpk



15-DEC-83
04:12:38
?

SHOCK RESPONSE
10165 SET 1 OBE 7 CONTROL

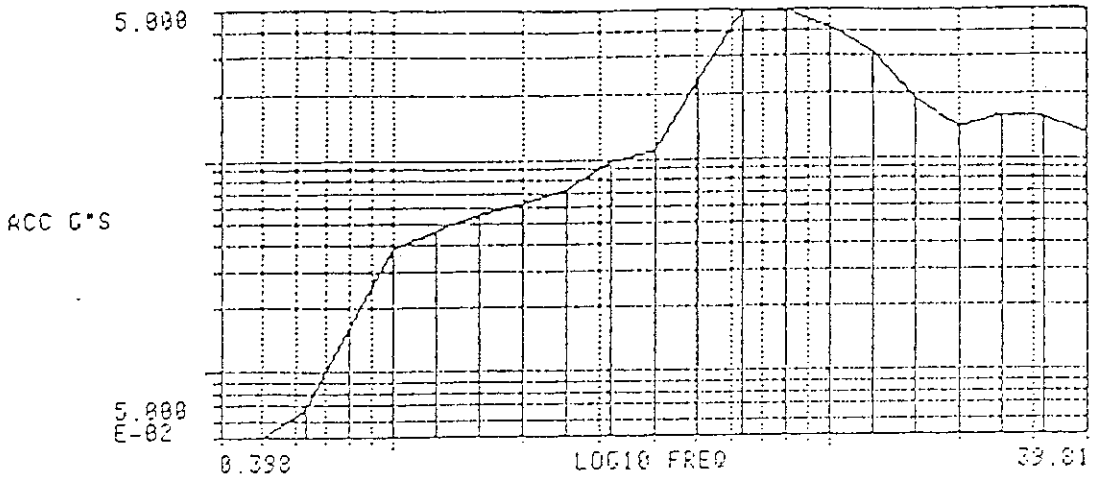
2.0 % Damp Abs Acc
1/3 Octave Maxi-Max

Freq	Amdl	Freq	Amdl	Freq	Amdl
0.50	0.06	2.51	0.89	12.59	3.54
0.63	0.07	3.16	1.26	15.85	2.32
0.79	0.14	3.98	1.55	19.95	1.91
1.00	0.46	5.01	2.00	25.12	1.49
1.26	0.62	6.31	3.07	31.62	1.21
1.58	0.69	7.94	3.65	39.81	0.99
2.00	0.72	10.00	4.40		

FIGURE 6.2

Accelerometer # X * Damping 2
 Direction N-S Location # _____
 Test # 7 Test Type: OBE SSE _____ FRAG _____
 Excitation Type: BIAX _____ TRIAX N-S _____ E-W _____
 Accelerometer Type: CONTROL SURVEY _____

CHANNEL - 8 ZPA* 0.98 Gpk



16-DEC-83
04:15:20
?

SHOCK RESPONSE
18165 SET 1 OBE 7 CONTROL

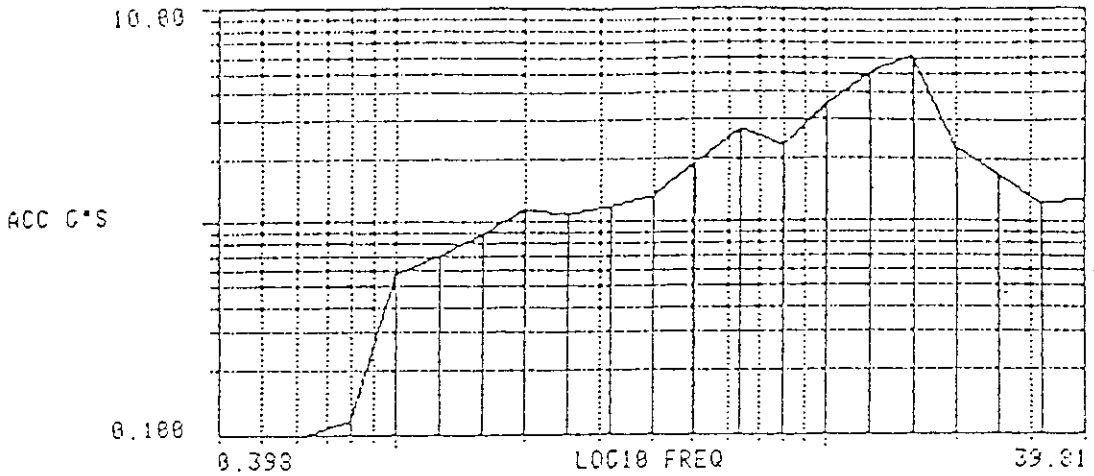
2.0 % Damp Abs Acc
1/3 Octave Maxi-Max

Freq	Ampl	Freq	Ampl	Freq	Ampl
0.50	0.05	2.51	0.72	12.59	3.11
0.63	0.07	3.16	0.97	15.85	1.87
0.79	0.16	3.98	1.09	19.95	1.33
1.00	0.38	5.01	2.36	25.12	1.59
1.26	0.47	6.31	4.81	31.62	1.55
1.58	0.55	7.94	4.92	39.81	1.29
2.00	0.62	10.00	4.05		

FIGURE 6.3

Accelerometer # Y % Damping 2
 Direction E-W Location #
 Test # 7 Test Type: OBE SSE FRAG
 Excitation Type: BIAX TRIAX N-S E-W
 Accelerometer Type: CONTROL SURVEY

CHANNEL - C ZPA- 1.01 Gpk



16-DEC-83
04:16:58
?

SHOCK RESPONSE
10165 SET 1 OBE 7 CONTROL

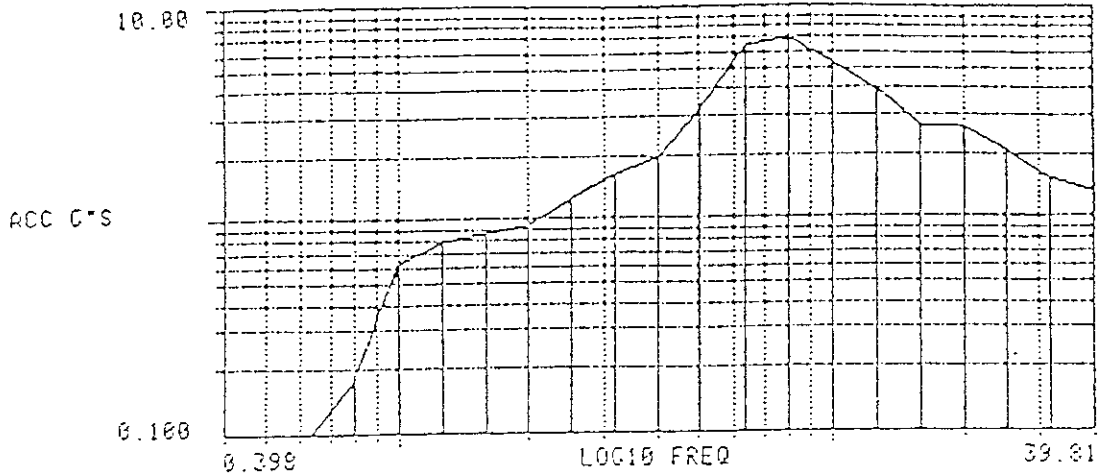
2.0 % Damp Abs Acc
1/3 Octave Maxi-Max

Freq	Ampl	Freq	Ampl	Freq	Ampl
0.50	0.03	2.51	1.08	12.59	4.99
0.63	0.05	3.16	1.17	15.85	6.09
0.79	0.11	3.98	1.33	19.95	2.26
1.00	0.56	5.01	1.06	25.12	1.65
1.25	0.63	6.31	2.64	31.62	1.21
1.58	0.66	7.94	2.24	39.81	1.23
2.00	1.13	10.00	3.43		

FIGURE 6.4

Accelerometer # 2 * Damping 2
 Direction vert Location # _____
 Test # _____ Test Type: OBE SSE _____ FRAG _____
 Excitation Type: BIAX _____ TRIAX N-S _____ E-W _____
 Accelerometer Type: CONTROL SURVEY _____

CHANNEL - A ZPA= 1.17 GPK



16-DEC-83
04:22:10
?

SHOCK RESPONSE
10165 SET 1 SSE 1 CONTROL

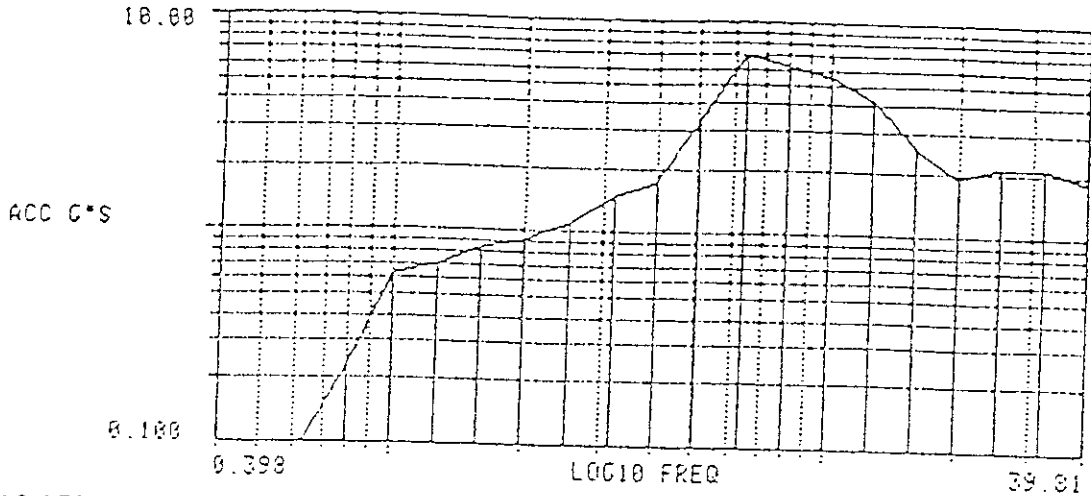
3.0 % Damp Abs Acc
1/3 Octave Maxi-Max

Freq	Ampl	Freq	Ampl	Freq	Ampl
0.50	0.05	2.51	1.24	12.59	3.89
0.53	0.08	3.16	1.60	16.25	2.64
0.79	0.16	3.98	1.95	19.95	2.50
1.00	0.61	5.01	3.14	25.12	2.82
1.26	0.77	6.31	6.31	31.62	1.94
1.58	0.94	7.94	6.87	39.81	1.61
2.00	0.92	10.00	5.28		

FIGURE 6.5

Accelerometer # X X Damping 3
Direction N-S Location # _____
Test # B Test Type: OBE _____ SSE FRAG _____
Excitation Type: B1AX _____ TRIAX N-S _____ E-W _____
Accelerometer Type: CONTROL SURVEY _____

CHANNEL - B ZPA= 1.48 Gpk



16-DEC-83
04:23:56
?

SHOCK RESPONSE
10165 SET 1 SSE 1 CONTROL

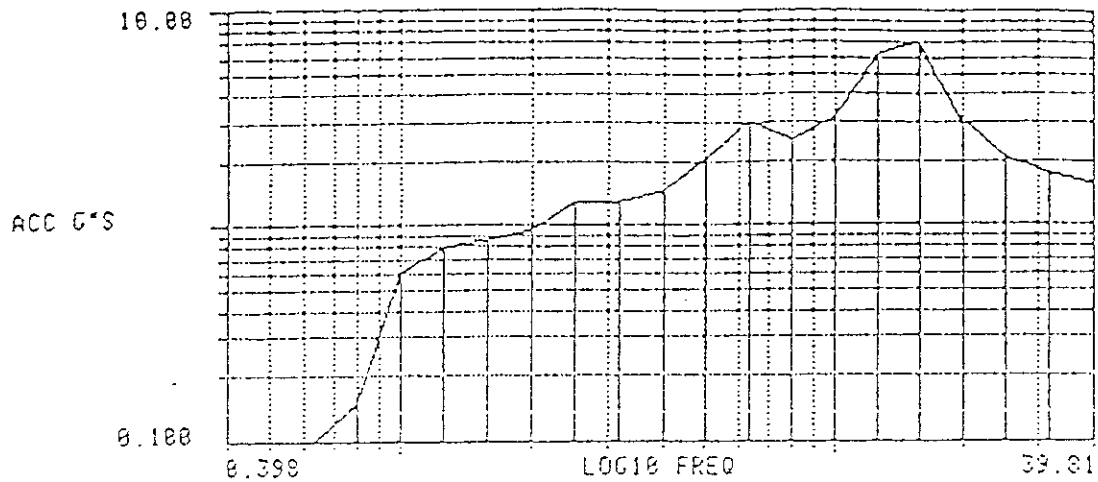
3.8 % Damp Abs Acc
1/3 Octave Maxi-Max

Freq	Ampl	Freq	Ampl	Freq	Ampl
0.50	0.07	2.51	1.12	12.59	4.10
0.63	0.10	3.15	1.50	15.85	2.50
0.79	0.23	3.98	1.71	19.95	1.80
1.00	0.50	5.01	2.27	25.12	2.12
1.26	0.69	6.31	3.00	31.62	2.00
1.58	0.83	7.94	3.14	39.81	1.84
2.00	0.90	10.00	3.32		

FIGURE 6.6

Accelerometer # Y % Damping 3
 Direction E-W Location #
 Test # B Test Type: DBE SSE FRAG
 Excitation Type: BIAX TRIAX N-S E-W
 Accelerometer Type: CONTROL SURVEY

CHANNEL - C ZPA= 1.27 Gpk



16-DEC-83
04:25:48
?

SHOCK RESPONSE
10165 SET 1 SSE 1 CONTROL

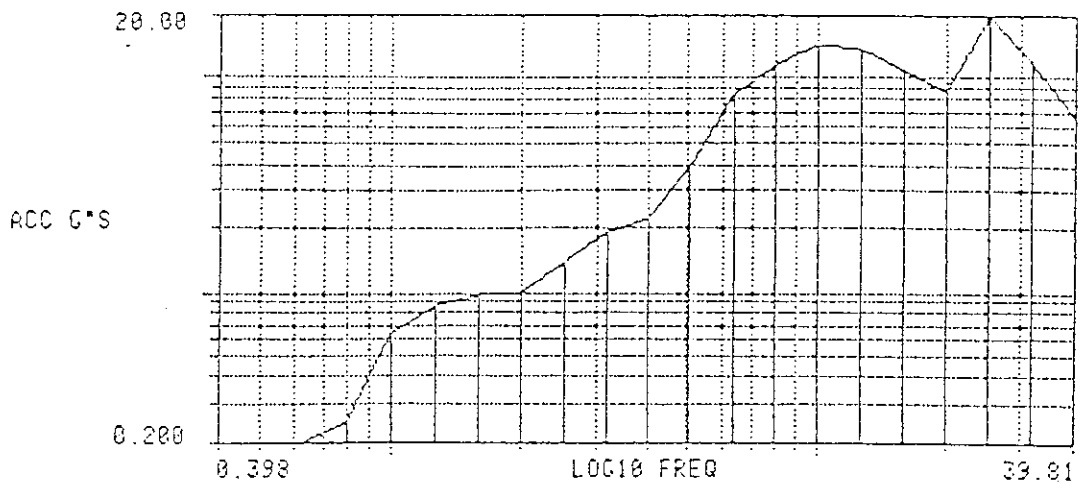
3.0 % Damp Abs Acc
1/3 Octave Maxi-Max

Freq	Ampl	Freq	Ampl	Freq	Ampl
0.50	0.84	2.51	1.27	12.59	6.14
0.63	0.87	3.16	1.27	15.85	7.80
0.79	0.15	3.98	1.46	19.95	2.99
1.00	0.60	5.01	2.06	25.12	2.06
1.26	0.76	6.31	2.98	31.62	1.71
1.58	0.85	7.94	2.44	39.81	1.52
2.00	0.96	10.00	3.06		

FIGURE 6.7

Accelerometer # 8 * Damping 3
 Direction Vert Location #
 Test # 8 Test Type: OBE SSE FRAG
 Excitation Type: BIAx TRIAX N-S E-W
 Accelerometer Type: CONTROL SURVEY

CHANNEL - C ZPA= 3.76 Gpk



16-DEC-83
01:20:00
?

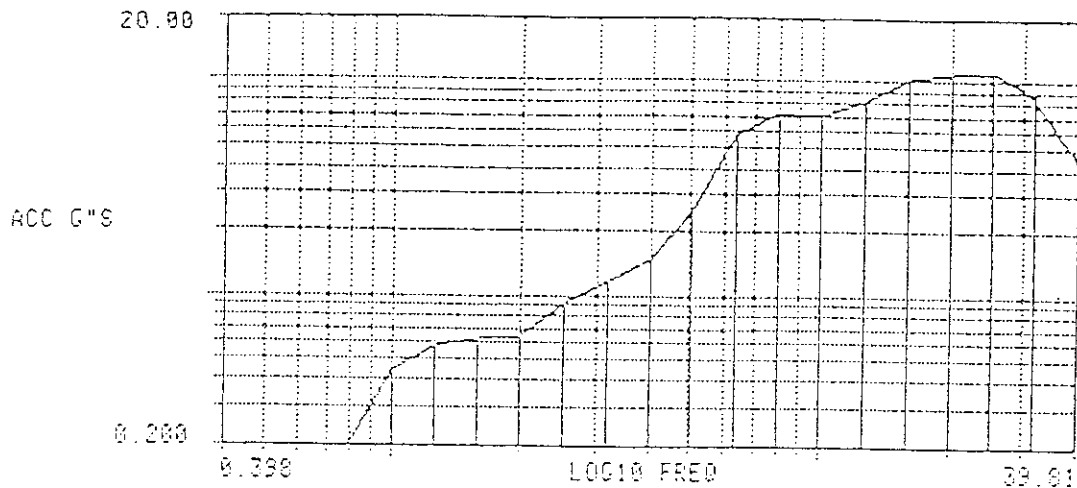
SHOCK RESPONSE
10165 SET 2 SSE 1 SURVEY

3.0 % Damp Abs Acc
1/3 Octave Maxi-Max

Freq	Ampl	Freq	Ampl	Freq	Ampl
0.50	0.10	2.51	1.38	12.59	13.79
0.63	0.11	3.16	1.91	15.85	10.92
0.79	0.24	3.98	2.19	19.95	8.52
1.00	0.64	5.01	3.88	25.12	19.49
1.26	0.85	6.31	8.37	31.62	11.88
1.58	0.97	7.94	11.45	39.81	6.43
2.00	0.99	10.00	14.44		

Accelerometer # 3 % Damping 3
 Direction N-S Location # _____
 Test # _____ Test Type: OBE _____ SSE 1 FRAG _____
 Excitation Type: BIAX _____ TRIAX ✓ N-S _____ E-W _____
 Accelerometer Type: CONTROL _____ SURVEY ✓

CHANNEL - C ZPA= 2.69 Gpk



16-DEC-83
01:28:30

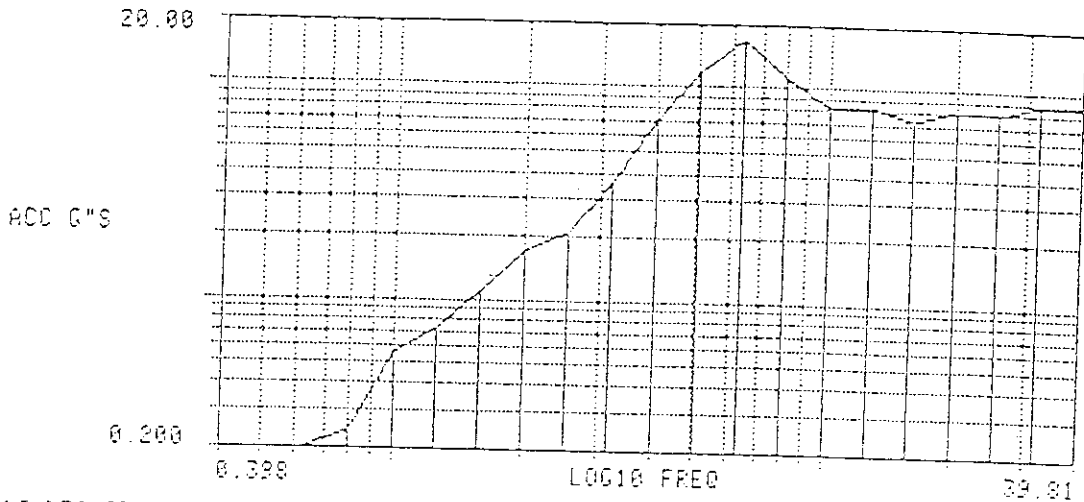
SHOCK RESPONSE
10185 SET 2 OBE 5 SURVEYS

3.0 % Damp Abs Acc
1/3 Octave Maxi-Max

Free	Ampl	Free	Ampl	Free	Ampl
0.50	0.12	2.51	0.90	12.59	9.00
0.63	0.12	3.16	1.15	15.85	10.15
0.79	0.17	3.98	1.46	19.95	10.54
1.00	0.44	5.01	2.49	25.12	11.22
1.26	0.56	6.31	5.69	31.62	8.40
1.58	0.63	7.94	7.09	39.81	4.49
2.00	0.65	10.00	6.96		

Accelerometer # 3 % Damping 3
 Direction N-S Location # _____
 Test # _____ Test Type: OBE 5 SSE _____ FRAG _____
 Excitation Type: BIAX _____ TRIAX N-S _____ E-W _____
 Accelerometer Type: CONTROL _____ SURVEY

CHANNEL - 8 ZPA= 4.81 Gpk



16-DEC-83
01:17:30
?

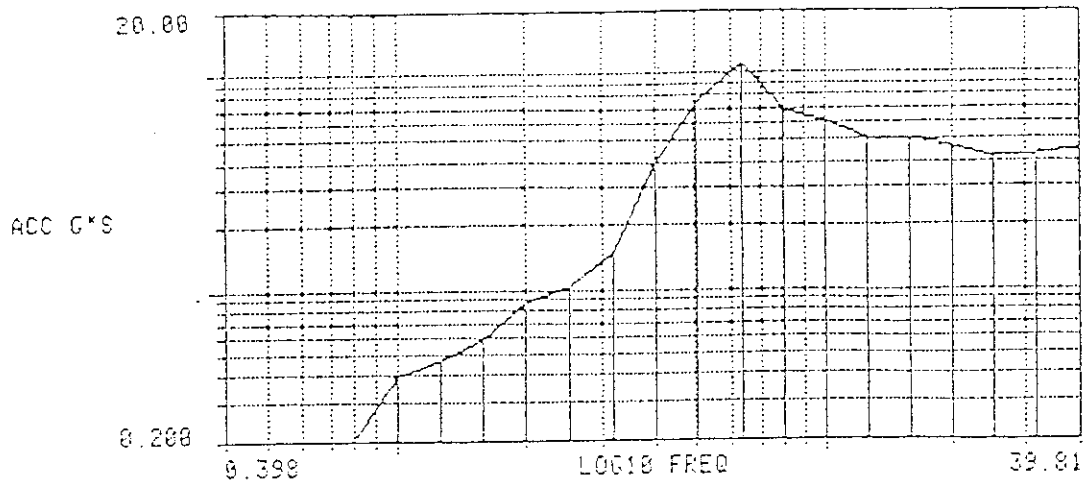
SHOCK RESPONSE
18165 SET 2 SSE 1 SURVEY

3.0 % Damp Abs Acc
1/3 Octave Maxi-Max

Freq	Amp	Freq	Amp	Freq	Amp
0.50	0.10	2.51	2.11	10.00	18.00
0.63	0.12	3.16	3.43	15.85	7.07
0.79	0.24	3.98	6.84	19.95	7.00
1.00	0.55	5.01	11.91	25.12	7.73
1.26	0.73	6.31	16.71	31.62	6.55
1.58	1.10	7.94	11.85	39.81	6.57
2.00	1.67	10.00	7.97		

Accelerometer # 2 % Damping 3
 Direction E-W Location #
 Test # Test Type: OBE SSE 1 FRAG
 Excitation Type: BIAX TRIAX ✓ N-S E-W
 Accelerometer Type: CONTROL SURVEY ✓

CHANNEL - B ZPA= 2.34 Gpk



16-DEC-83
01:27:00
?

SHOCK RESPONSE
16165 SET 2 OBE 5 SURVEYS

3.0 % Damp Abs Acc
1/3 Octave Maxi-Max

Free	Ampl	Free	Ampl	Free	Ampl
0.50	0.85	2.51	1.01	12.59	5.85
0.63	0.87	3.16	1.47	15.85	5.00
0.79	0.17	3.98	3.01	19.95	4.60
1.00	0.38	5.01	7.24	25.12	4.13
1.26	0.46	6.31	11.04	31.62	4.21
1.58	0.60	7.94	6.81	39.81	4.42
2.00	0.85	10.00	5.97		

Accelerometer # 2 % Damping 3
 Direction E-W Location #
 Test # Test Type: OBE 5 SSE FRAG
 Excitation Type: BIAX TRIAX ✓ N-S E-W
 Accelerometer Type: CONTROL SURVEY ✓