

PRELIMINARY ISSUE

Date 10/18/85

VIRGIL C. SUMMER NUCLEAR STATION

SEISMIC CONFIRMATORY PROGRAM

SAMPLE EXAMPLE 1

EQUIPMENT NAME & SYSTEM: Flow & Temperature Indicators (I&C)

EQUIPMENT TAG NUMBER &
LOCATION : TI-4497 Control Bldg. El. 463'
FI-4496 "
TI-4467 "
TI-4480 "
FI-4466 "
TI-4510 "

EQUIPMENT VENDOR : International Instruments

TESTED BY : Wyle Laboratories

QUALIFICATION REPORT # : IMS-92-4038-0

MARGIN AGAINST ACRS : 1.95

MARGIN AGAINST ASLB : 2.45

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A C R S

REQUIRED RESPONSE SPECTRA (RRS)

SAMPLE EXAMPLE 1

SCE&G V.C. SUMMER NUCLEAR STATION
EQUIP. SEISMIC SAFETY MARG. REVIEW
COMPARISON OF FAS FOR SSE
ACRS DATE: 09/17/83

ACRS-RESERVOIR INDUCED
SEISMICITY - R.I.S.
FIGURE 26X SPEC 702
MODIFIED TO SSE

CONTROL BLDG EL 463-0
HORZ SHAKE
EQUIPMENT DAMPING: 0.050
ID-ACRS/26X/0.050

MAXIMUM FLOOR ACC.
ACRS --- = 0.375 G
SPEC 702 = 0.508 G

RRS for Sample Example 1

ACCELERATION (G)
16.00
15.00
12.00
9.00
6.00
3.00
0.00

10⁰ 2 3 4 5 6 7 8 9 10¹ 2 3 4 5

FREQUENCY (HZ)

JOB 656 DATE: 09/17/83



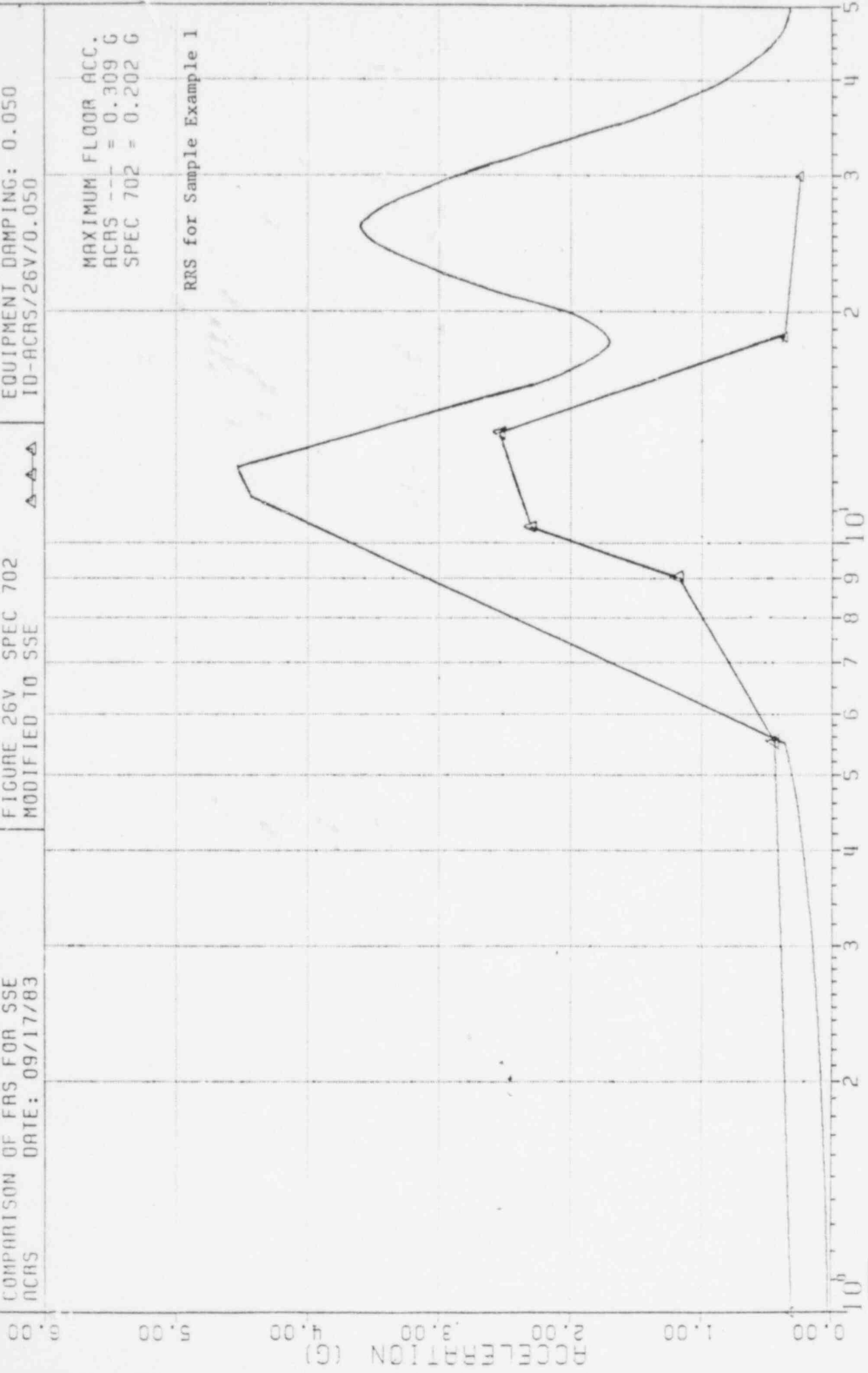
SCE&G V.C. SUMMER NUCLEAR STATION
EQUIP. SEISMIC SAFETY MARG. REVIEW
COMPARISON OF FRS FOR SSE
ACRS DATE: 09/17/83

ACRS-RESERVOIR INDUCED
SEISMICITY - R.I.S.
FIGURE 26V SPEC 702
MODIFIED TO SSE

CONTROL BLDG EL 463-0
VERT QUAKE
EQUIPMENT DAMPING: 0.050
ID-ACRS/26V/0.050

MAXIMUM FLOOR ACC.
ACRS --- = 0.309 G
SPEC 702 = 0.202 G

RRS for Sample Example 1



FREQUENCY (HZ)

JOB 657 DATE: 09/17/83

A S L B

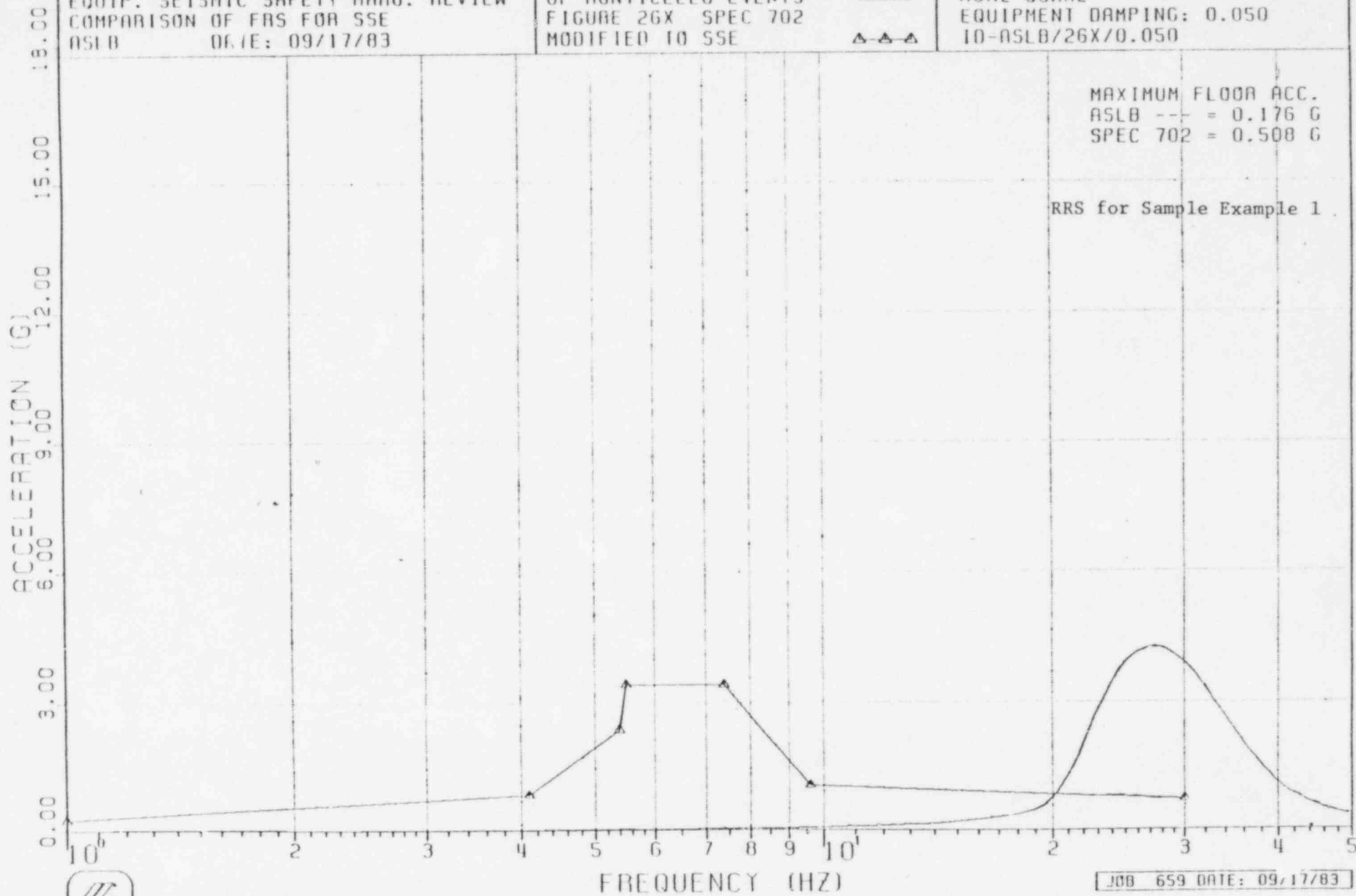
REQUIRED RESPONSE SPECTRA (RRS)

SAMPLE EXAMPLE 1

SCE&G V.C. SUMNER NUCLEAR STATION
EQUIP. SEISMIC SAFETY MARG. REVIEW
COMPARISON OF FRS FOR SSE
ASLB DATE: 09/17/83

ASLB-MODIFIED ENVELOPE
OF MONTICELLO EVENTS
FIGURE 26X SPEC 702
MODIFIED TO SSE

CONTROL BLDG EI 463-0
HORZ QUAKE
EQUIPMENT DAMPING: 0.050
10-ASLB/26X/0.050

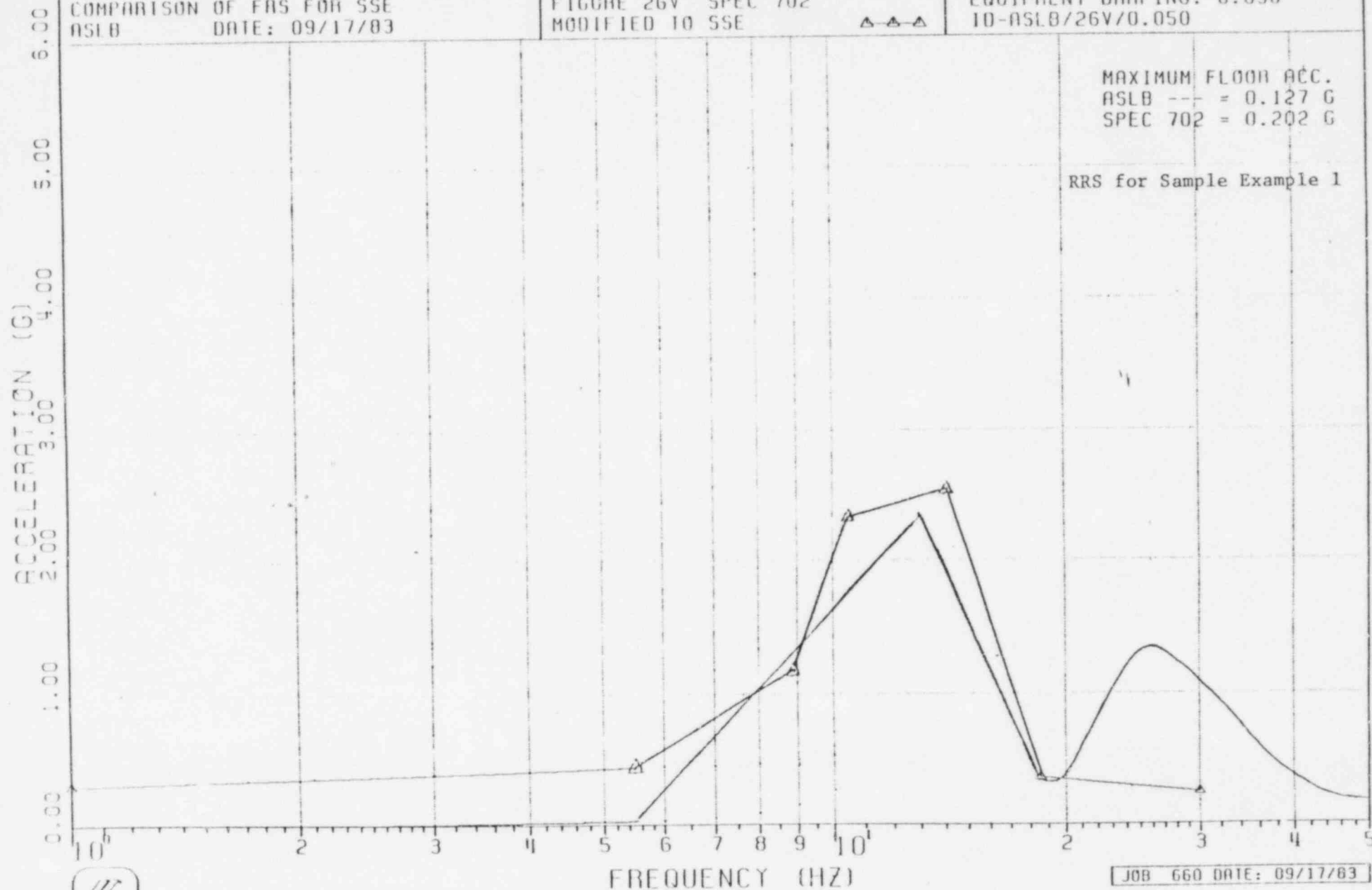


JOB 659 DATE: 09/17/83

SCE&G V.C. SUMNER NUCLEAR STATION
EQUIP. SEISMIC SAFETY MARG. REVIEW
COMPARISON OF FAS FOR SSE
ASLB DATE: 09/17/83

ASLB-MODIFIED ENVELOPE
OF MONTICELLO EVENTS
FIGURE 26V SPEC 702
MODIFIED TO SSE

CONTROL BLDG EL 463-0
VERT QUAKE
EQUIPMENT DAMPING: 0.050
1D-ASLB/26V/0.050



JOB 660 DATE: 09/17/83

RELEVANT SEISMIC QUALIFICATION
REPORT INFORMATION FROM
SEISMIC QUALIFICATION REPORT
NO. IMS-92-4038-0
AND
SPECIFICATION

SPECIFICATION

MAIN CONTROL BOARD

VIRGIL C. SUMMER NUCLEAR STATION - UNIT 1

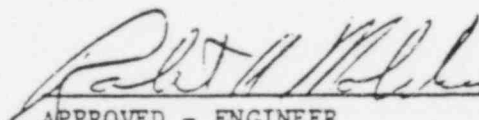
SP-568-044461-000

JULY 31, 1974

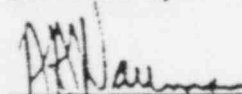
SAFETY RELATED

QUALITY PROGRAM REQUIRED

SOUTH CAROLINA ELECTRIC & GAS COMPANY
COLUMBIA, SOUTH CAROLINA

 073174
APPROVED - ENGINEER DATE

Reviewed by:

 7/31/74
Program Manager
Quality Assurance

Gilbert Associates, Inc.
525 Lancaster Avenue
Reading, PennsylvaniaR.A.M.-D.M.S.
W.O. 044461-000

2:00 DETAILED REQUIREMENTS2:01 Equipment, Materials, and Services to be Supplied by the Contractor

- 2:01.1 This Specification sets forth the requirements for the final design, manufacture, fabrication, assembly, testing, inspection, and delivery of the main control board and 50 associated termination cabinets to be installed for South Carolina Electric and Gas Company, Virgil C. Summer Nuclear Station - Unit 1.
- 2:01.2 The WORK shall include all labor, equipment, wiring, drawings, and material, except as noted, necessary to design, manufacture, fabricate, assemble, test, and deliver the main control board and 50 associated terminal cabinets.
- 2:01.3 The CONTRACTOR shall be responsible for mounting and wiring of all devices (as listed in items 2:01.6 and 2:02.5) on the control board. The wiring shall include the following:
1. Terminating the wires on the device as described in item 2:07.5 subitems 2 and 3.
 2. Routing of the wire in appropriate internal trays to designated floor openings and adding support where necessary.
 3. Coiling and tagging a minimum of 12 feet of wire at the exit of the board at designated floor openings for the OWNER'S field connection to the termination cabinets.
- 2:01.4 The CONTRACTOR shall provide all required seismic qualification and documentation as described in item 2:08.7.
- 2:01.5 The CONTRACTOR shall perform and document all testing as detailed in Item 2:08.
- 2:01.6 The CONTRACTOR shall furnish and install the following main control board equipment material (including 25 bound volumes of instruction books per Item 1:09 of this Specification):

Quantity

1. Indicators:
 - a. Single (International Instruments Model 1151). 100
 - b. Dual (International Instruments Model 1251). 10
 - c. General Electric Co. Type AB-40. 70

QCTR-108

CLASS IE QUALIFICATION

TEST REPORT

FOR

INSTRUMENT MODEL

W1151/1251

FOR

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

SEABROOK STATION, UNITS 1 & 2

INTERNATIONAL INSTRUMENTS
 Division of Sigma Instruments, Inc.
 88 Marsh Hill Road
 Orange, CT 06477

Gregory E. Hanson 6/17/80
 Gregory E. Hanson, Nuclear Project Engineer.

Roy Marshon 6/19/80
 Roy Marshon, Chief Engineer

Michael B. Kalakay 6/19/80
 Michael Kalakay, Mgr. Quality Control

Joseph V. LeBlanc
 Official - Joseph V. LeBlanc, Vice President

GILBERT - W.O. NG.
 ASSOC., INC.

AUG 22 '83 5066

Rev. 1
 11/11/81

11202
 621
 1MS-92-4038-0

I INTRODUCTION

The following test program was conducted to qualify the International Instruments, hereafter referred to as "I.I.", models W1151/1251 indicators for use at Public Service Company of New Hampshire, Seabrook Station Units 1 and 2. This test was performed in accordance with the requirements of Q.C. Test Plan QTP-108 Rev. 2 (Appendix I) which reflects the requirements of United Engineers and Constructors, Inc.

II CONCLUSION

This test program, upon its successful completion has demonstrated that five (5) years of service in a control room will not compromise the ability of a model W1151/1251 to withstand a postulated seismic event. This conclusion is drawn from performance data acquired after a simulation of the postulated seismic event on indicators that have been in service for five (5) years. These indicators were supplied by Public Service Company of New Hampshire's Newbury Station. The service history of which is documented in Appendix II. All of the five (5) year old indicators, hereafter referred to as "old", successfully met the criteria of Section VII of QTP-108 with the exception of zero adjustment.

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TEST REPORT NO. 45062-1

TABLE I

TEST RUN DESCRIPTIONS

TEST RUN NO.	TYPE TEST	TEST AXES	LEVEL	INPUT ACCELERATION (g)		REMARKS
				HZPA	VZPA	
1	Sine Sweep	FB/V	0.2 g	---	---	Internal resonance at 19 Hz and 34.5 Hz
2	RMF	FB/V	< OBE	2.5	2.7	
3	RMF	FB/V	OBE	2.7	2.8	
4	RMF	FB/V	OBE	2.6	2.8	
5	RMF	FB/V	OBE	2.6	2.8	
6	RMF	FB/V	OBE	2.5	2.8	
7	RMF	FB/V	OBE	2.5	2.9	
8	RMF	FB/V	SSE	5.0	5.4	
9	Sine Sweep	SS/V	0.2 g	---	---	Internal resonance at 21.5 Hz and 26.5 Hz
10	RMF	SS/V	OBE	2.6	3.0	
11	RMF	SS/V	OBE	2.5	2.9	
12	RMF	SS/V	OBE	2.5	2.8	
13	RMF	SS/V	OBE	2.5	2.8	
14	RMF	SS/V	OBE	2.5	2.8	
15	RMF	SS/V	SSE	4.8	5.8	

LEGEND:

RMF = Random Multifrequency

FB/V = Front-to-Back and Vertical

SS/V = Side-to-Side and Vertical

OBE = Operating Basis Earthquake

SSE = Safe Shutdown Earthquake

HZPA = Horizontal Zero Period Acceleration

VZPA = Vertical Zero Period Acceleration

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TEST REPORT NO. 45062-1

APPENDIX II

TEST RESPONSE SPECTRUM PLOTS
OF THE
CONTROL ACCELEROMETERS
FOR THE
OPERATING BASIS EARTHQUAKE TESTS
AT 1% DAMPING

<u>TEST RUN NUMBERS</u>	<u>ORIENTATION</u>
3, 4, 5, 6 and 7	Front-to-Back/Vertical
10, 11, 12, 13 and 14	Side-to-Side/Vertical

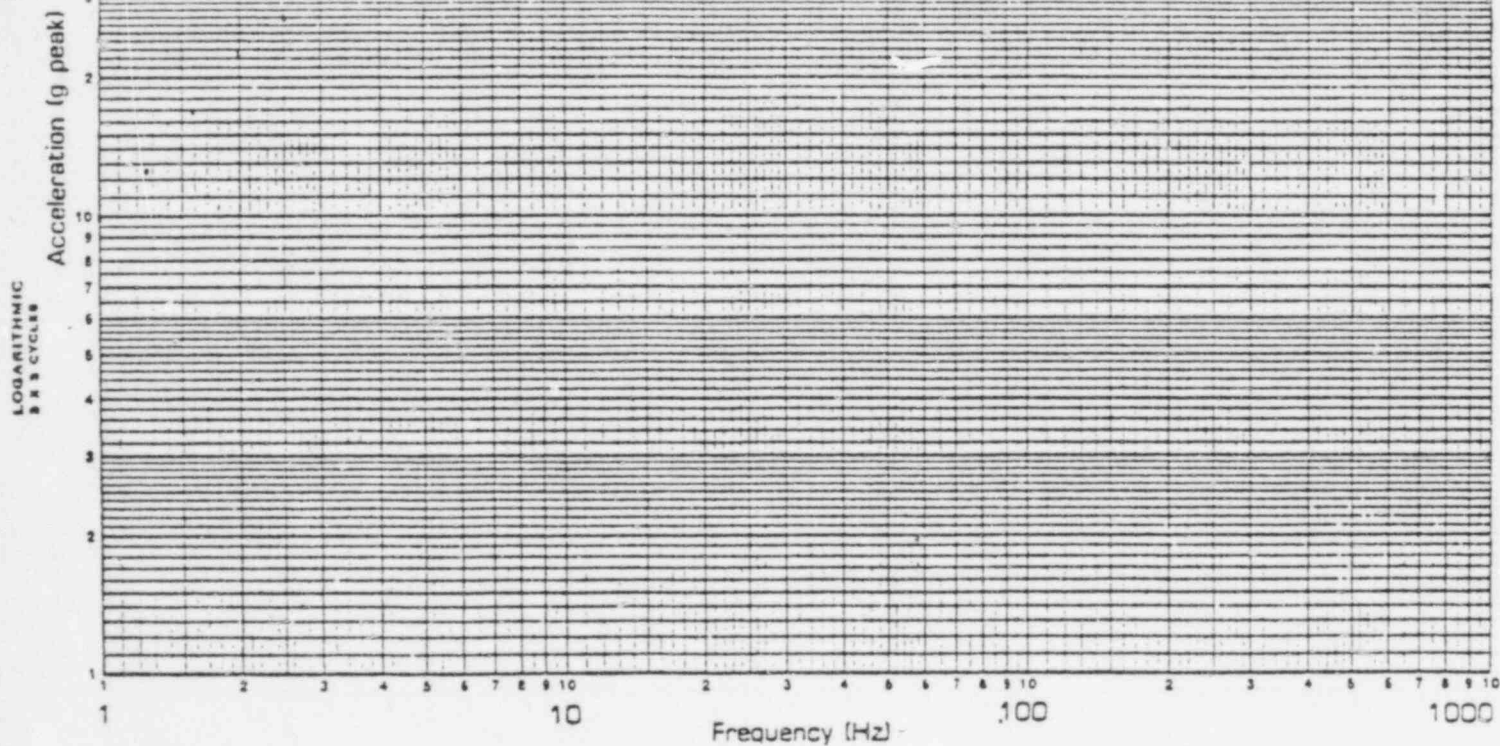
HCA = Horizontal Control Accelerometer

VCA = Vertical Control Accelerometer

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FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐DAMPING ☐ 5 %

AXIS

FBV

LOCATION NO.

HCA

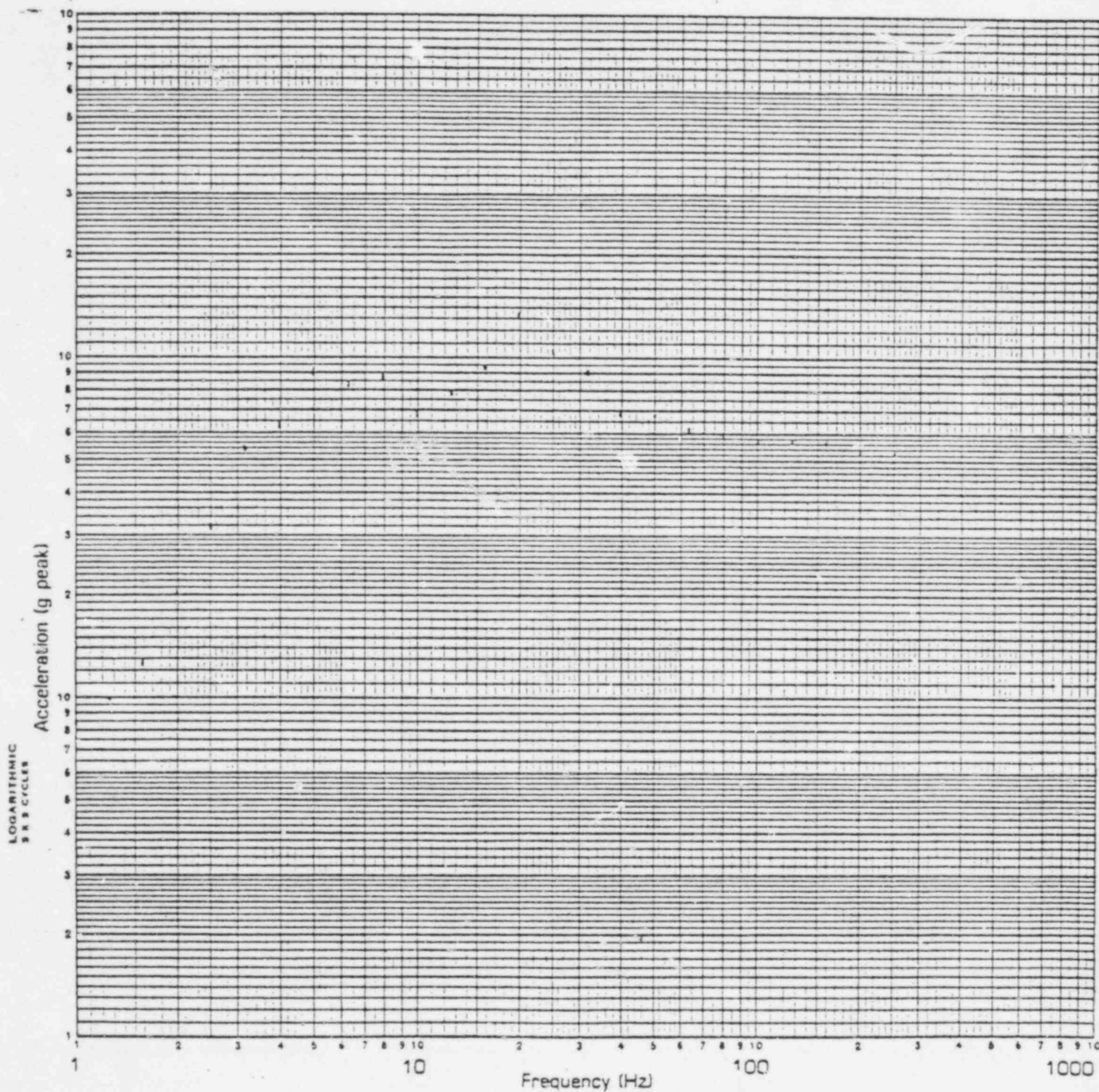
TEST RUN NO

8

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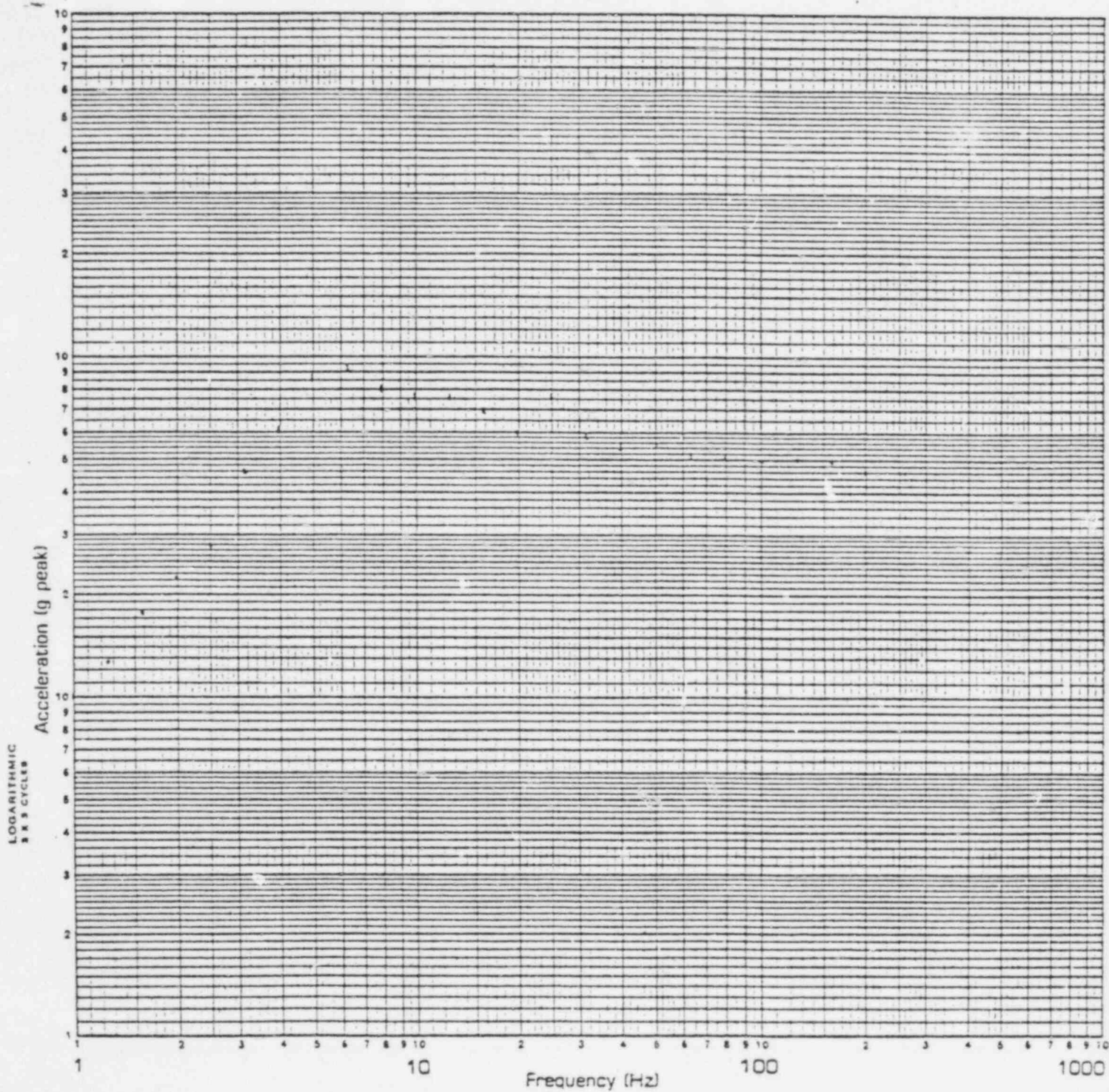
Report No. 45062-1

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐DAMPING ☒ 5%AXIS FB/VLOCATION NO. VCATEST RUN NO. 8

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Report No. 45062-1

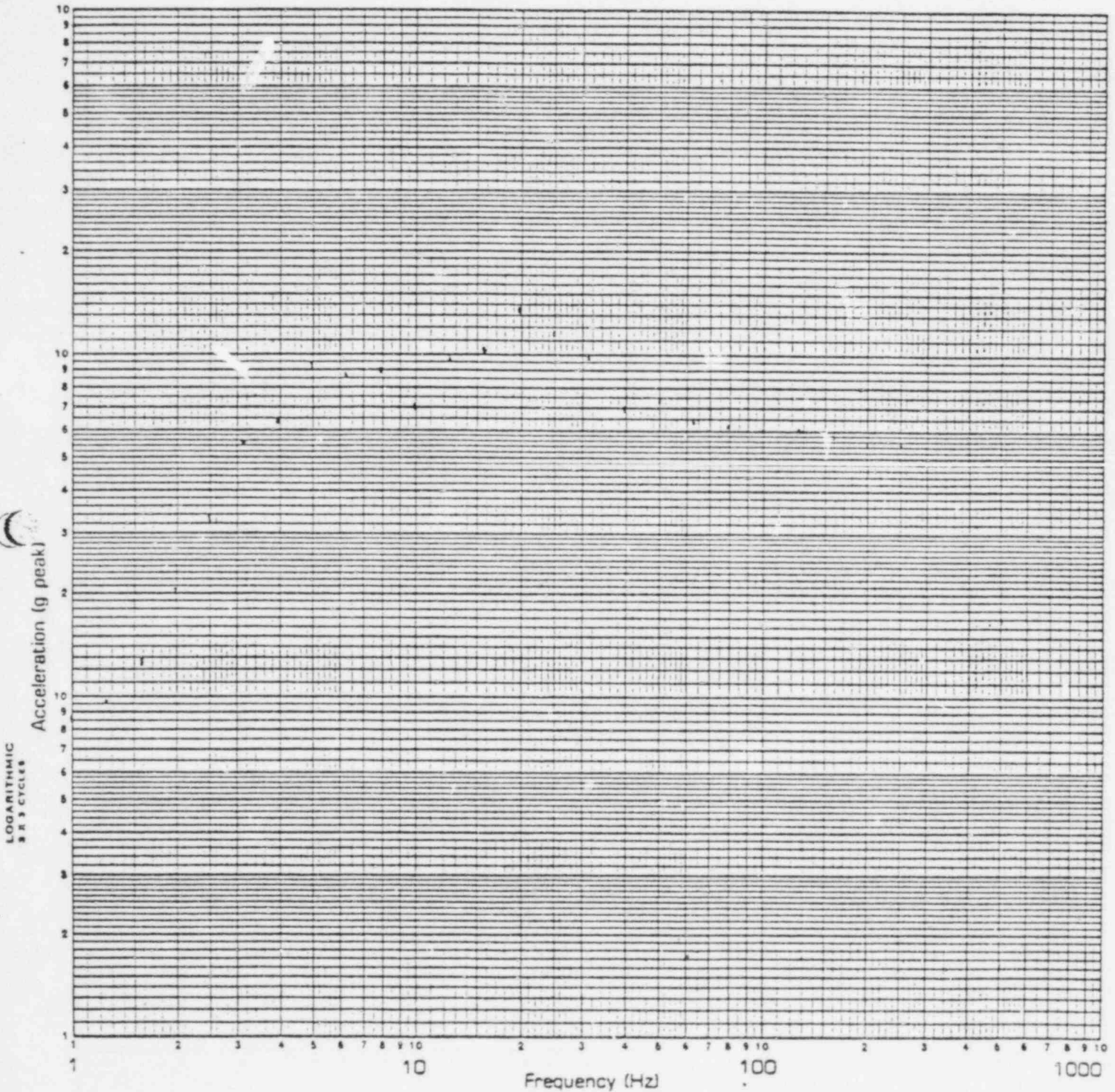
FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐DAMPING ☒ 5%AXIS SS/VLOCATION NO. HCATEST RUN NO. 15

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐

DAMPING ☐ 5 %



AXIS SS/V

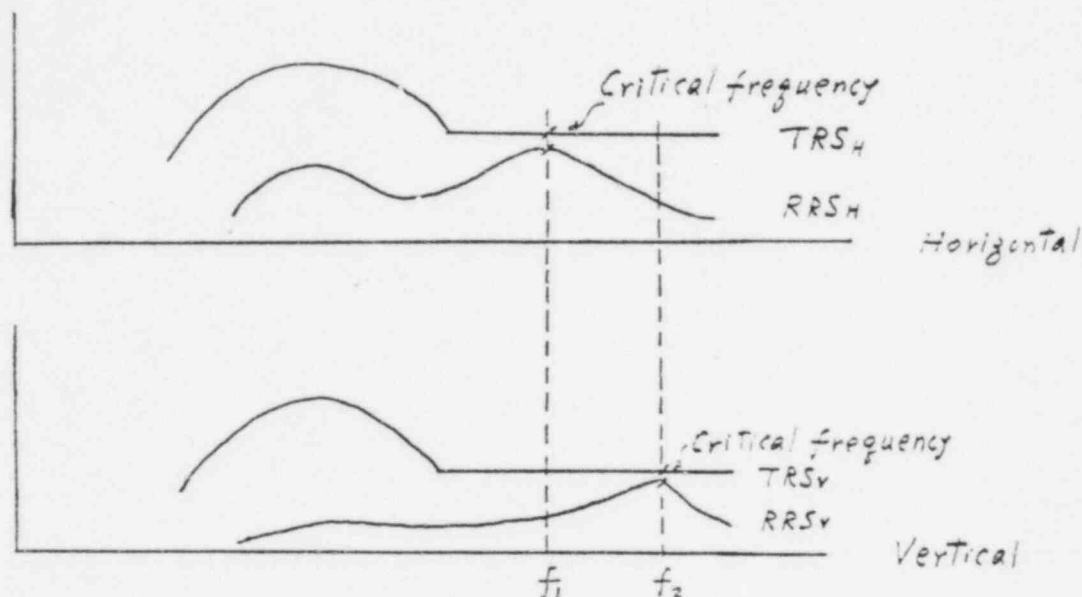
LOCATION NO. VCA

TEST RUN NO. 15

COMPARISON PLOTS
OF
TRS AND RRS (ASLB)
AND
MARGIN CALCULATION

Margin for Equipment Qualified by Biaxial Test

Equipment margin can be calculated as shown below.



Calculate margin m_1 , m_2 for frequencies f_1 and f_2 as

$$m_1 = \sqrt{(TRS_{Hf_1})^2 + (TRS_{Vf_1})^2} / \sqrt{(RRS_{Hf_1})^2 + (RRS_{Vf_1})^2} \quad \times 0.9$$

$$m_2 = \sqrt{(TRS_{Hf_2})^2 + (TRS_{Vf_2})^2} / \sqrt{(RRS_{Hf_2})^2 + (RRS_{Vf_2})^2} \quad \times 0.9$$

The smaller value of m_1 and m_2 is defined as the margin of the equipment.

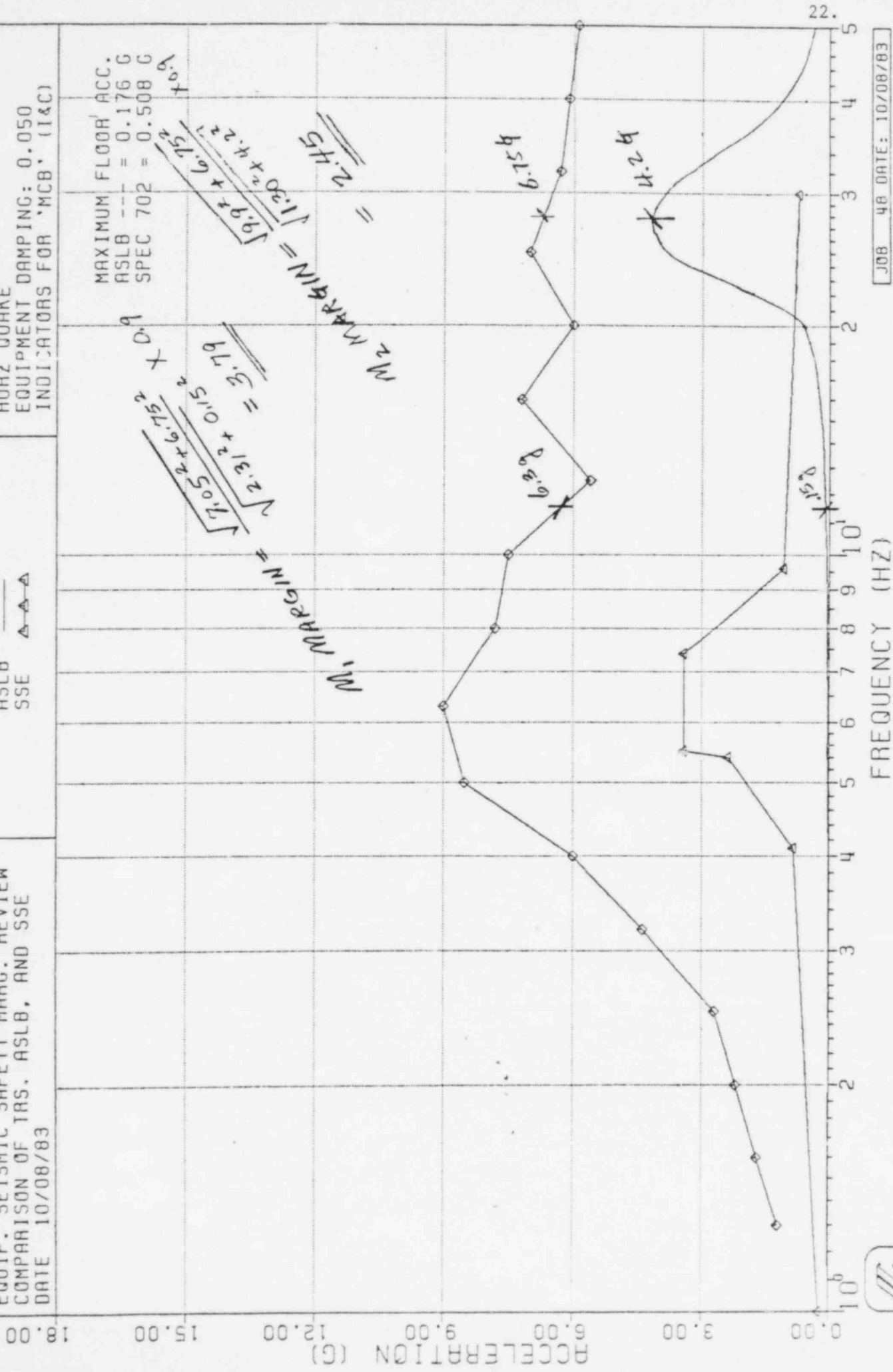
Critical frequency is defined as the frequency which has the smallest TRS/RRS ratio.

A constant 0.9 is applied to incorporate the 10% increase of RRS.

SCE&G V.C. SUMMER NUCLEAR STATION
EQUIP. SEISMIC SAFETY MARG. REVIEW
COMPARISON OF TRS, ASLB, AND SSE
DATE 10/08/83

TRS $\diamond-\diamond-\diamond$
ASLB ---
SSE $\triangle-\triangle-\triangle$

CONTROL BLDG EL 463-0
HORZ QUAKE
EQUIPMENT DAMPING: 0.050
INDICATORS FOR 'MCB' (I&C)



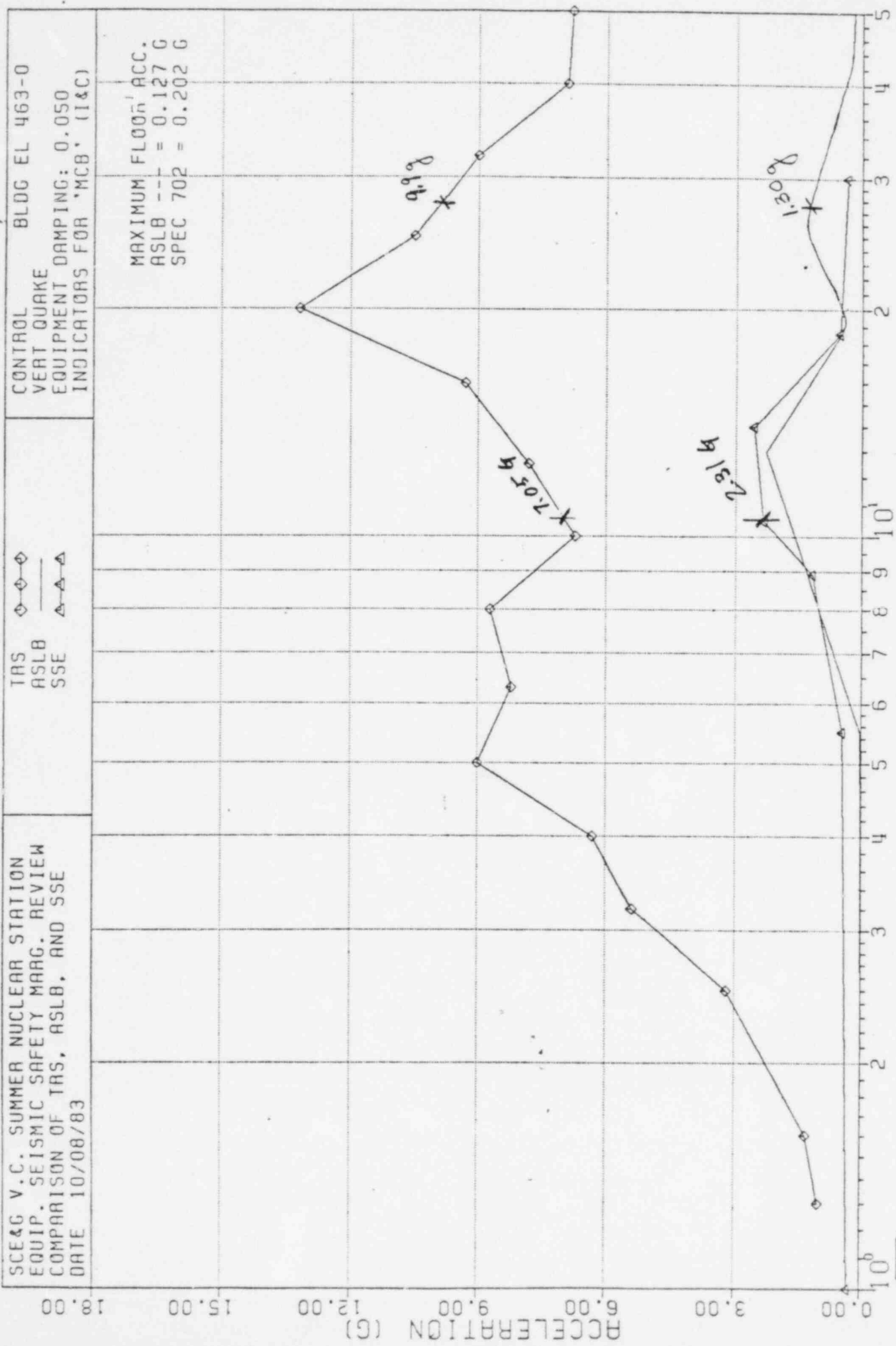
SCE&G V.C. SUMMER NUCLEAR STATION
EQUIP. SEISMIC SAFETY MARG. REVIEW
COMPARISON OF TRS, ASLB, AND SSE
DATE 10/08/83

TRS
ASLB
SSE

CONTROL

BLDG EL 463-0
VERT QUAKE
EQUIPMENT DAMPING: 0.050
INDICATORS FOR 'MCB' (I&C)

MAXIMUM FLOOR ACC.
ASLB --- = 0.127 G
SPEC 702 = 0.202 G



FREQUENCY (HZ)

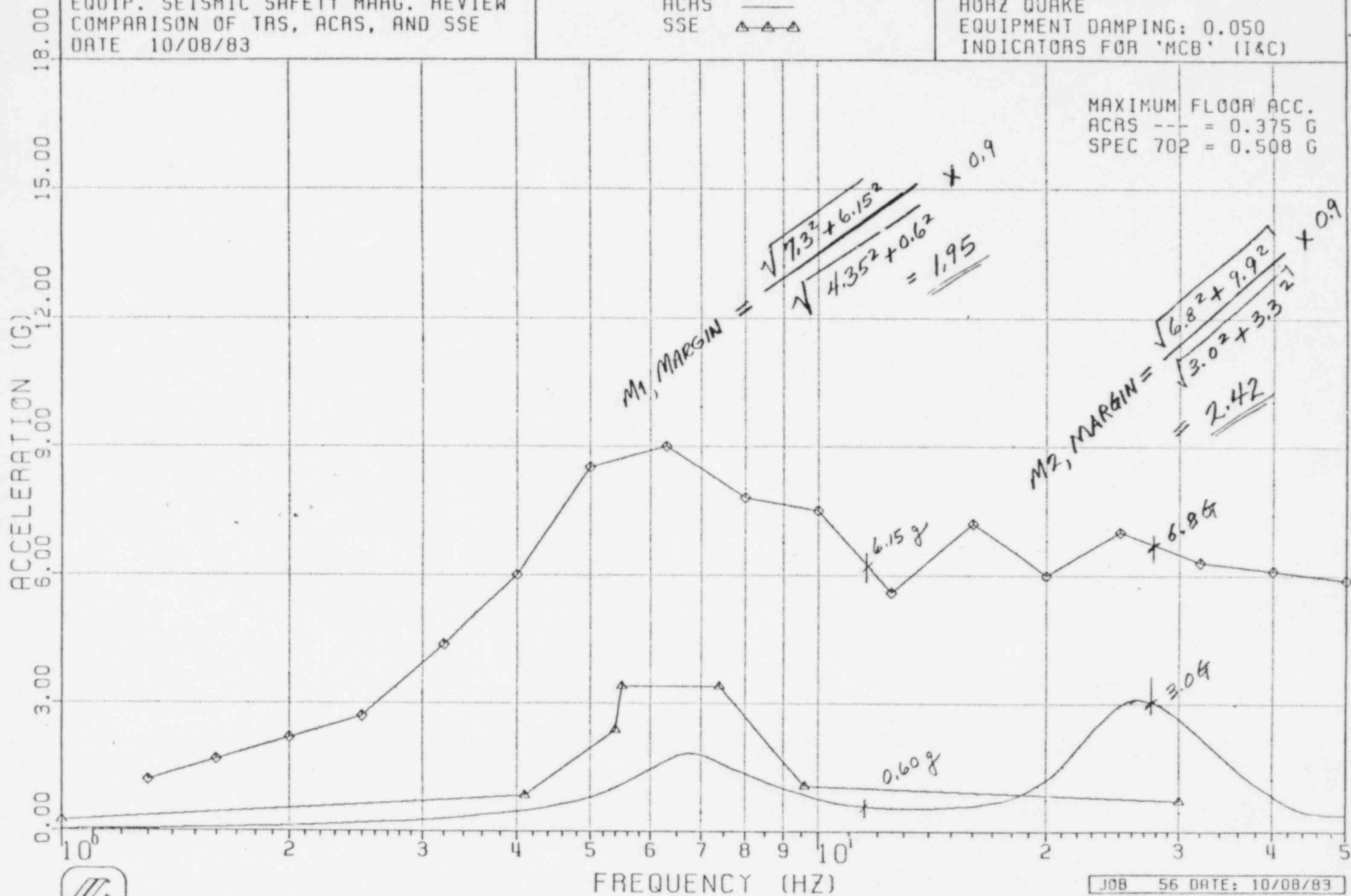
JOB 50 DATE: 10/08/83

COMPARISON PLOTS
OF
TRS AND RRS (ACRS)
AND
MARGIN CALCULATION

SCE&G V.C. SUMMER NUCLEAR STATION
EQUIP. SEISMIC SAFETY MARG. REVIEW
COMPARISON OF TAS, ACAS, AND SSE
DATE 10/08/83

TAS $\diamond-\diamond-\diamond$
ACAS $---$
SSE $\triangle-\triangle-\triangle$

CONTROL BLDG EL 463-0
HORZ QUAKE
EQUIPMENT DAMPING: 0.050
INDICATORS FOR 'MCB' (I&C)



SCE&G V.C. SUMMER NUCLEAR STATION
EQUIP. SEISMIC SAFETY MARG. REVIEW
COMPARISON OF TBS, ACBS, AND SSE
DATE 10/08/83

TBS $\diamond-\diamond-\diamond$
ACBS $---$
SSE $\triangle-\triangle-\triangle$

CONTRACT BLDG EL 463-0
VERT QUAKE
EQUIPMENT DAMPING: 0.050
INDICATORS FOR 'MCB' (I&C)

MAXIMUM FLOOR ACC.
ACBS --- = 0.309 G
SPEC 702 = 0.202 G

