GE Nuclear Energy

General Electric Company
175 Curtner Avenue, San Jose, CA 95125

April 26, 1993

Docket No. STN 52-001

Chet Poslusny, Senior Project Manager
Standardization Project Directorate
Associate Directorate for Advanced Reactors
and License Renewal
Office of the Nuclear Reactor Regulation

Subject: Submittal Supporting Accelerated ABWR Review Schedule - **DFSER Outstanding Items for Chapters 3 and 6**

Dear Chet:

Enclosed are SSAR markups addressing Open items 3.8.4-2 and 6.2.6-8, and COL Action Item 3.8.4-1.

In addition to the outstanding items above, GE has addressed Open Item 6.2.6-7 by reviewing systems that interface with the primary containment. It was determined there are two closed loop systems that provide an extension to containment. These are the containment atmosphere monitoring and fuel pool cooling systems. Both of these systems are leak tested by opening their lines to containment atmosphere during the Type A ILRT. Both systems already have notes describing this method of leak testing.

Please provide a copy of this transmittal to Tom Cheng, Dave Terao and Butch Burton.

Sincerely,

Jack Fox

Jack Fox
Advanced Reactor Programs

cc: Gary Ehlert (GE)
Norman Fletcher (DOE)

JF93-111

Item	Specification
High strength structural steel plates	ASTM A572 or A441
Bolts, studs, and nuts (dia. ≥ 3/4")	ASTM A325 or A490
Bolts, studs, and nuts (dia. ≤ 3/4")	ASTM A307

3.8.3.6.5 Other Internal Structures

The materials conform to all applicable requirements of ANSI/AISC N690 and comply with the following:

Item	Specification
Miscellaneous platforms	Same as Section 3.8.3.6.4
Lower drywell equipment tunnel	ASTM A516 Grade 70 SA-240 Type 304 L
Lower drywell personnel tunnel	ASTM A516 Grade 70 SA-240 Type 304 L
Reactor shield wall stabilizer	
--tube sections	ASTM A501
--plates	ASTM A36
Lower drywell floor fill material	A material other than limestone concrete

3.8.3.7 Testing and Inservice Inspection Requirements

A formal program of testing and inservice inspection is not planned for the internal structures except the diaphragm floor, reactor pedestal, and lower drywell access tunnels. The other internal structures are not directly related to the functioning of the containment system; therefore, no testing or inspection is performed.

Testing and inservice inspection of the diaphragm floor, reactor pedestal and lower drywell access tunnels are discussed in Subsection 3.8.1.7.

3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES

Other Seismic Category I structures which constitute the ABWR Standard Plant are the reactor building, control building and radwaste building substructure. Figure 1.2-1 shows the spatial relationship of these buildings. The only other structure in close proximity to these structures is the turbine building. They are structurally separated from the other ABWR Standard Plant buildings.

The Seismic Category I structure within the ABWR Standard Plant, other than the containment structures, that contains high-energy pipes is the reactor building. The steam tunnel walls protect the reactor building from potential impact by rupture of the high-energy pipes. This building is designed to accommodate the guard pipe support forces.

The reactor building, steam tunnel, residual heat removal (RHR) system, reactor water cleanup (RWCU) system, and reactor core isolation cooling (RCIC) system rooms are designed to handle the consequences of high energy pipe breaks. The RHR, RCIC, and RWCU rooms are designed for differential compartment pressures, with the associated temperature rise and jet force. Steam generated in the RHR compartment from the postulated pipe break exits to the steam tunnel through blowout panels. The steam tunnel is vented to the turbine building through the seismic interface restraint structure (SIRS). The steam tunnel, which contains several pipelines (e.g., main steam, feedwater, RHR), is also designed for a compartment differential pressure with the associated temperature changes and jet force.

Seismic Category I masonry walls are not used in the design. The ABWR Standard Plant does not contain seismic Category I pipelines buried in soil.

(a) The COL applicant will identify all Seismic Category I structures. See Subsection 3.8.6.4 for COL license information.

3.8.4.1 Description of the Structures

3.8.4.1.1 Reactor Building Structure

The reactor building (RB) is constructed of reinforced concrete with a steel frame roof. The RB has four stories above the ground level and three stories below. Its shape is a rectangle of 59 meters in the E-W direction, 56 meters in the N-S direction, and a height of about 57.9 meters from the top of the basemat.

interaction of the substructure with the underlying foundation medium. For a mat foundation supported on soil or rock, the pertinent aspects in the design are to maintain the bearing pressures within allowable limits, particularly due to overturning forces, and to ensure that there is adequate frictional and passive resistance to prevent sliding of the structure when subjected to lateral loads.

The design loads considered in analysis of the foundations are the worst resulting forces from the superstructures and loads directly applied to the foundation mat due to static and dynamic load combinations.

The capability of the foundation to transfer shear with waterproofing will be evaluated. See Subsection 3.8.6.1 for COL license information requirements.

The standard ABWR design is developed using a range of soil conditions as detailed in Appendix 3A. The variations of physical properties of the site-specific subgrade materials will be determined (see Subsection 3.8.6.2). Settlement of the foundations, differential settlement between foundations for the site-specific foundations medium will be calculated and safety-related systems (i.e., piping, conduit, etc.) will be designed for the calculated settlement of the foundations. The effect of the site-specific subgrade stiffness and calculated settlement on the design of the seismic Category I structures and foundations will be evaluated. See Subsection 3.8.6.2 for COL license information requirements.

A detailed description of the analytical and design methods for the reactor building foundation mat including the containment foundation, is included in Section 3.8.1.4.

3.8.5.5 Structural Acceptance Criteria

The main structural criteria for the containment portion of the foundation are adequate strength to resist loads and sufficient stiffness to protect the containment liner from excessive strain. The acceptance criteria for the containment portion of the foundation mat are presented in Subsection 3.8.1.5. The structural acceptance criteria for the reactor building foundations are described in Subsection 3.8.4.5.

The calculated and allowable factors of safety of the ABWR structures for overturning, sliding, and flotation are shown in Sections 3H.1 and 3H.2.

3.8.5.6 Materials, Quality Control, and Special Construction Techniques

The foundations of seismic Category I structures are constructed of reinforced concrete using proven methods common to heavy industrial construction. For further discussion see Subsections 3.8.1.6 and 3.8.4.6.

3.8.5.7 Testing and Inservice Inspection Requirements

A formal program of testing and inservice inspection is not planned and is not required for the seismic Category I structures of the ABWR.

3.8.6 COL License Information

3.8.6.1 Foundation Waterproofing

The capability of foundations to transfer shear loads where foundation waterproofing is used will be evaluated (see Subsection 3.8.5.4).

3.8.6.2 Site Specific Physical Properties and Foundation Settlement

Physical properties of the site specific subgrade medium shall be determined and the settlement of foundations and structures including seismic Category I will be evaluated see Subsection 3.8.5.4).

3.8.6.3 Structural Integrity Pressure Result

Each COL applicant will perform the structural integrity test (SIT) of the ABWR containment in accordance with Subsection 3.8.1.7.1. Additionally, the first ABWR containment is considered as a prototype and its SIT performed accordingly. The details of the test and the instrumentation as required for such a test will be provided by the first COL applicant for NRC review and approval.

3.8.6.4 Identification of Seismic Category I Structures

The COL applicant will identify all Seismic Category I structures. (See Subsection 3.8.4)

OI 6.2.6-8

Table 6.2-10 Potential Bypass Leakage Paths[1]

Item	Name	Diameter (mm)	Termination Region(3)	Leakage Barriers(2)	Potential Bypass Path
X-1	U/D Equipment Hatch	2600	S		No
X-2	U/D Personnel Hatch	2600	S		No
X-3	ISI Hatch	200	S		No
X-4	Wetwell Access Hatch	2000	S		No
X-5	L/D Personnel Hatch	2400	S		No
X-6	L/D Equipment Hatch	2400	S		No
X-10A	Mainsteam Line	1100	E	~~C~~ D, G	~~No~~ Yes
X-10B	Mainsteam Line	1100	E	~~C~~ D, G	~~No~~ Yes
X-10C	Mainsteam Line	1100	E	~~C~~ D, G	~~No~~ Yes
X-10D	Mainsteam Line	1100	E	~~C~~ D, G	~~No~~ Yes
X-11	Mainsteam Drain	600	E	~~C~~ D, G	~~No~~ Yes
X-12A	Feedwater Line	950	E	~~C~~ D, F	~~No~~ Yes
X-12B	Feedwater Line	950	E	~~C~~ D, F	~~No~~ Yes
X-22	Borated Water INjection	40	S		No
X-30A	Drywell Spray	200	S		No
X-30B	Drywell Spary	200	S		No
X-31A	HPCF (B)	600	S		No
X-31B	HPCF (C)	600	S		No
X-32A	LPFL (B)	650	S		No
X-32B	LPFL (C)	650	S		No
X-33A	RHR Suction (A)	750	S		No
X-33B	RHR Suction (B)	750	S		No
X-33C	RHR Suction (C)	750	S		No
X-37	RCIC Turbine Steam	550	S		No
X-38	RPV Head Spray	550	S		No
X-50	CUW Pump Feed	600	S		No
X-60	MUWP Suction	50	S		No
X-61	RCW Suction (A)	200	E	C	No
X-62	RCW Return (A)	200	E	C	No
X-63	RCW Suction (B)	200	E	C	No
X-64	RCW Return (B)	200	E	C	No
X-65	HNCW Suction	150	E	C	No
X-66	HNCW Return	150	E	C	No
X-69	SA	25	E	C	No
X-70	IA	50	E	C	No
X-71A	ADS Accumulator (A)	50	S		No
X-71B	ADS Accumulator (B)	50	S		No
X-72	RElief Valve Accum.	150	S		No
X-80	Drywell Purge Suction	550	E	C	No
X-81	Drywell Purge Exhaust	550	E	C	No
X-82	FCS Suction	100	S		No
X-90	Spare	400	P	A	No
X-91	Spare	400	P	A	No
X-92	Spare	400	P	A	No
X-93	Spare	400	P	A	No
X-100A	IP Power	450	S		No
X-100B	IP Power	450	S		No
X-100C	IP Power	450	S		No

Table 6.2-10 Potential Bypass Leakage Paths[1] (Continued)

Item	Name	Diameter (mm)	Termination Region(3)	Leakage Barriers(2)	Potential Bypass Path
X-143A	C & I	100	S		No
X-143B	C & I	100	S		No
X-143C	C & I	100	S		No
X-143D	C & I	100	S		No
X-144A	C & I	100	S		No
X-144B	C & I	100	S		No
X-144C	C & I	100	S		No
X-144D	C & I	100	S		No
X-146A	C & I	300	S		No

Notes:

1. This Table provided in response to Question 430.52b.

2. A) Penetration is capped
   B) Terminates at Primary Containment Wall
   C) Terminates inside Secondary Containment
   D) Terminates outside Secondary Containment
   E) Redundant Containment Isolation Valves
   F) water seal plus third stop check valve.
   G) Leakage handled and accounted for alternate leakage control system (condenser).

3. E - Environment
   P - Primary containment
   S - Secondary containment

OI 3.8.4-2

APPENDIX 3G

RESPONSE OF STRUCTURES DUE TO CONTAINMENT LOADS

TABLE OF CONTENTS

1. Scope

This appendix specifies the design for safety-related structures, systems, and components as applicable due to dynamic excitations originating in the primary containment in the event of operational transients and LOCA. The input containment loads are described in appendix 3B. The containment loads considered for structural dynamic response analysis are Condensation Oscillation (CO), Pool Chugging (CH), Horizontal Vent Chugging (HV), Safety/Relief Valve discharge (SRV), and Annulus Pressurization (AP).

2. Dynamic Response

2.1 Classification Of Analytical Procedure

Analytical procedure of hydrodynamic loads classified into following three groups:

a. Pipe nozzle break loads,

b. Symmetric loads, and

c. Asymmetric loads.

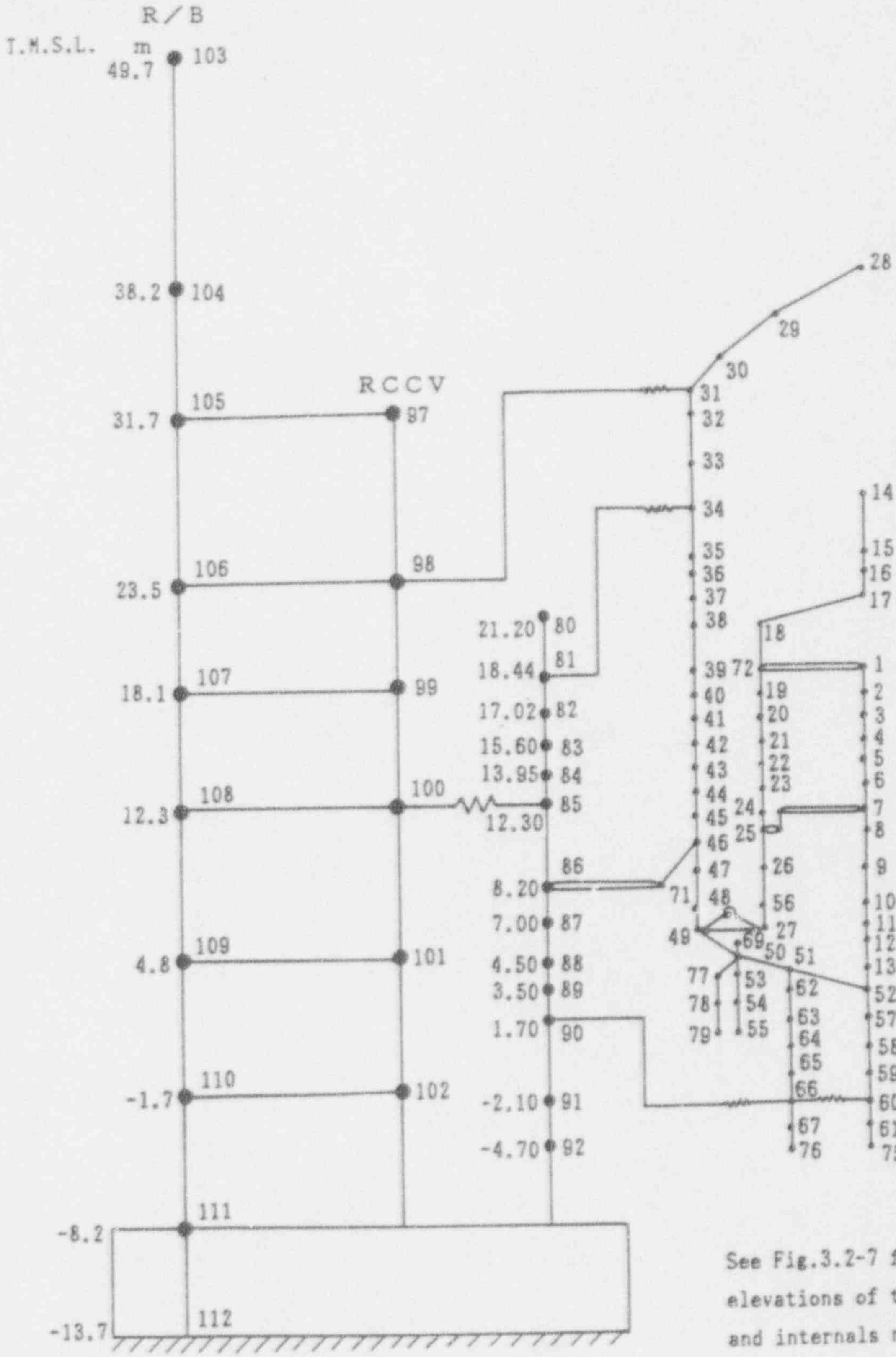
2.2 Analysis Models

(1) Analysis Model

The structural models used in the analyses represent a synthesis of the reactor building model and the RPV & Internals model. The beam model used in the pipe break load analysis is illustrated in figure 2.2-1. The analysis model used for symmetric load and asymmetric load are illustrated in figure 2.2-2 and figure 2.2-3 respectively.

(2) Structural Damping

Regulatory Guide 1.61 OBE and SSE damping values were used for SRV and LOCA loads respectively.



See Fig.3.2-7 for elevations of the RPV and internals nodes.

Fig. ~~3.2-1~~ 2.2-1 Horizontal Beam Model for AP Load

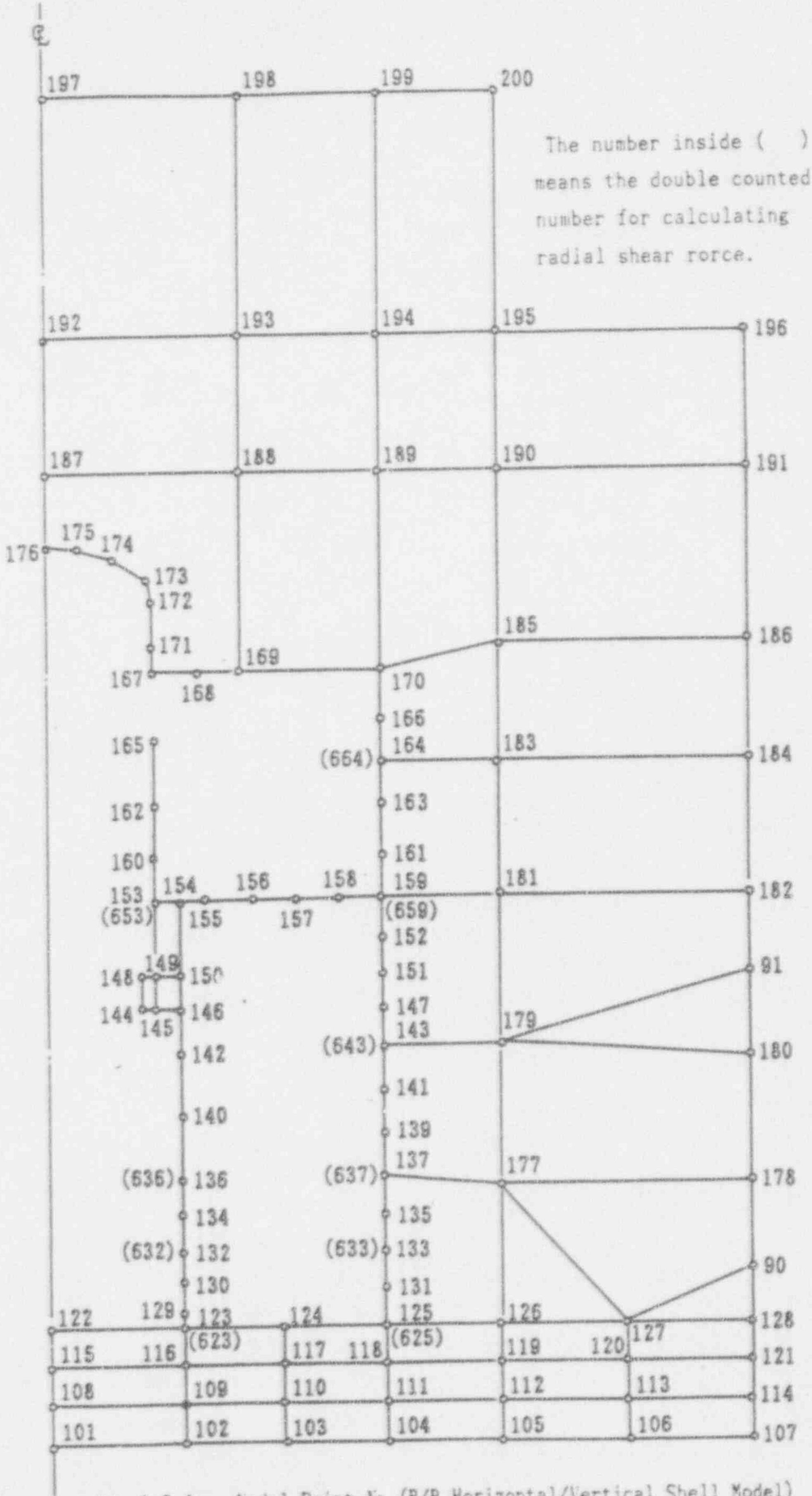
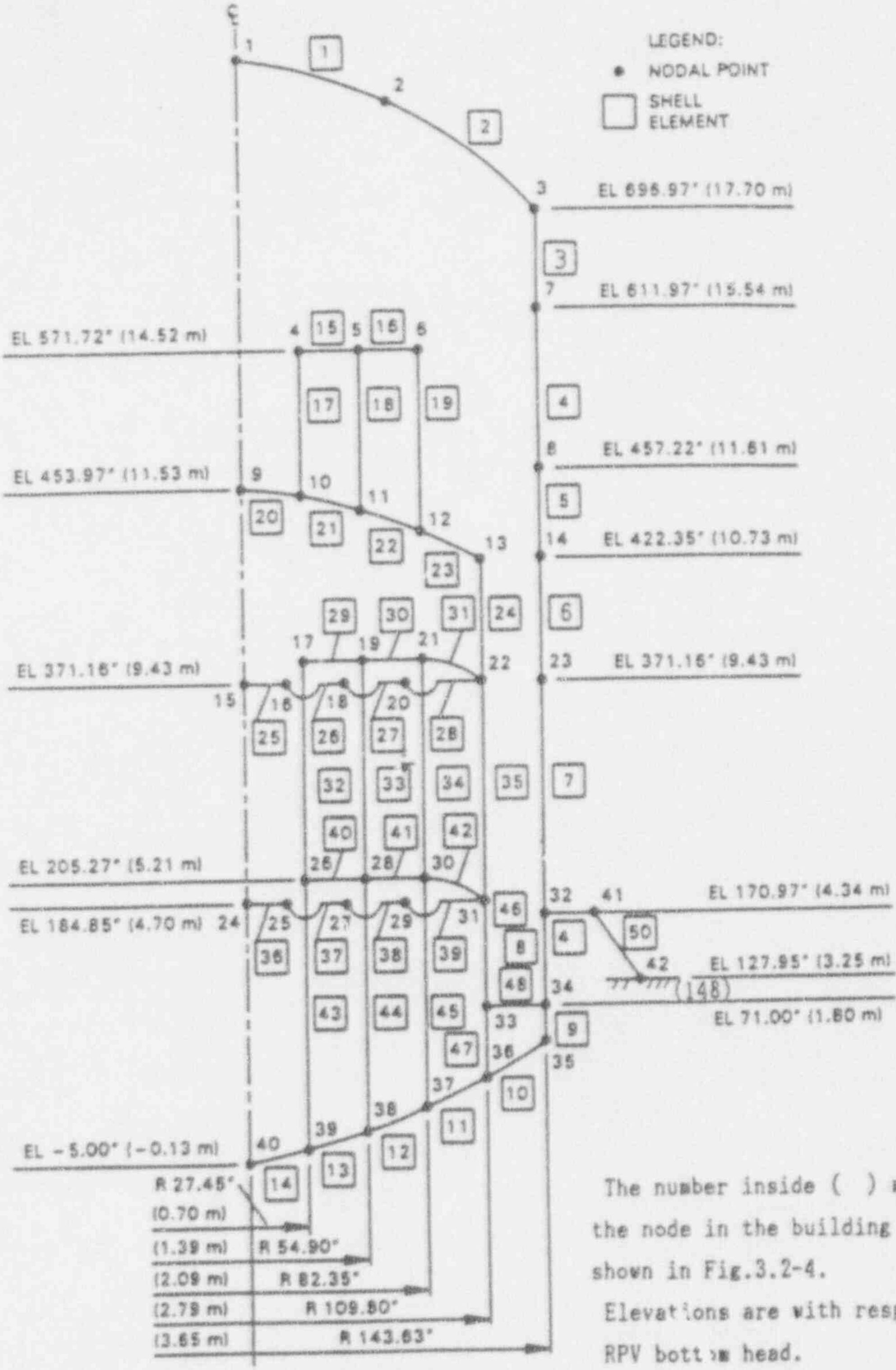


Fig. ~~3.2-4~~ Nodal Point No (R/B Horizontal/Vertical Shell Model)
Z Z-Z



The number inside ( ) means the node in the building model shown in Fig.3.2-4.
Elevations are with respect to RPV bottom head.

Fig. ~~3.2-6~~ 2.2-3 Nodal Point No. (RPV / Internal Vertical Shell Model)

2.3 Load Application

(1) Pipe break nozzle load

The AP pressures were converted to horizontal forces to the following formula.

For RSW side:

$$Fj(t) = 2\sum_{i=1}^{\theta} Pij(t) \int_{\theta=ai}^{\theta=bi} R\cos(\theta)d\theta$$

For RPV side:

$$Fj(t) = -2\sum_{i=1}^{\theta} Pij(t) \int_{\theta=ai}^{\theta=bi} r\cos(\theta)d\theta$$

Fj(t)	:	Force per unit height each level
Pij(t)	:	Pressure each level and angle
i	:	Cell No.
j	:	Level No.
R	:	RSW Inner Radius
r	:	RPV Outer Radius
θ	:	angle (≤180°)

Jet reaction, jet impingement, and pipe whip reaction forces were considered as steady state loads whose rise time for initial pulse was set as one millisecond.

(2) SRV Load

Symmetric SRV (all) response analysis is covered by n=0 harmonic. Asymmetric case of SRV (all) actuation is to be covered by n=1 harmonic that corresponds to overturning moment. SRV (1) is also in this category. The SRV air bubble frequencies are expected to be within a range of 5 to 12hz. Ways of selecting minimum number of bubble frequencies for dynamic analysis are as follows.

Frequency range of SRV Loads : $f_1 \leq f \leq f_2$ (f_1 = 5hz, f_2 = 12hz)

For vertical structural frequencies (n=0)

(1) If $(f_s)_v > f_2$ then use f_2

(2) If $f_1 < (f_s)_v < f_2$ then use $(f_s)_v$

For horizontal structural frequencies (n=1)

(1) If $(f_s)_h < f_1$ then use f_1

(2) If $f_1 < (f_s)_h < f_2$ then use $(f_s)_h$

(3) If $f_2 < (f_s)_h$ then use f_2

In symmetric load case, 12hz was adopted as bubble frequency, because the vertical frequencies of the structure were higher than 12hz. In asymmetric load case, 3 horizontal beam frequencies of the structure within the above range 7.73hz, 9.59hz, and 11.58hz were adopted as bubble frequencies.

(3) HV Load

Both symmetric and non-symmetric upward loads on pedestal due to chugging in the top horizontal vents was considered.

(4) Chugging, Condensation Oscillation Loads

According to the study of the natural frequencies of the structure and the frequencies of the input motion, 4 critical pressure time histories out of 8 for CH and 2 out of 4 for CO, were selected for dynamic analysis. Furthermore, 1 local spike load was added in CO response study.

2.4 Analysis Method

(1) Pipe Nozzle Break Load Analysis

For pipe nozzle break cases, multi-input excitation time history analyses were performed by using mode superposition method. Strain energy damping was used for this analyses.

(2) Symmetric Load Analysis

For symmetric load cases, frequency response method for n=0 harmonic was used. Hysteresis damping was considered.

(3) Asymmetric Load Analysis

For asymmetric load cases, frequency response method for n=1 harmonic was used. Hysteresis damping was considered.

(4) Analysis Parameters

The analysis parameters in terms of time/frequency steps in analysis are shown in Table 2.4-1.

Table3.4-1 Analysis Parameters in Terms of Time/Frequency Steps

Load	Analysis Case		Domain Time/Freq.	Input Time Pitch Δt (sec)	Given Time Step n_1	Given Duration Time $t_1(=n_1 \cdot \Delta t)$(sec)	Trailing Zero Step n_2	Analysis Time Step $N(=n_1+n_2)$	Analysis Duration Time $T(=N\Delta t)$(sec)	Frequency Resolution 1/T (Hz)	Transfer Function Interpolation Method: Interval	Transfer Function Interpolation Method: Method
Pipe Break	Definition of AP		Time	1.0×10^{-3}	2000	2.0	—	—	—	—	—	—
	Definition of $F_1 \sim F_6$			1.0×10^{-3}	2000	2.0	—	—	—	—	—	—
	APA1, APA2 APB1, APB2 APC1, APC2			1.0×10^{-3}	2000	2.0	—	2000	2.0	—	—	—
SRV	Definition		Freq.	5×10^{-3}	150	0.75	—	—	—	—	—	—
	SRVV			3.333×10^{-3}	150	0.50	1898	2048	6.83	0.14649	Every Step	—
	SRVH1			4.170×10^{-3}	150	0.625	1898	2048	8.54	0.11710	Every 2 Step	Reciprocal
	SRVH2			3.454×10^{-3}	150	0.518	1898	2048	7.074	0.14136	Every Step	—
	SRVH3			5.175×10^{-3}	150	0.776	1898	2048	10.598	3.09436	Every 2 Step	Reciprocal
MV	Definition		Freq.	1×10^{-3}	2	0.002	—	—	—	—	—	—
	MVV MVH			1×10^{-3}	2	0.002	4094	4096	4.096	0.24414	Every Step	—
CH	Definition		Freq.	1×10^{-3}	1000	1.0	—	—	—	—	—	—
	CHV1,CHH1 CHV2,CHH2 CHV3,CHH3 CHV4,CHH4			1×10^{-3}	1000	1.0	3096	4096	4.096	0.24414	Every Step	—
CO	COV1	Definition	Freq.	1×10^{-3}	2000	2.0	—	—	—	—	—	—
	COV3	Analysis		1×10^{-3}	2000	2.0	2096	4096	4.096	0.24414	Every Step	—
	COV2	Definition		1×10^{-3}	3000	3.0	—	—	—	—	—	—
		Analysis		1×10^{-3}	3000	3.0	1096	4096	4.096	0.24414	Every Step	—

3. Hydrodynamic Load Analysis Results

The acceleration response spectra at a few select locations for each loading event are presented in figure 3-1 through 3-40. The maximum displacements, acceleration at a few select locations for each loading event are presented table 3-1 and 3-2.

The input excitation of suppression pool boundary horizontal loads (SRV, Chugging, and HV) was considered unidirectional which can be set at any direction in the horizontal plane, and the AP analysis was performed assuming that pipe break can be associated with any one of the vessel nozzles for each of the postulated line breaks.

The resulting response of structures considered in the analyses is thus unidirectional applicable to any azimuth angle for suppression pool loads and to the horizontal direction corresponding to the break direction for AP loads.

For subsystem analyses using floor response spectra and ,if applicable, building displacement data, the input direction of the horizontal load shall be selected to result in worst subsystem response.

As an alternate approach, the horizontal input to subsystem may be taken to be the same in the two orthogonal horizontal directions.

The SRV(one) loads can be obtained by multiplying the SRV(all) loads by 0.4 and 0.3 in the horizontal and vertical directions respectively.

~~Sheet1~~

Table 3-1

Maximum Accelerations For AP Loadings (g)

Location	Node	MSLB	FDW	RHR
Top Of RPV	28	0.727	0.523	0.897
Top Of Pedestal	86	0.11	0.063	0.085
Top Of RSW	80	3.89	0.504	0.759
D/F Slab	85	0.02	0.009	0.014

Maximum Accelerations For Hydrdynamic Loads (g)

Location	Direction	Node	SRV	HV	CH	CO
Top Of RPV	Horizontal		0.173	0.029	0.116	
	Vertical	1	0.273	0.008	0.057	0.400
Top Of Pedestal	Horizontal		0.116	0.006	0.051	
	Vertical	42	0.216	0.003	0.020	0.171
Top Of RSW	Horizontal		0.119	0.016	0.063	
	Vertical	165	0.220	0.008	0.065	0.378
D/F Slab	Horizontal		0.031	0.002	0.018	
	Vertical	157	0.045	0.001	0.008	0.069

Table 3-2 ~~Sheet1~~

Maximum Displacements For AP Loadings (mm)

Location	Node	MSLB	FDW	RHR
Top Of RPV	28	1.94	0.74	1.01
Top Of Pedestal	86	0.11	0.04	0.06
Top Of RSW	80	1.43	0.36	0.56
D/F Slab	85	0.15	0.05	0.07

Maximum Displacements For Hydrdynamic Loads (mm)

Location	Direction	Node	SRV	HV	CH	CO
Top Of RPV	Horizontal	28	0.110	0.013	0.029	
	Vertical	1	0.470	0.006	0.016	0.674
Top Of Pedestal	Horizontal	71	0.069	0.003	0.012	
	Vertical	42	0.420	0.003	0.011	0.636
Top Of RSW	Horizontal	165	0.065	0.006	0.001	
	Vertical	165	0.398	0.003	0.013	0.624
D/F Slab	Horizontal	153	0.039	0.002	0.006	
	Vertical	157	0.155	0.001	0.009	0.436

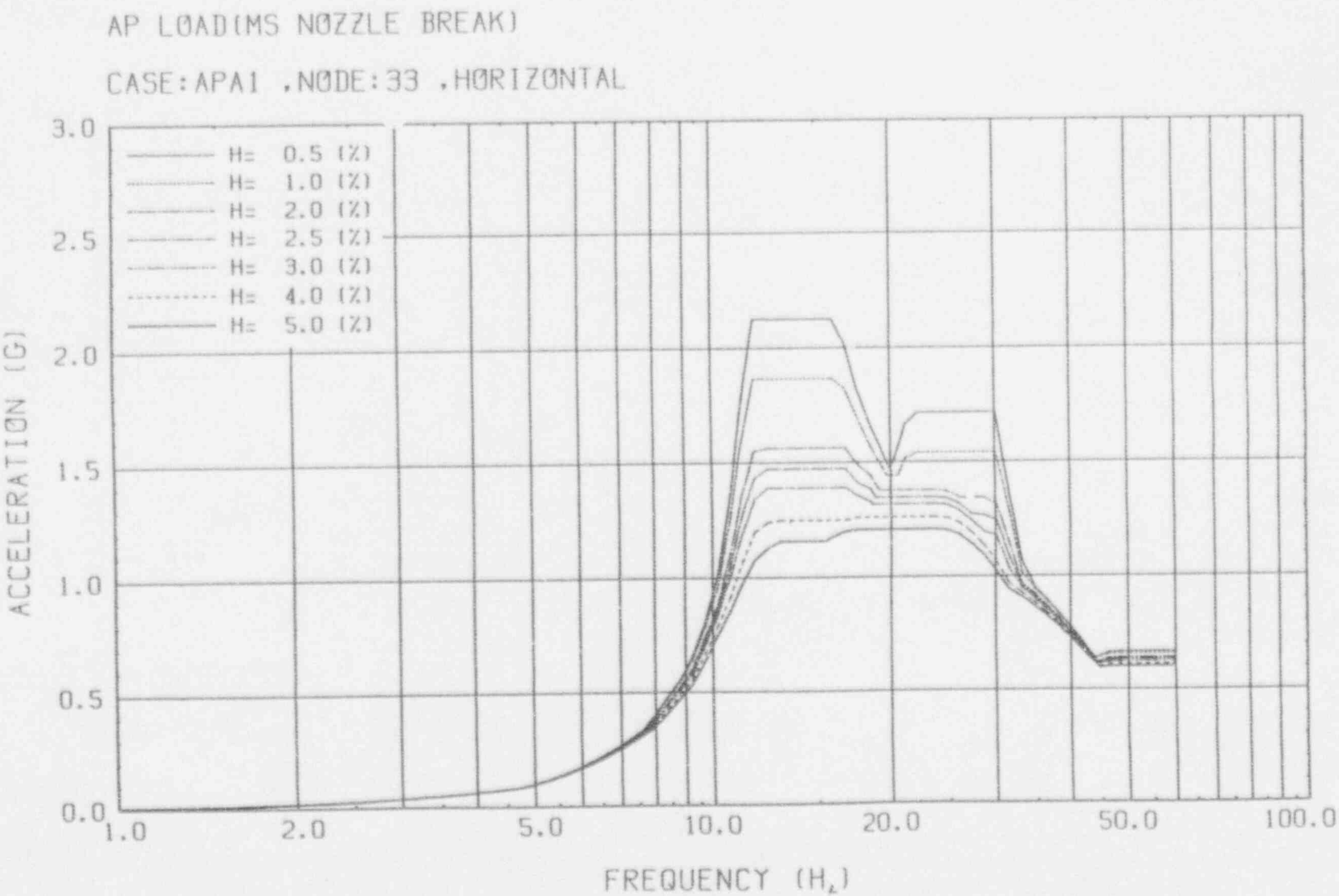


FIG.A-11 FLOOR RESPONSE SPECTRUM

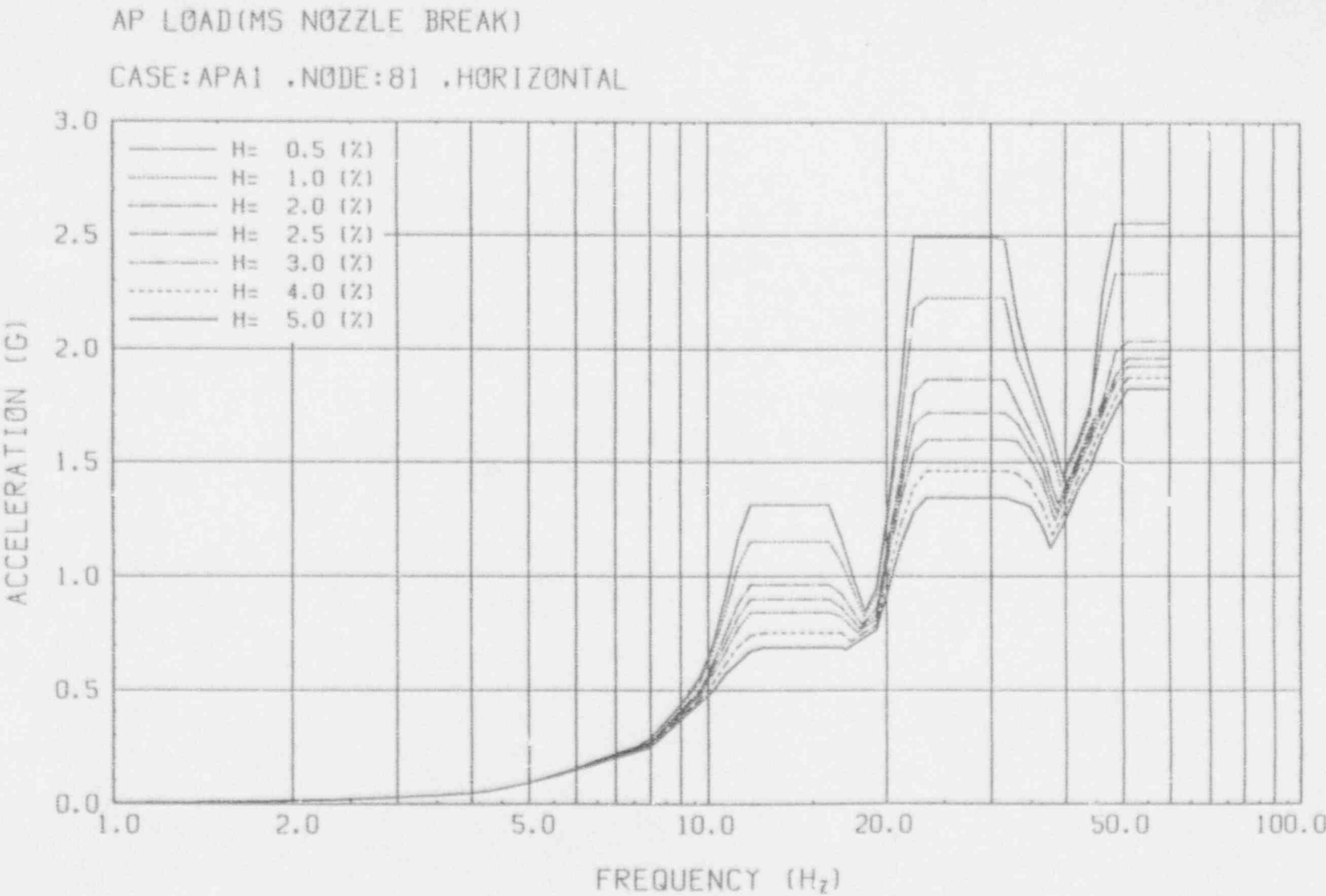


FIG.A-26 FLOOR RESPONSE SPECTRUM

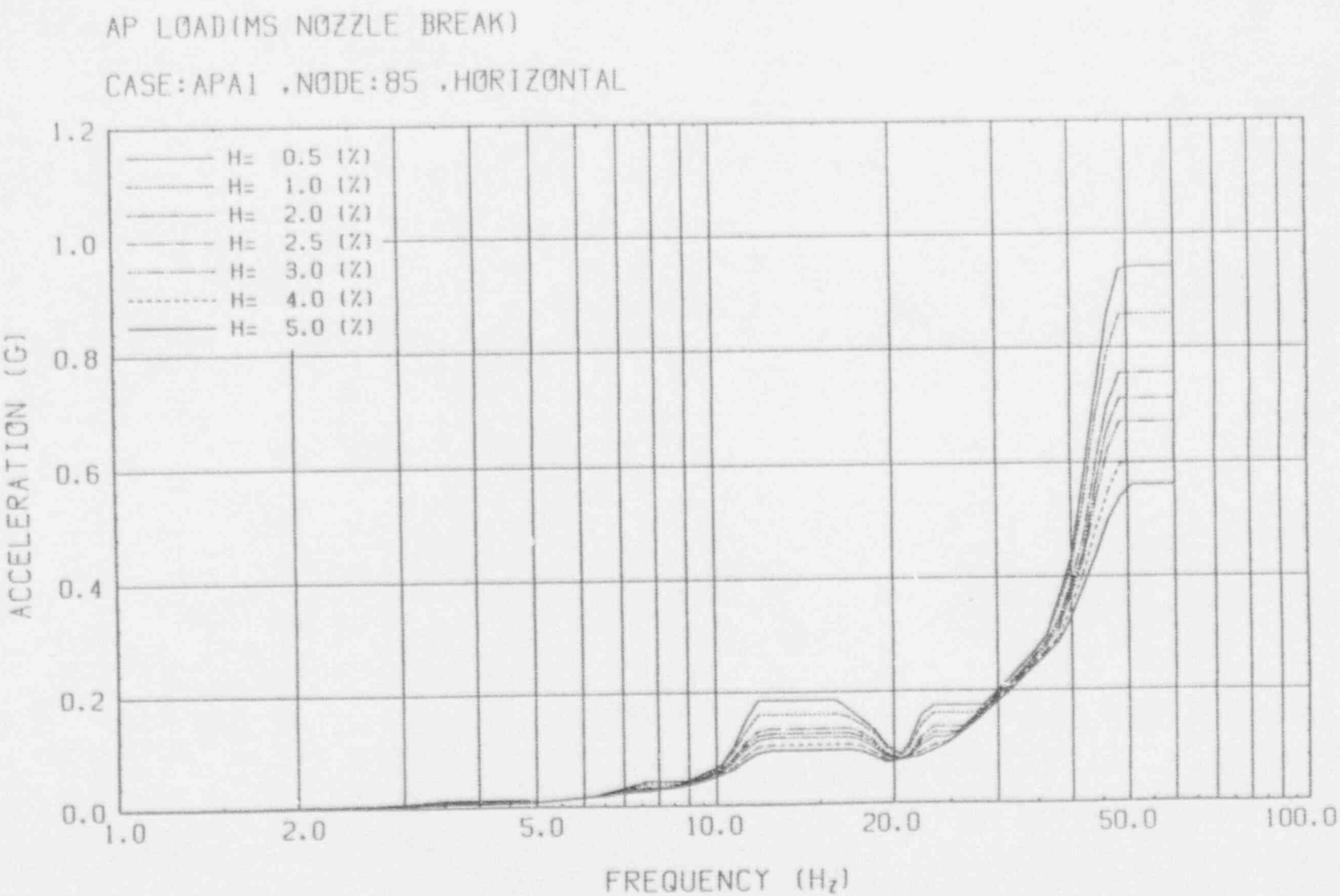


FIG. A-29 FLOOR RESPONSE SPECTRUM

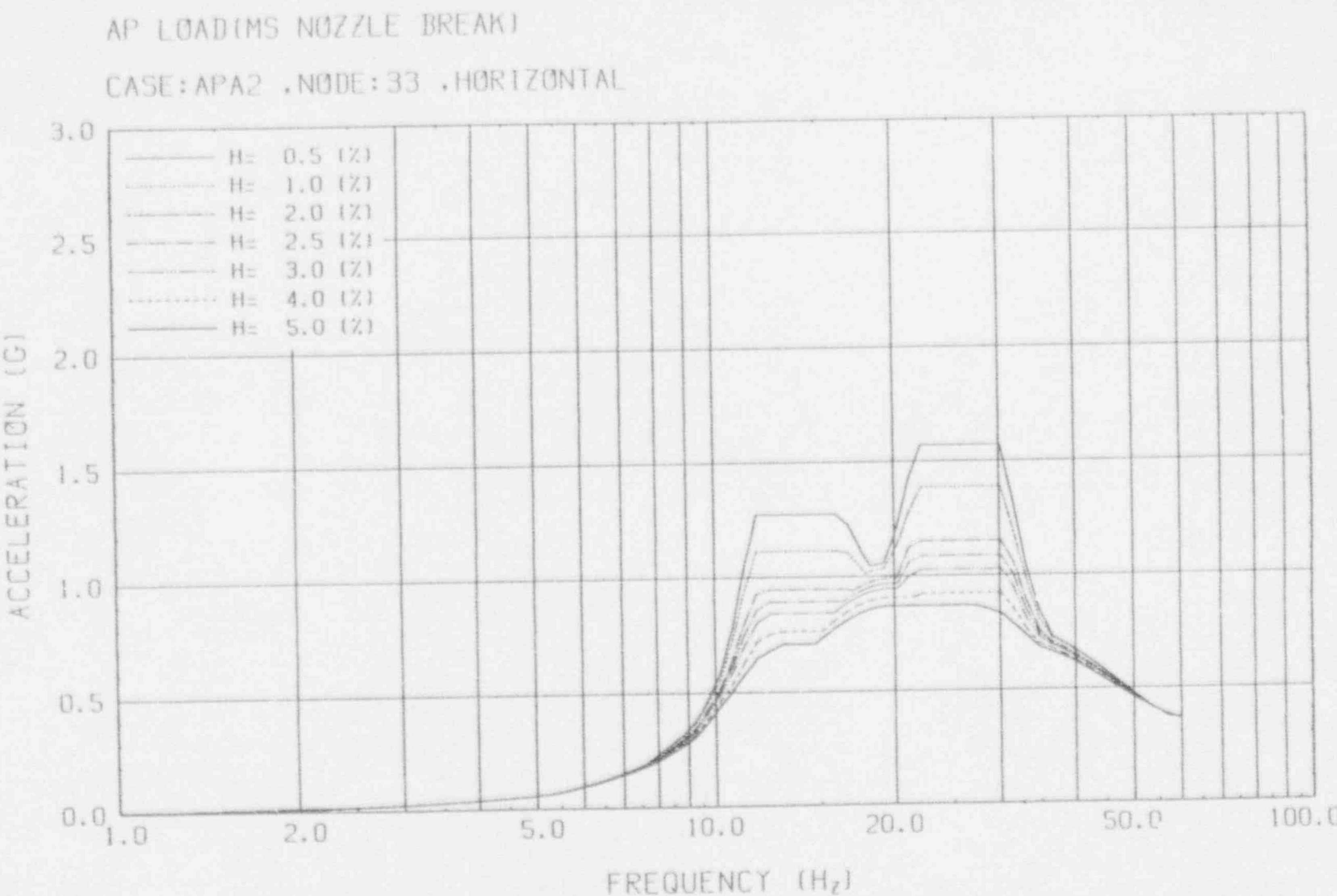


FIG. A-48 FLOOR RESPONSE SPECTRUM

AP LOAD(MS NOZZLE BREAK)

CASE:APA2 ,NODE:81 ,HORIZONTAL

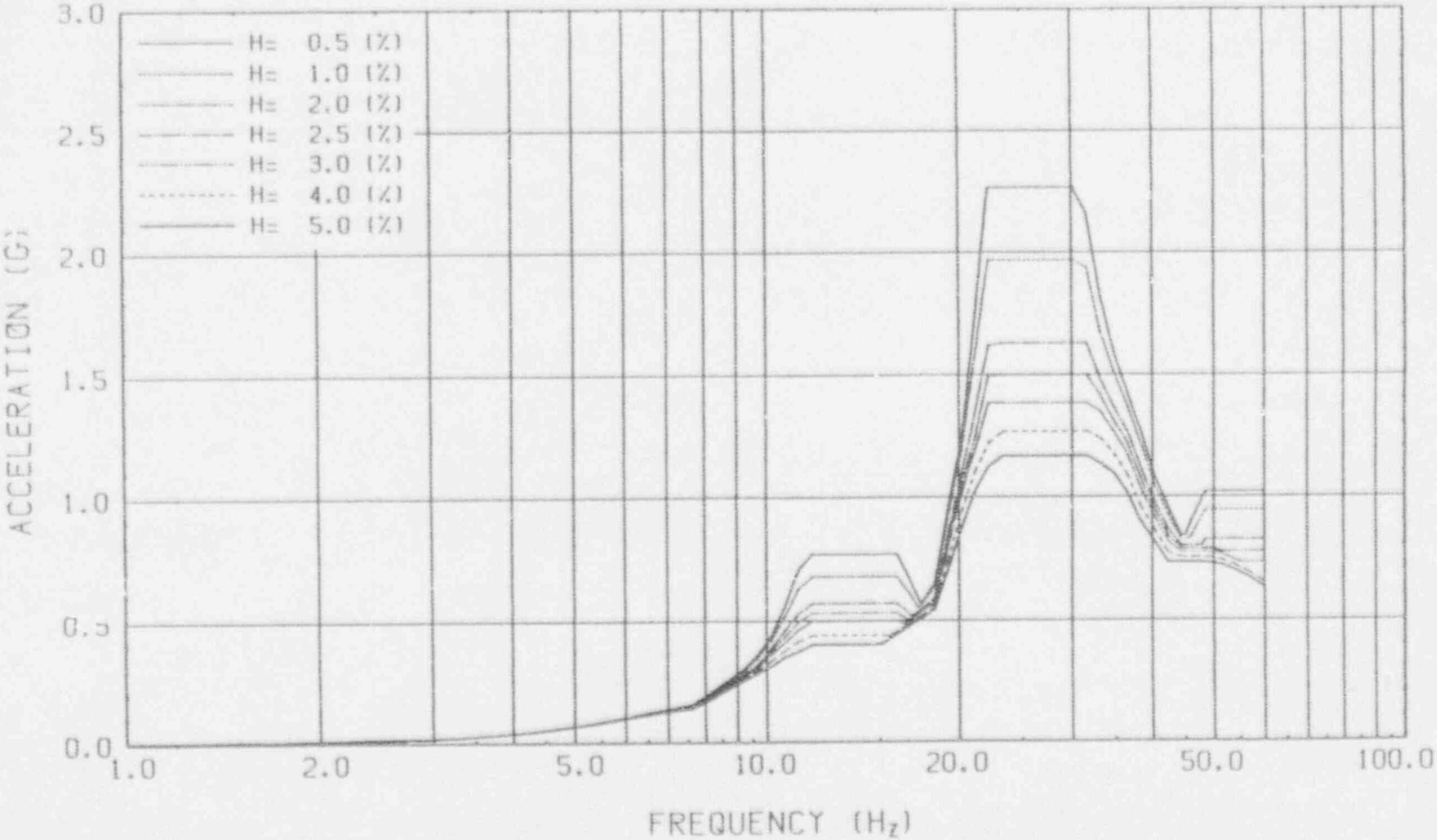


FIG. A-63 FLOOR RESPONSE SPECTRUM

AP LØAD(MS NØZZLE BREAK)

CASE:APA2 ,NØDE:85 ,HØRIZØNTAL

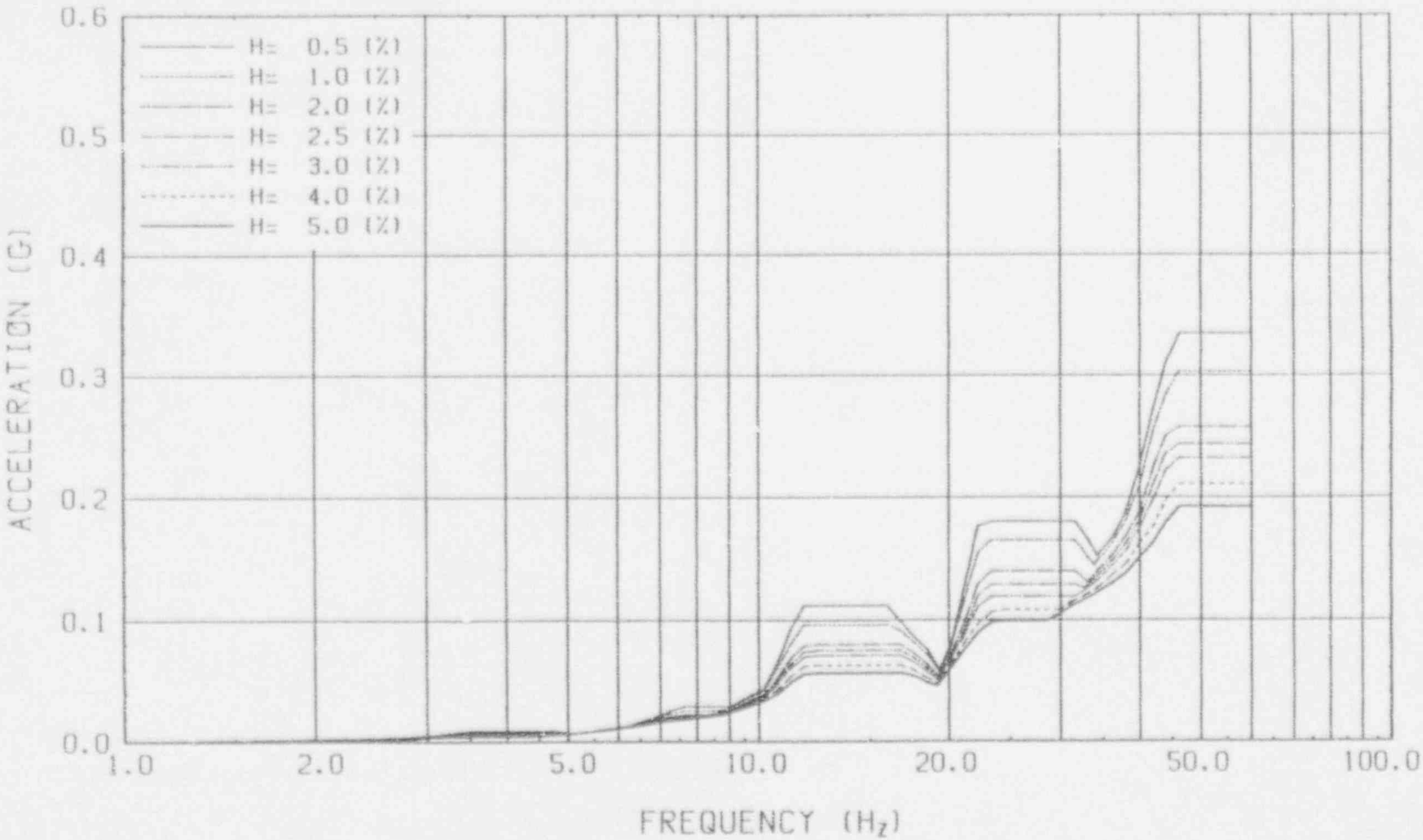


FIG.A-66 FLØØR RESPØNSE SPECTRUM

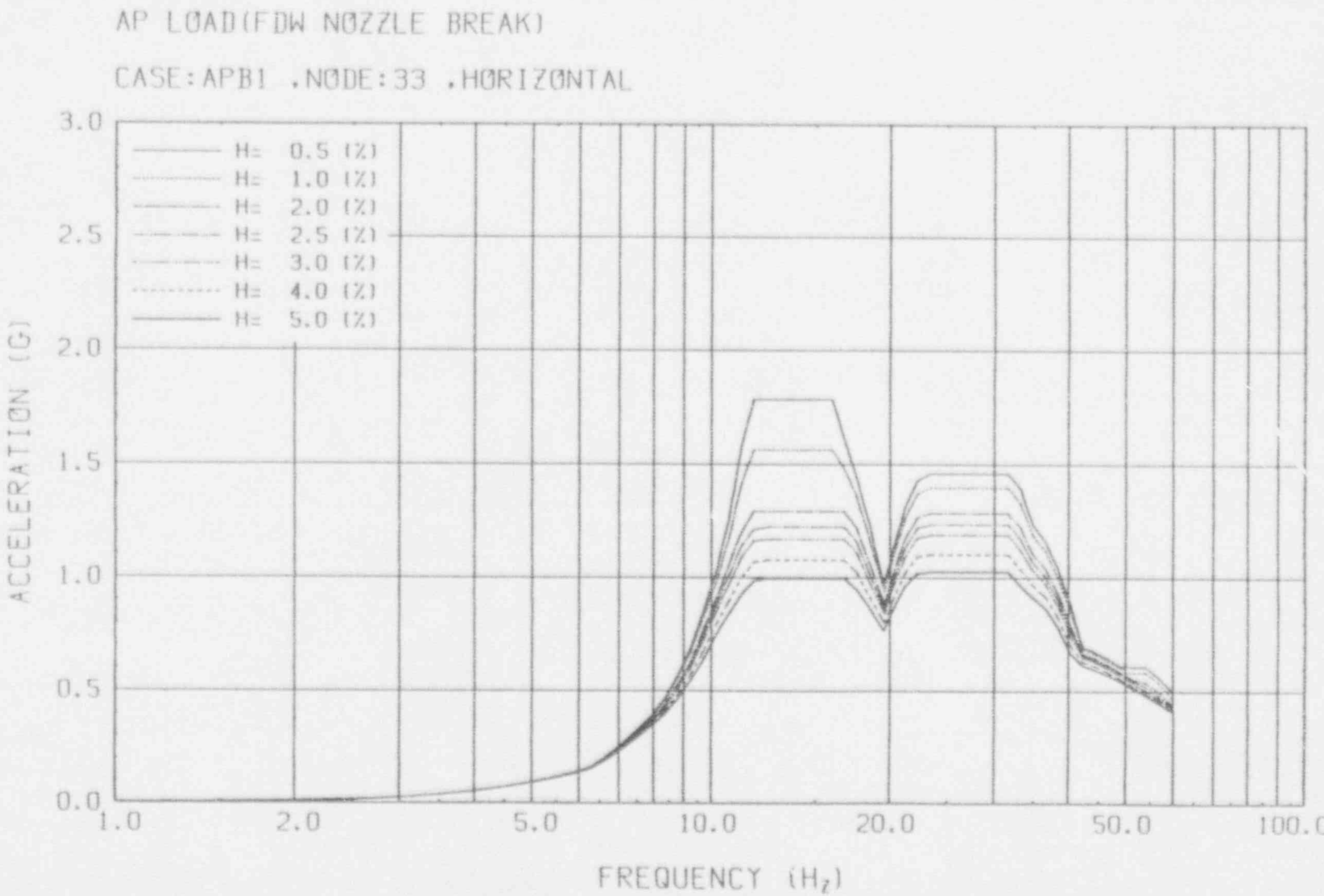


FIG. A-85 FLOOR RESPONSE SPECTRUM

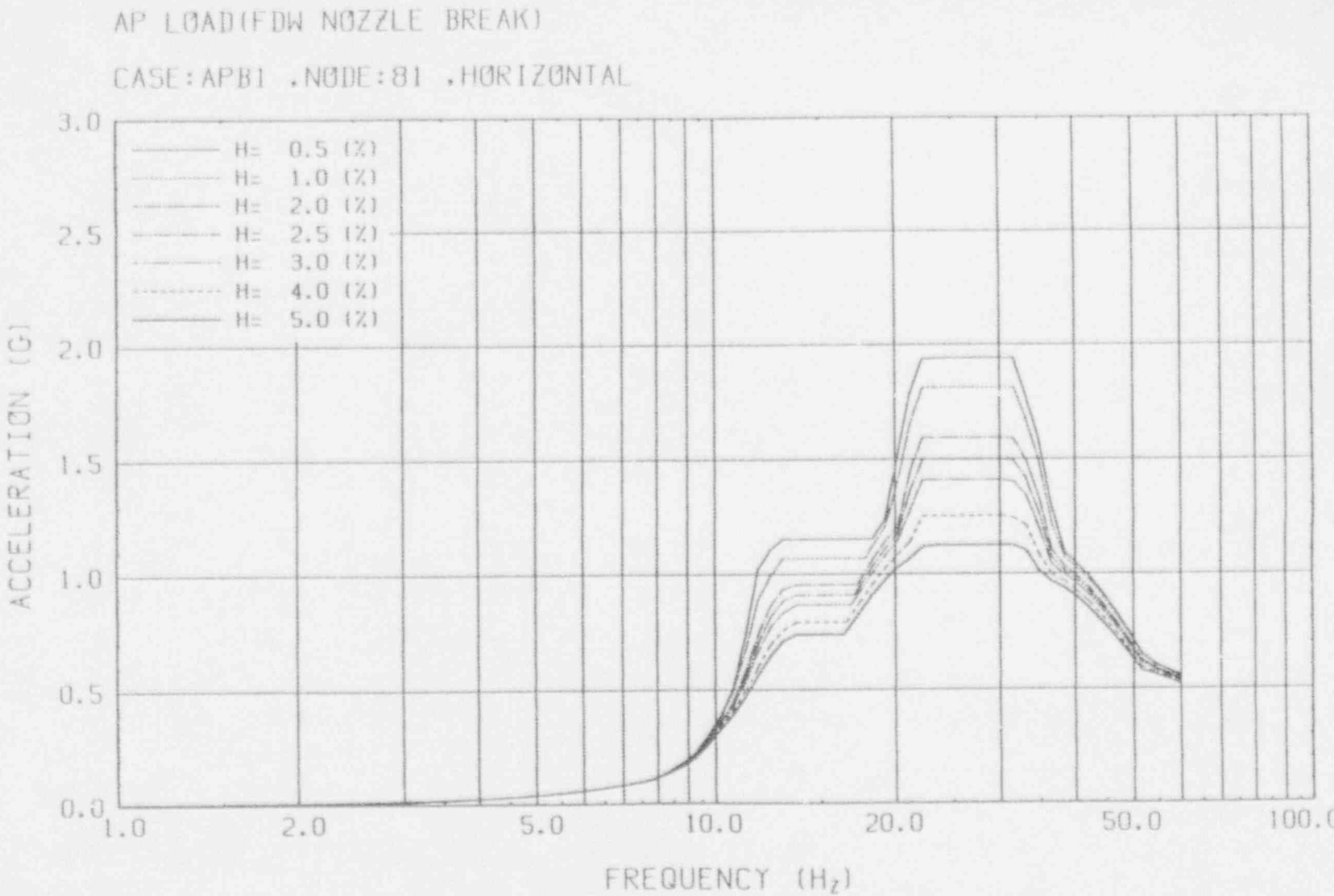


FIG. A-100 FLOOR RESPONSE SPECTRUM

A-100

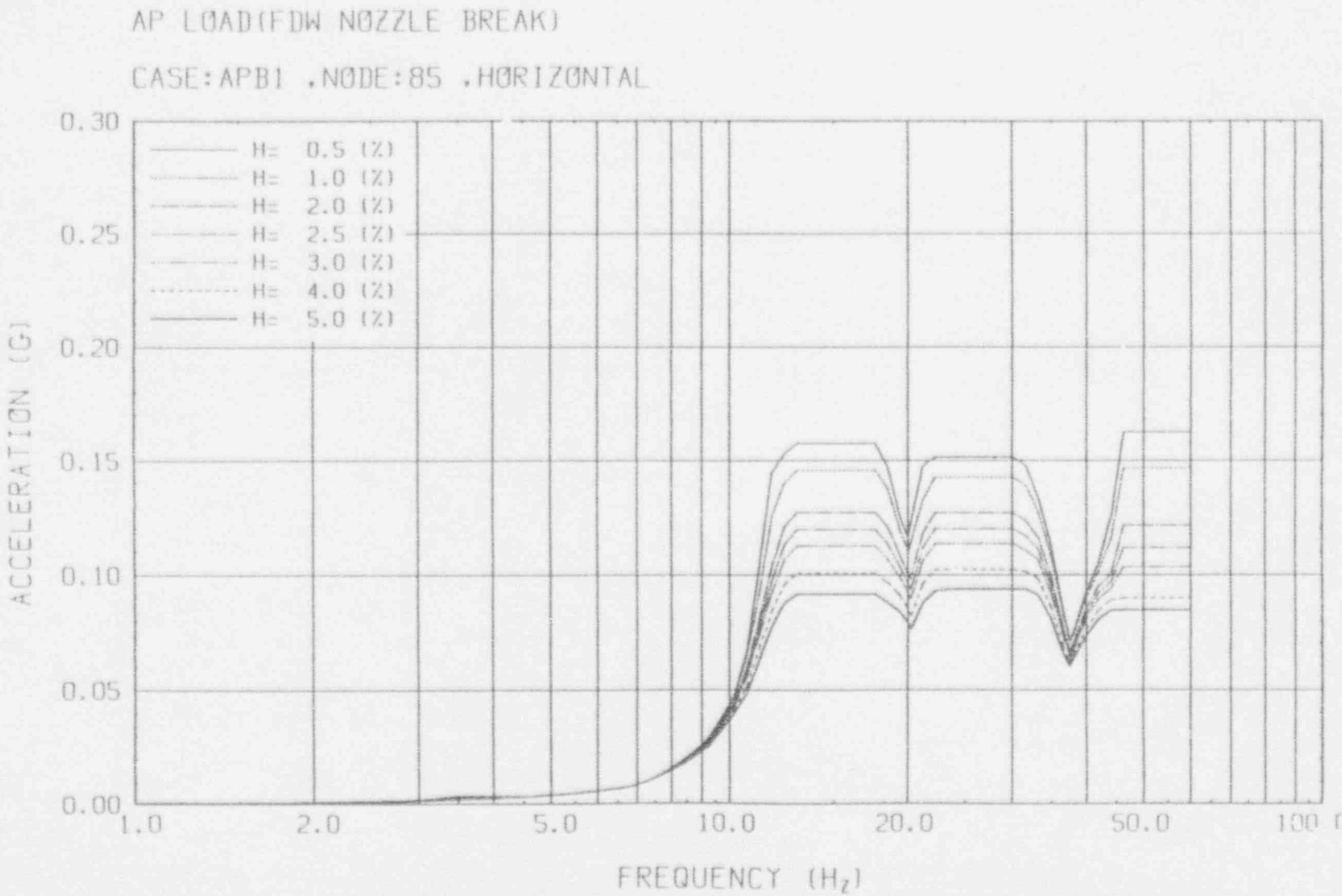


FIG. A-103 FLØØR RESPØNSE SPECTRUM

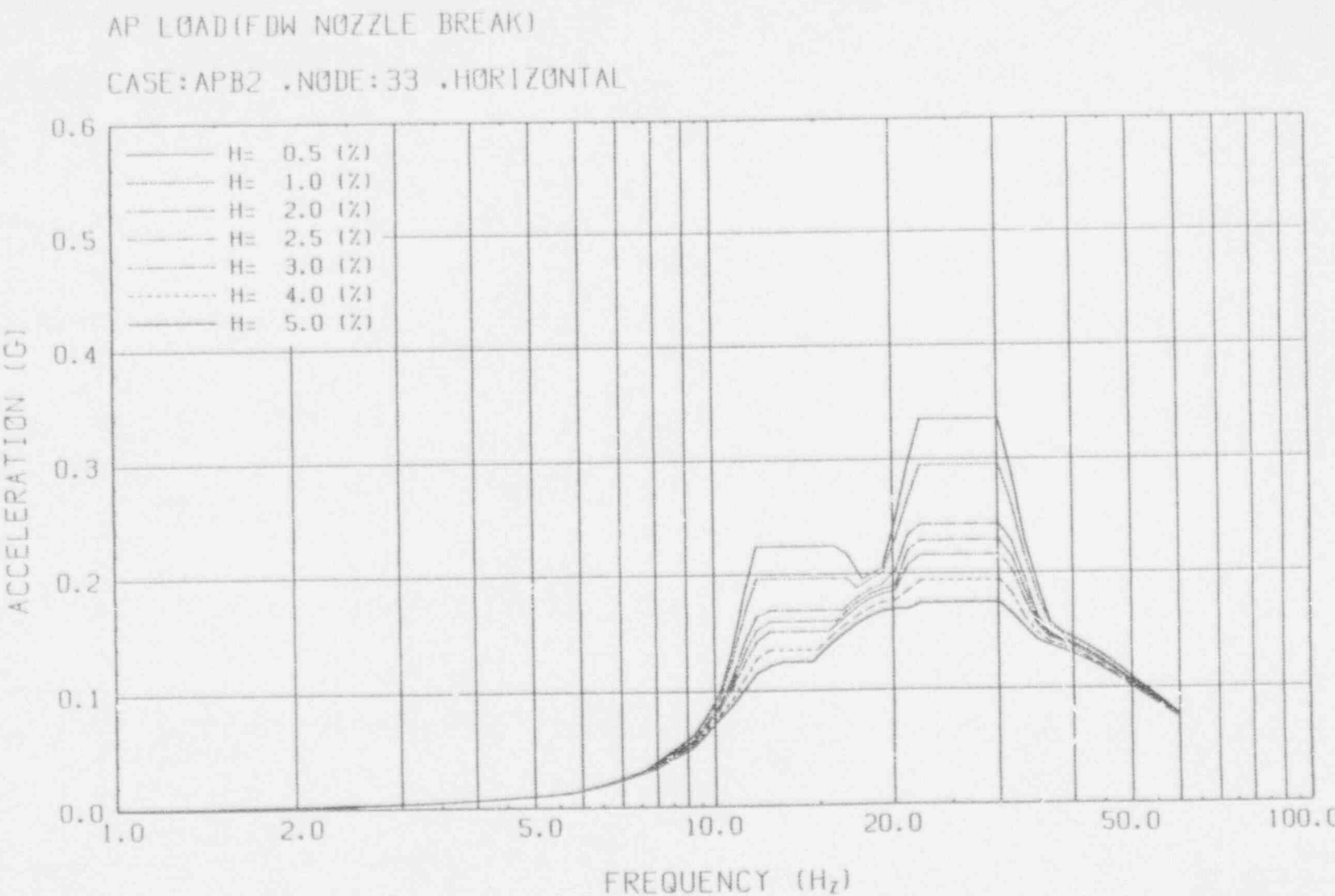


FIG. A-122 FLØØR RESPØNSE SPECTRUM

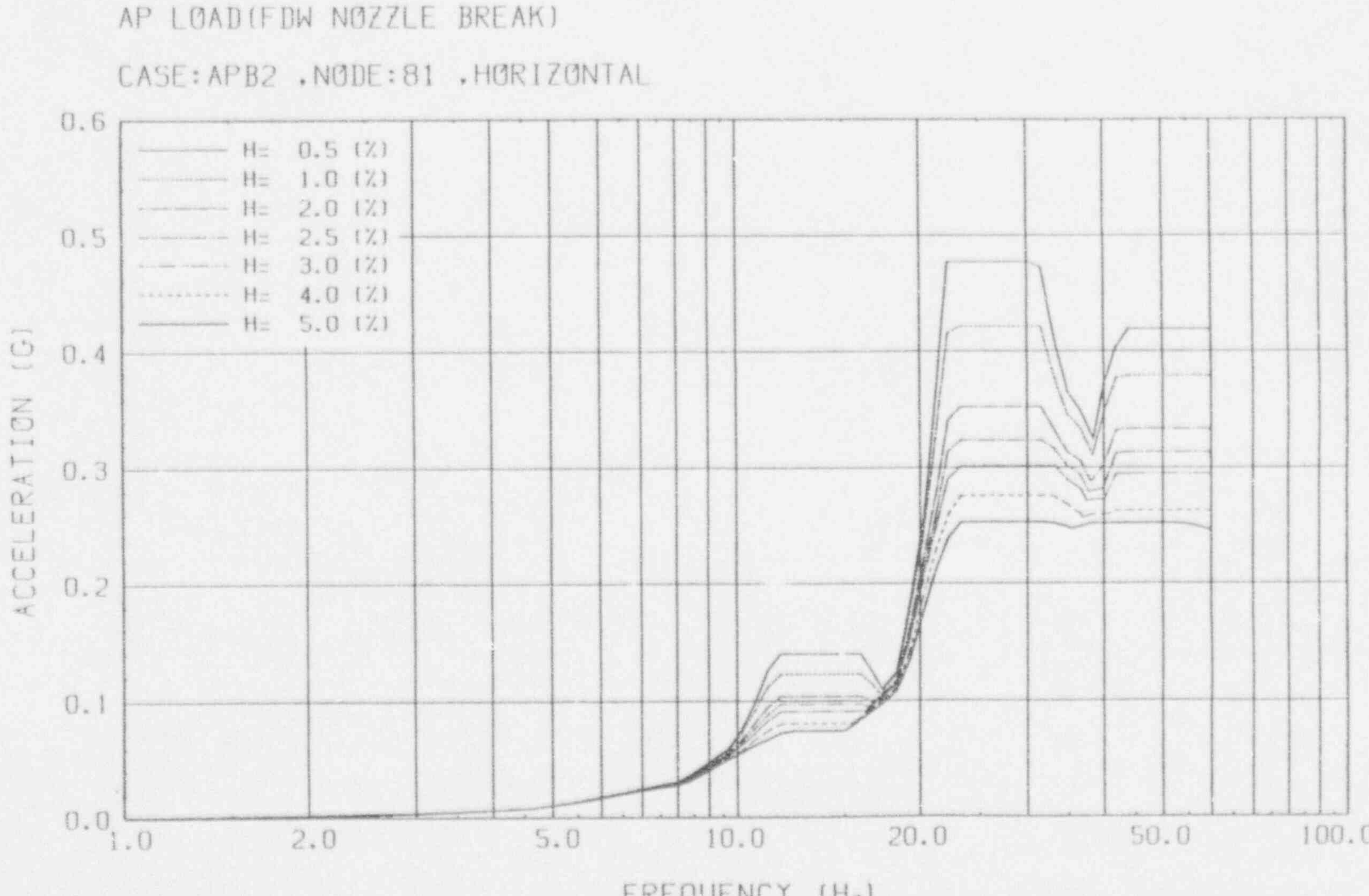


FIG. A-137 FLOOR RESPONSE SPECTRUM

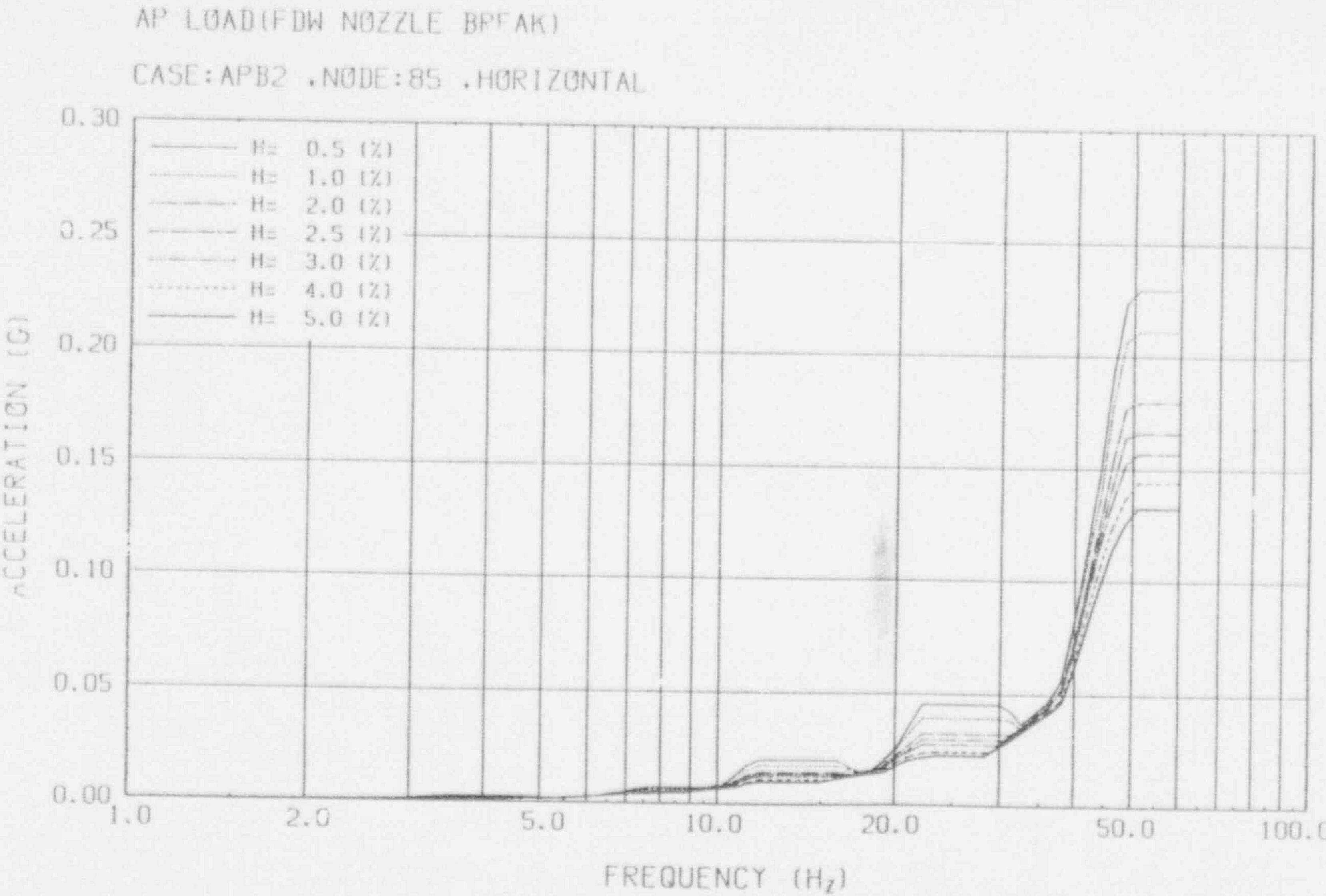


FIG. A-140 FLOOR RESPONSE SPECTRUM

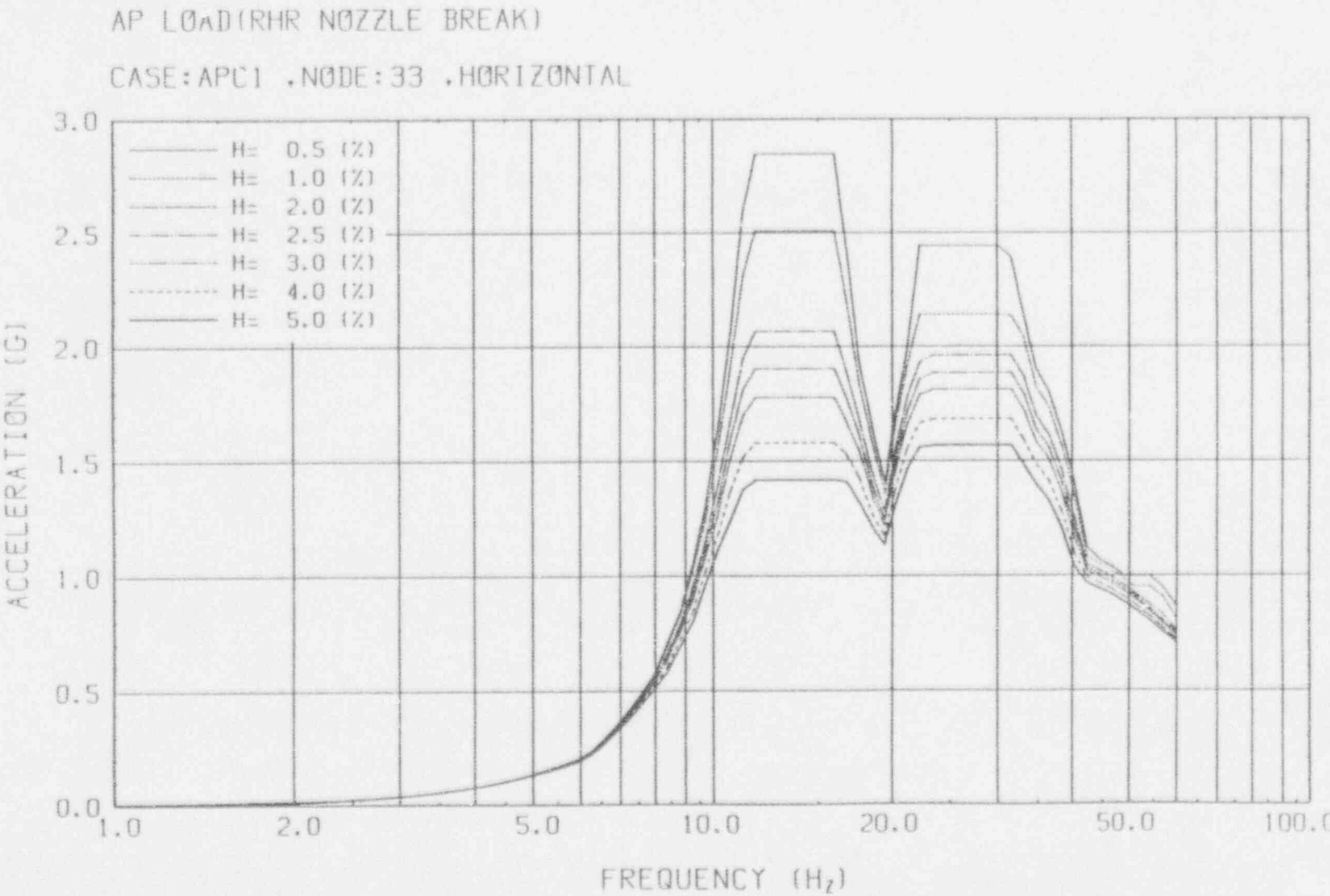


FIG. A-159 FLOOR RESPONSE SPECTRUM

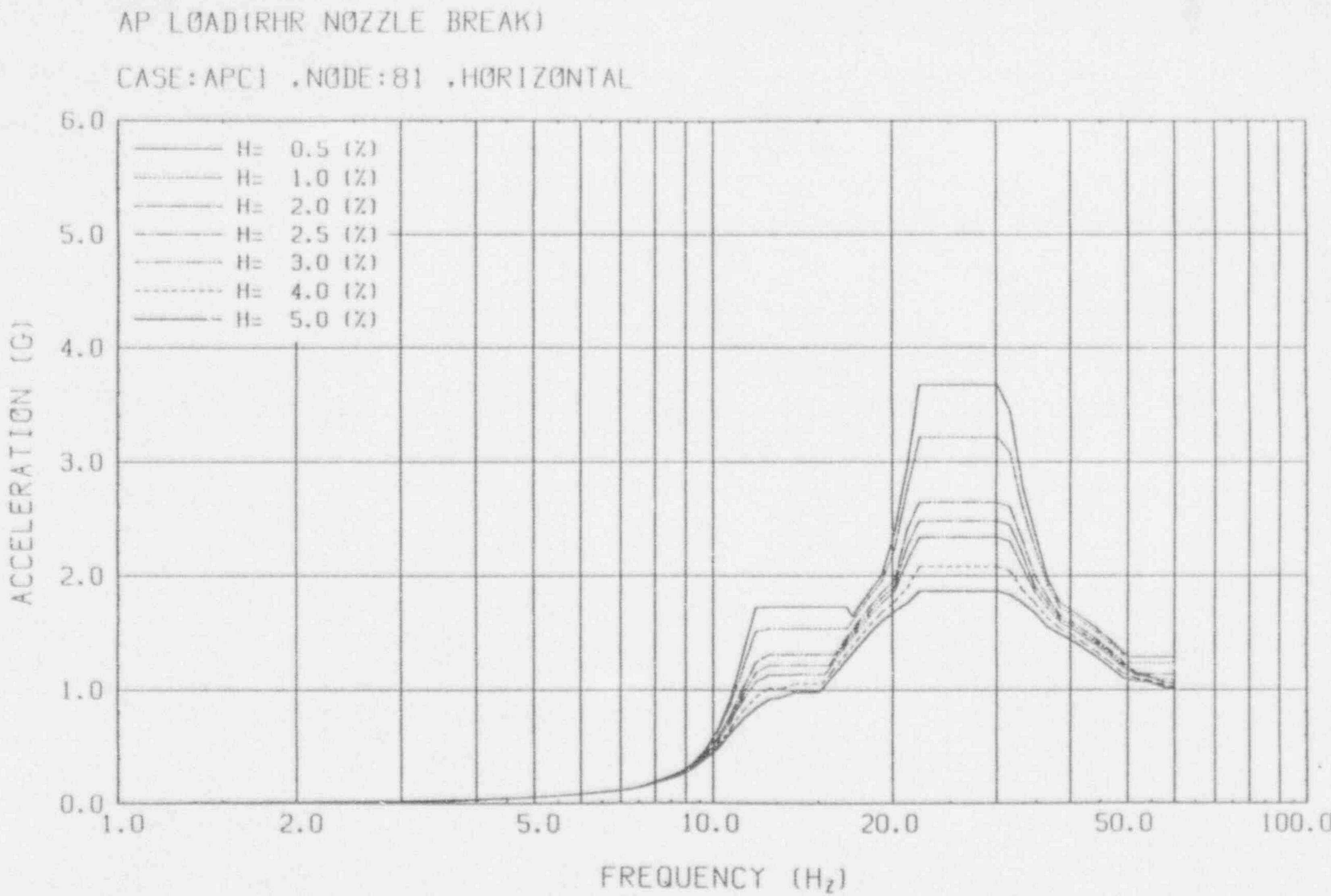


FIG. A-174 FLØØR RESPØNSE SPECTRUM

A-174

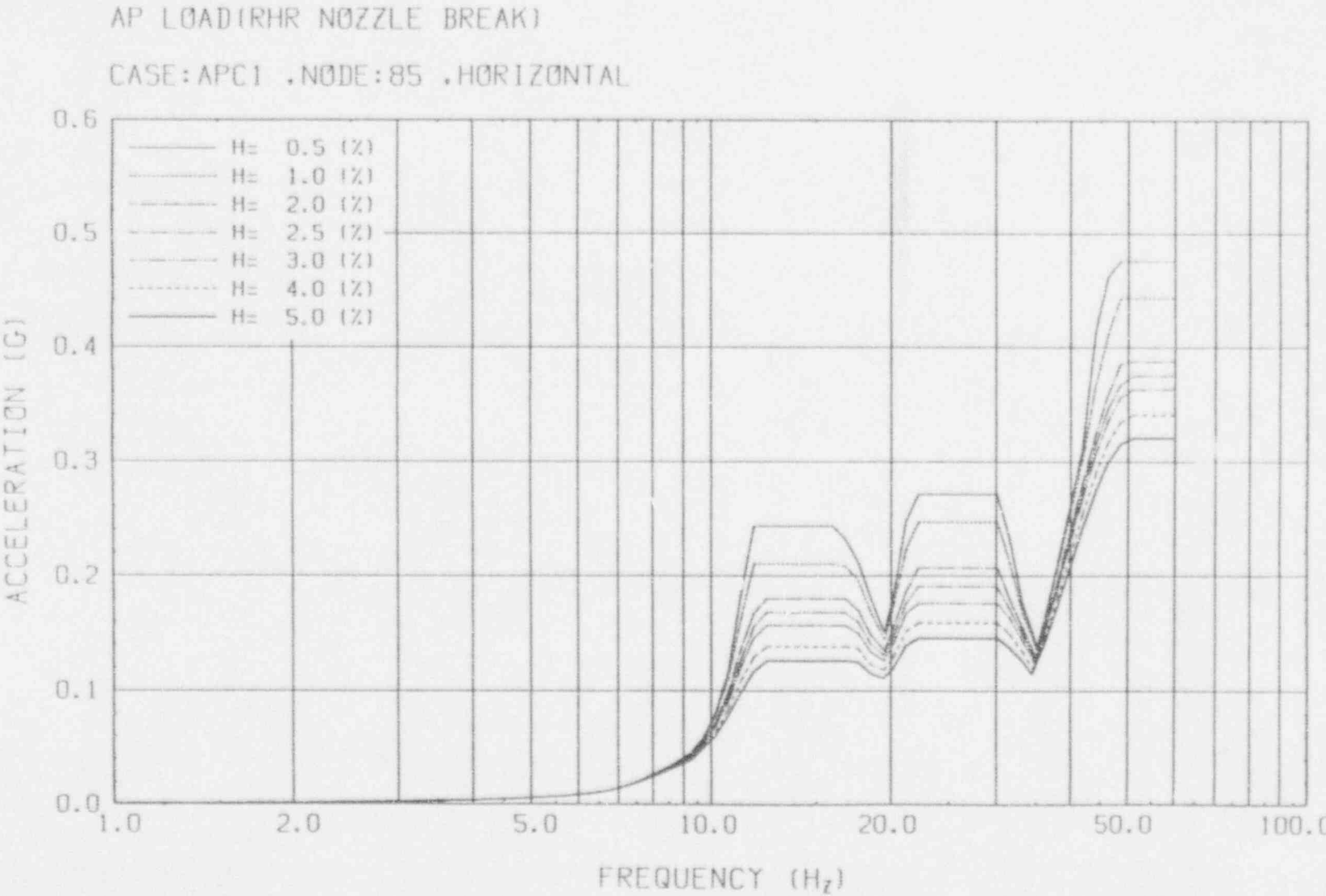


FIG. A-177 FLOOR RESPONSE SPECTRUM

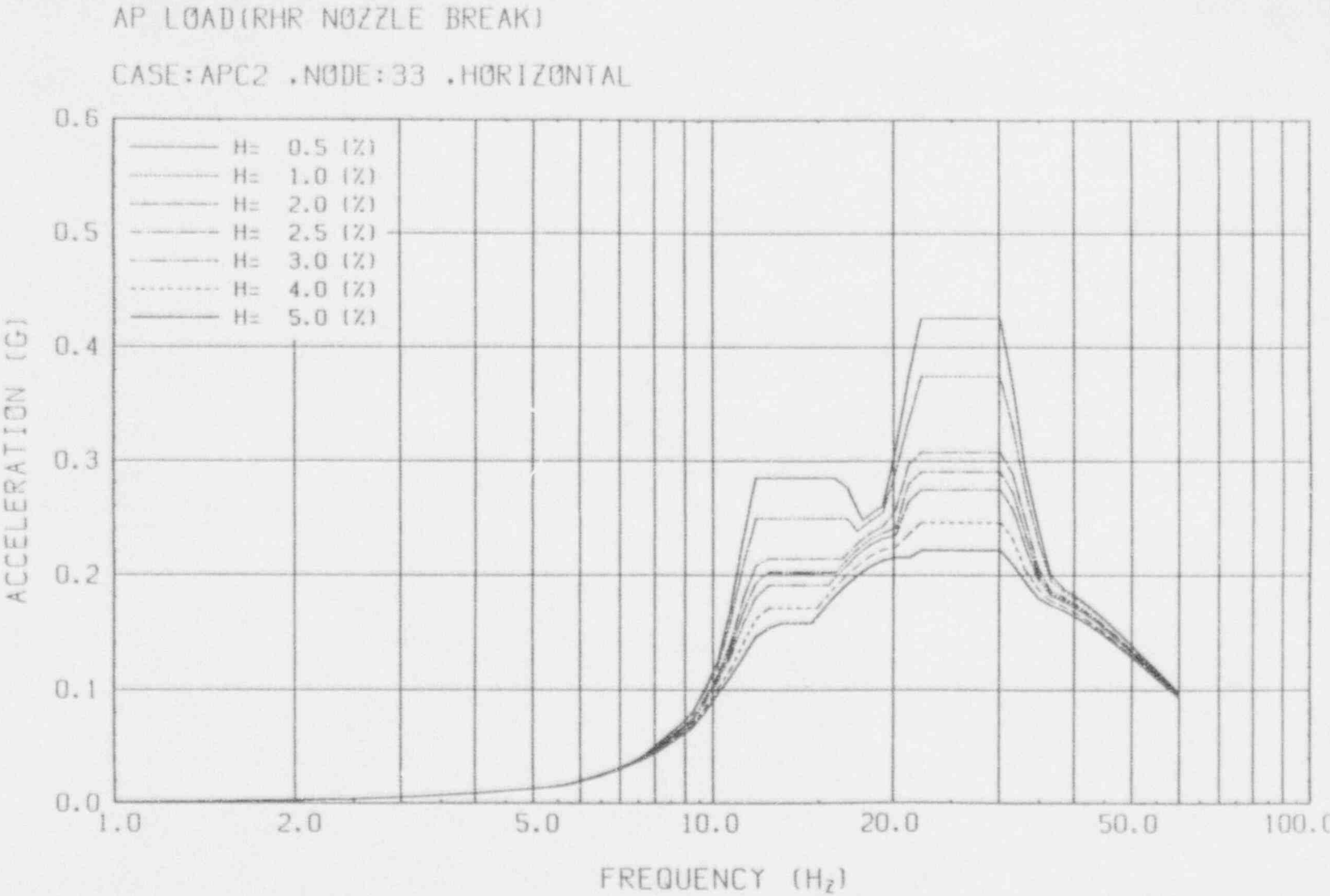


FIG.A-196 FLØØR RESPØNSE SPECTRUM

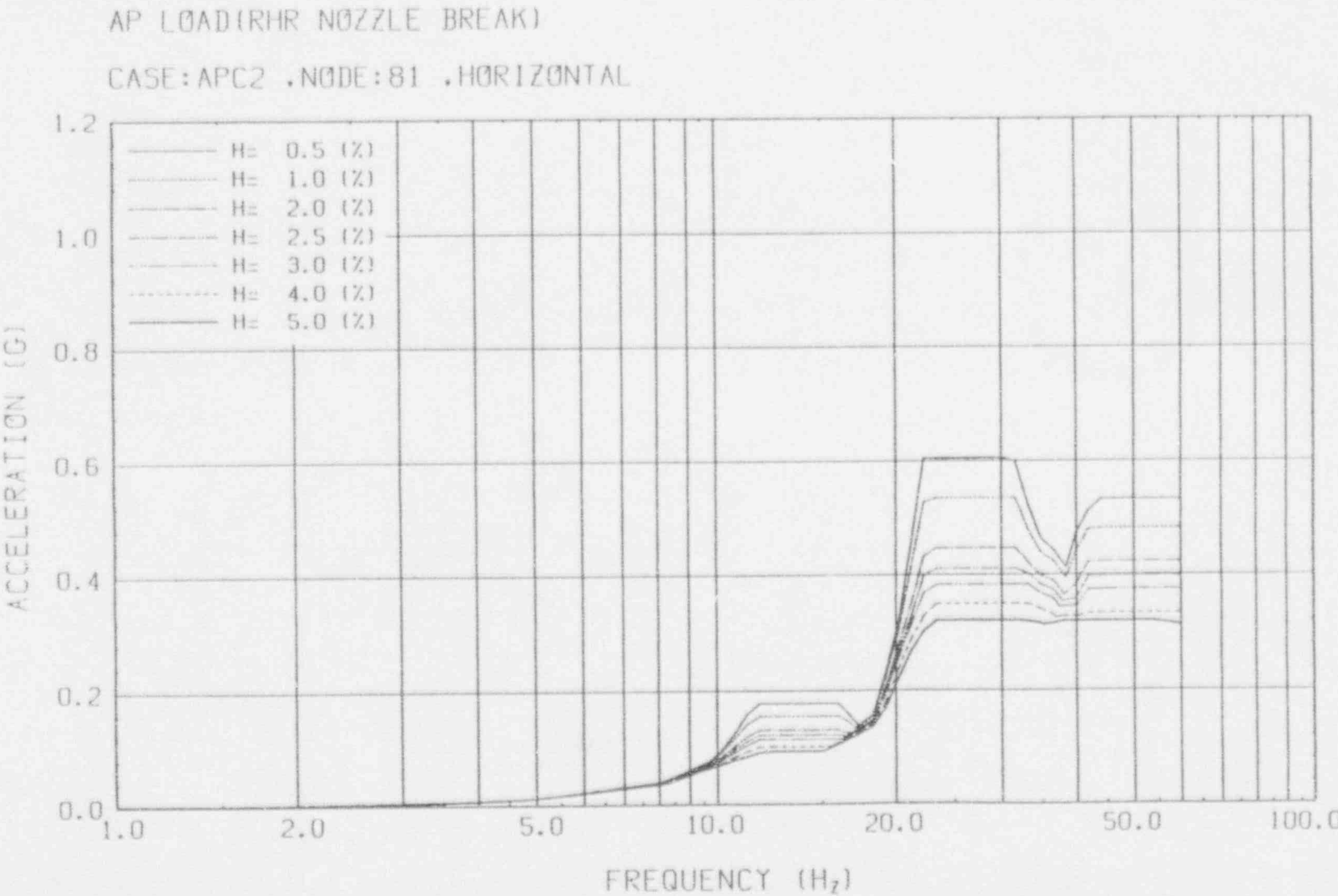


FIG.A-211 FLOOR RESPONSE SPECTRUM

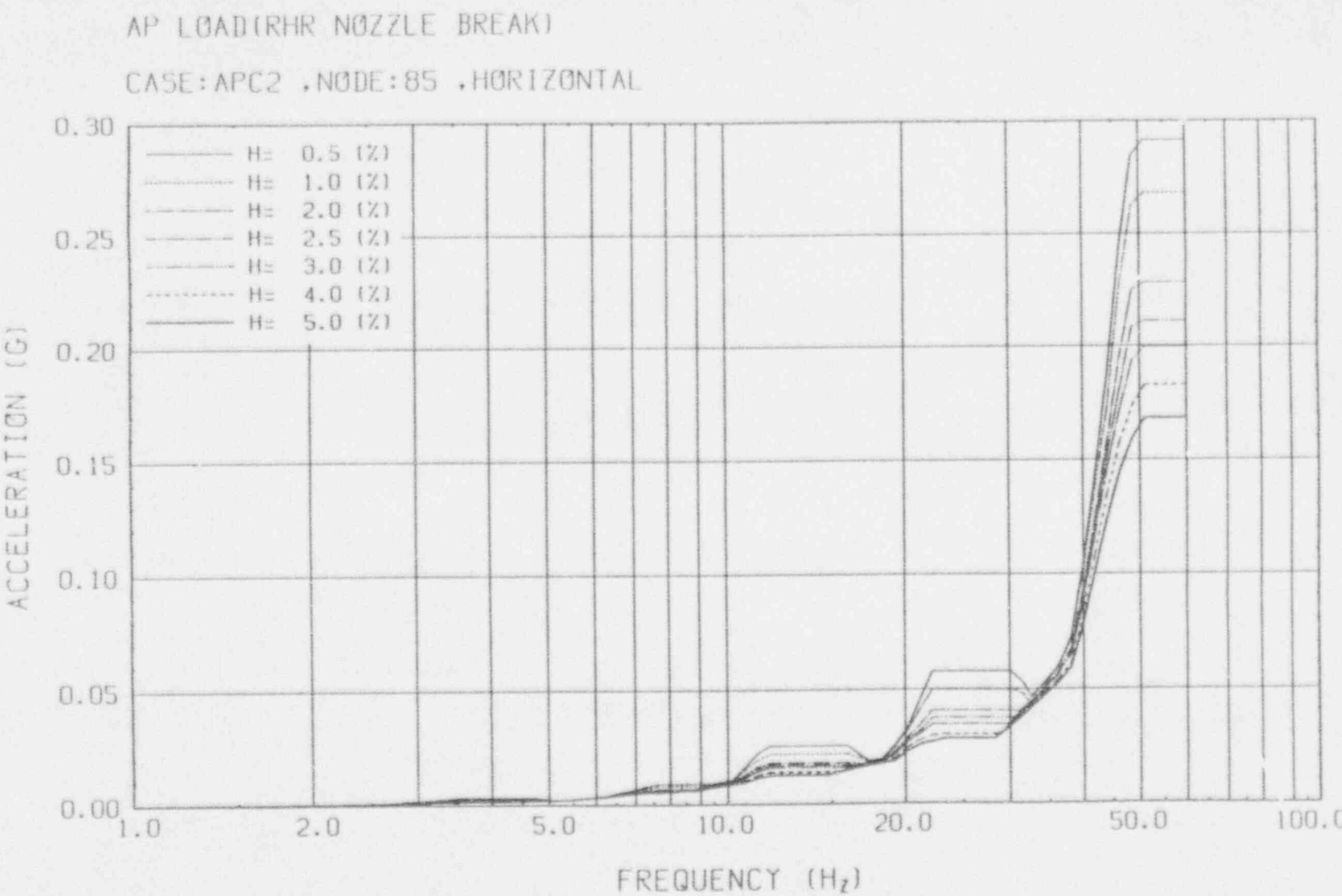


FIG. A-214 FLOOR RESPONSE SPECTRUM

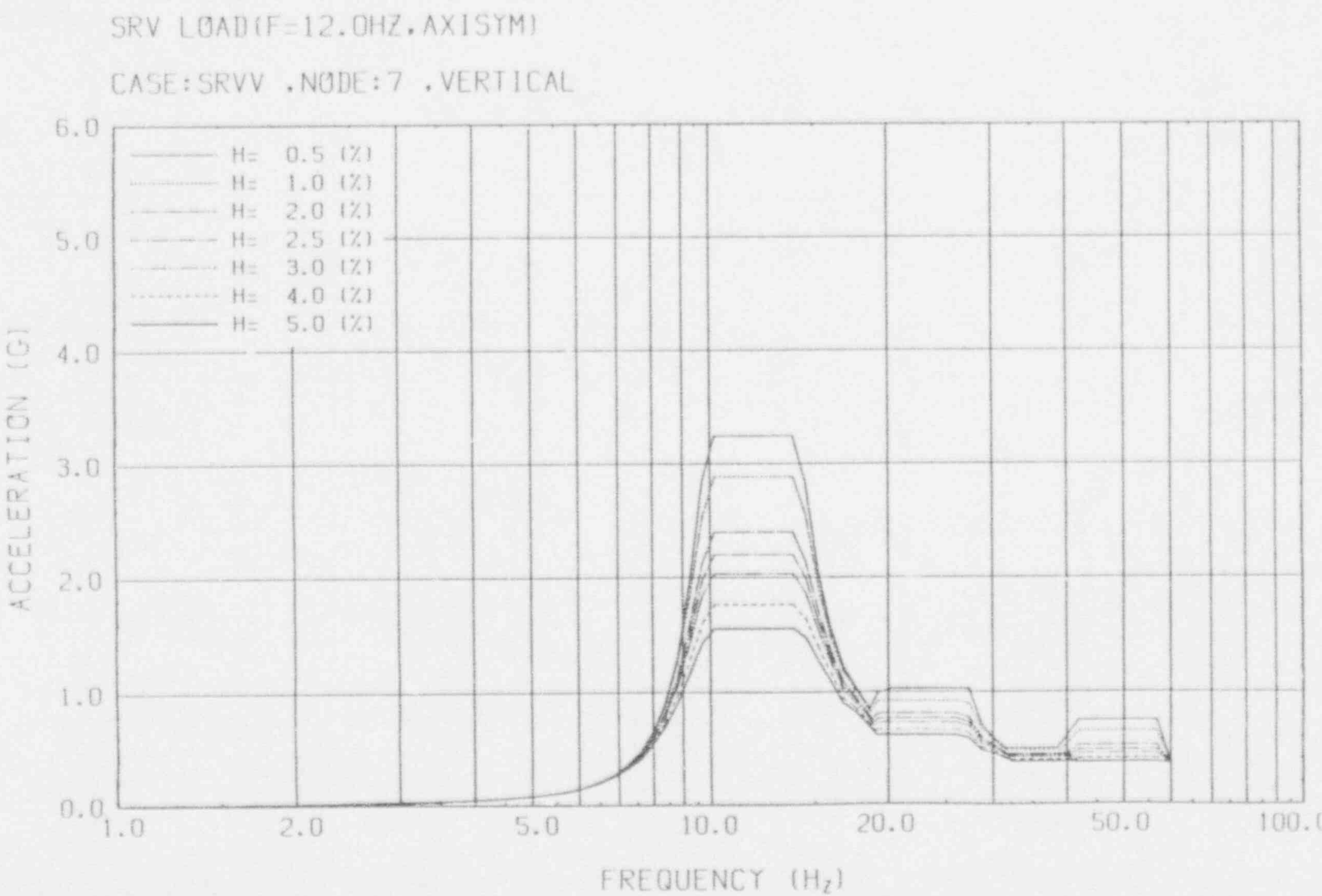


FIG. A-225 FLØØR RESPØNSE SPECTRUM

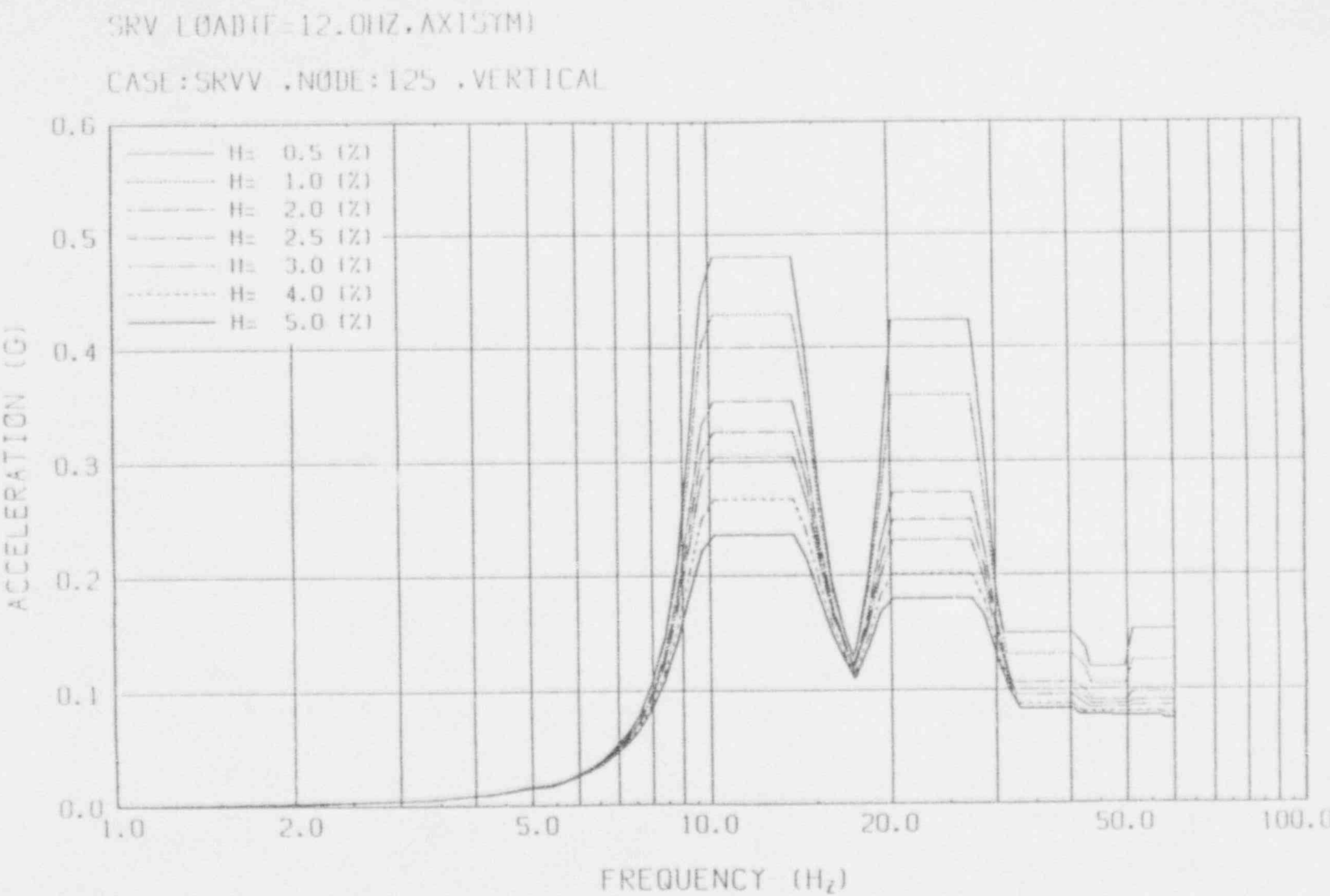


FIG. A-238 FLOOR RESPONSE SPECTRUM

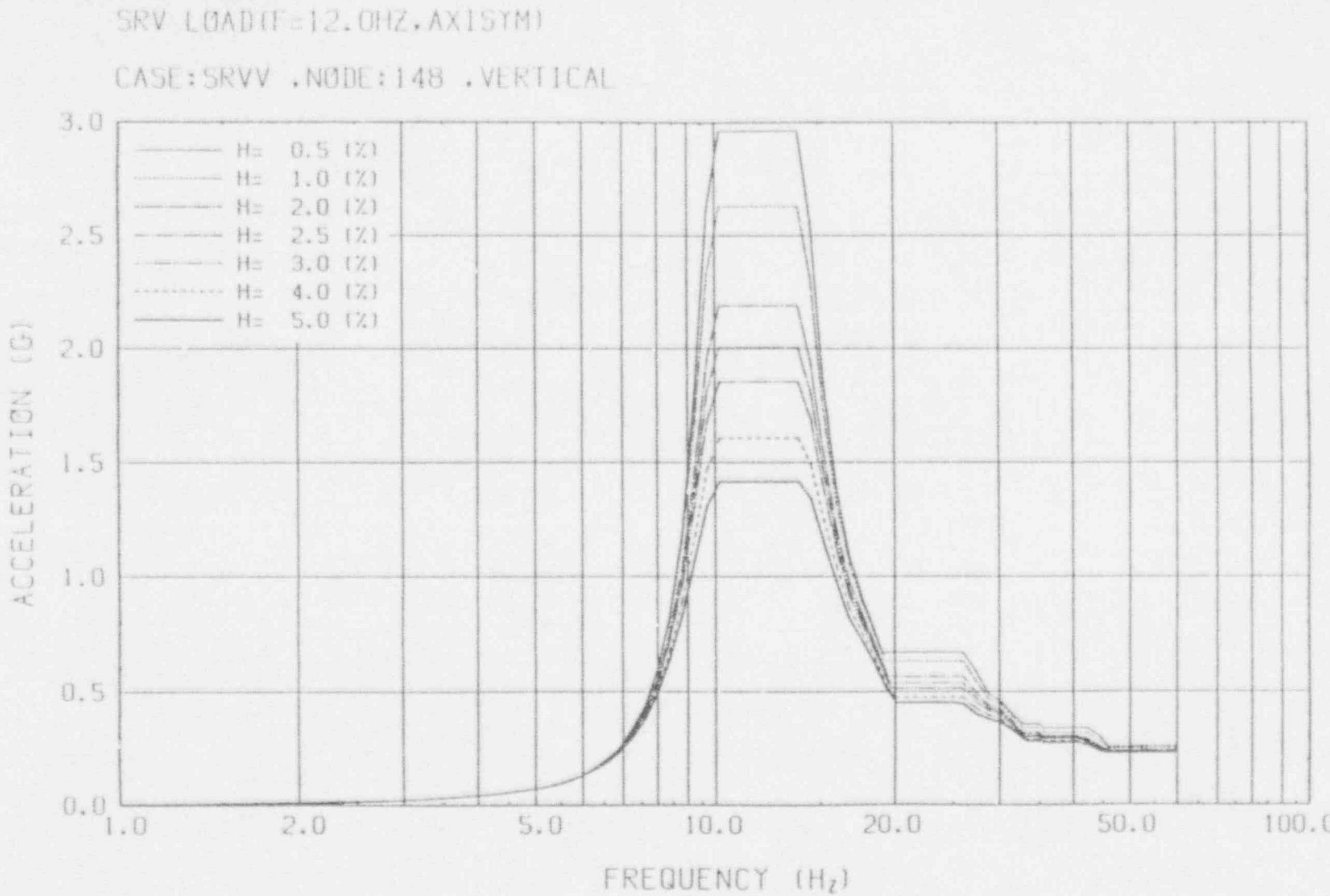


FIG. A-244 FLØØR RESPØNSE SPECTRUM

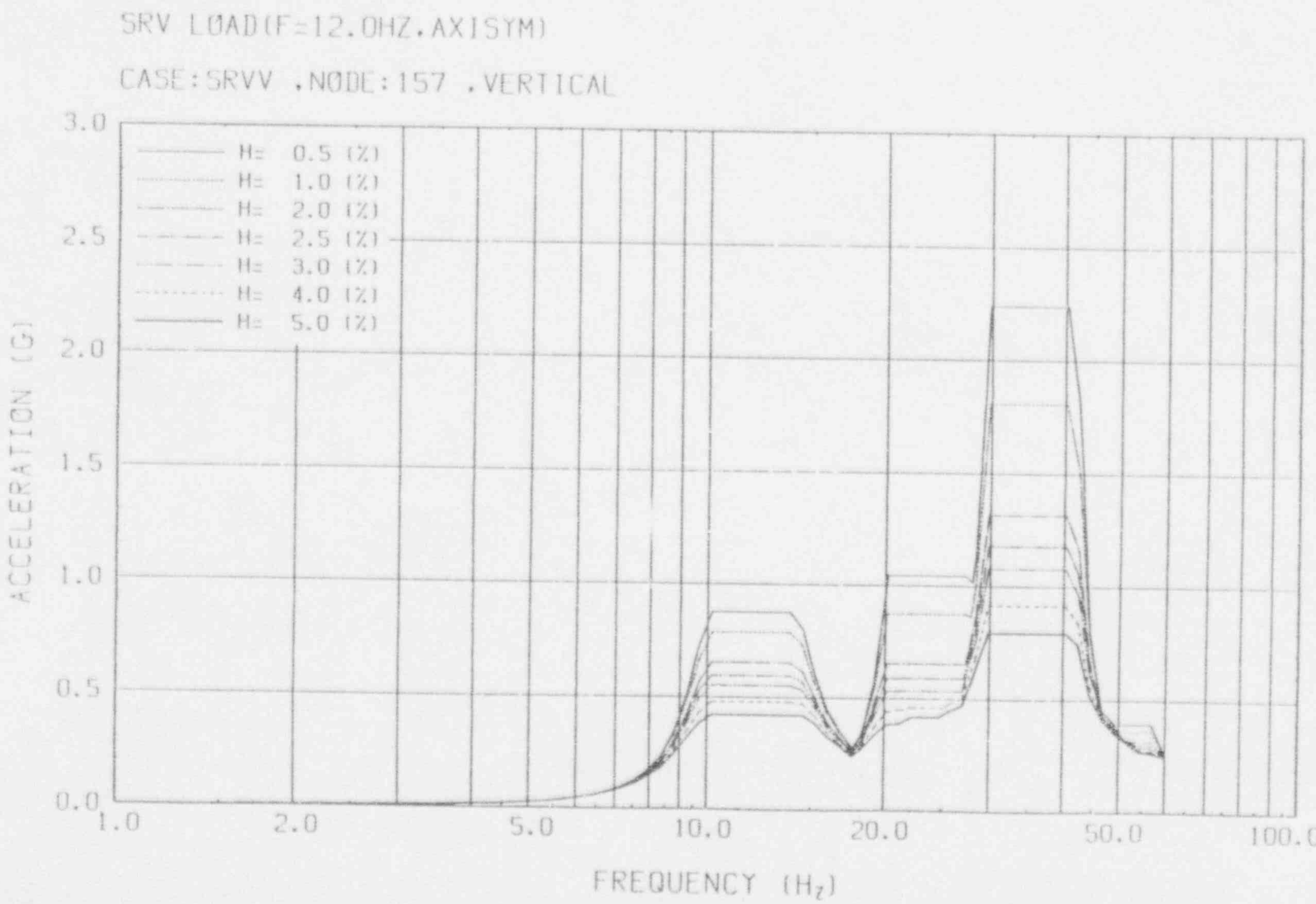


FIG. A-247 FLOOR RESPONSE SPECTRUM

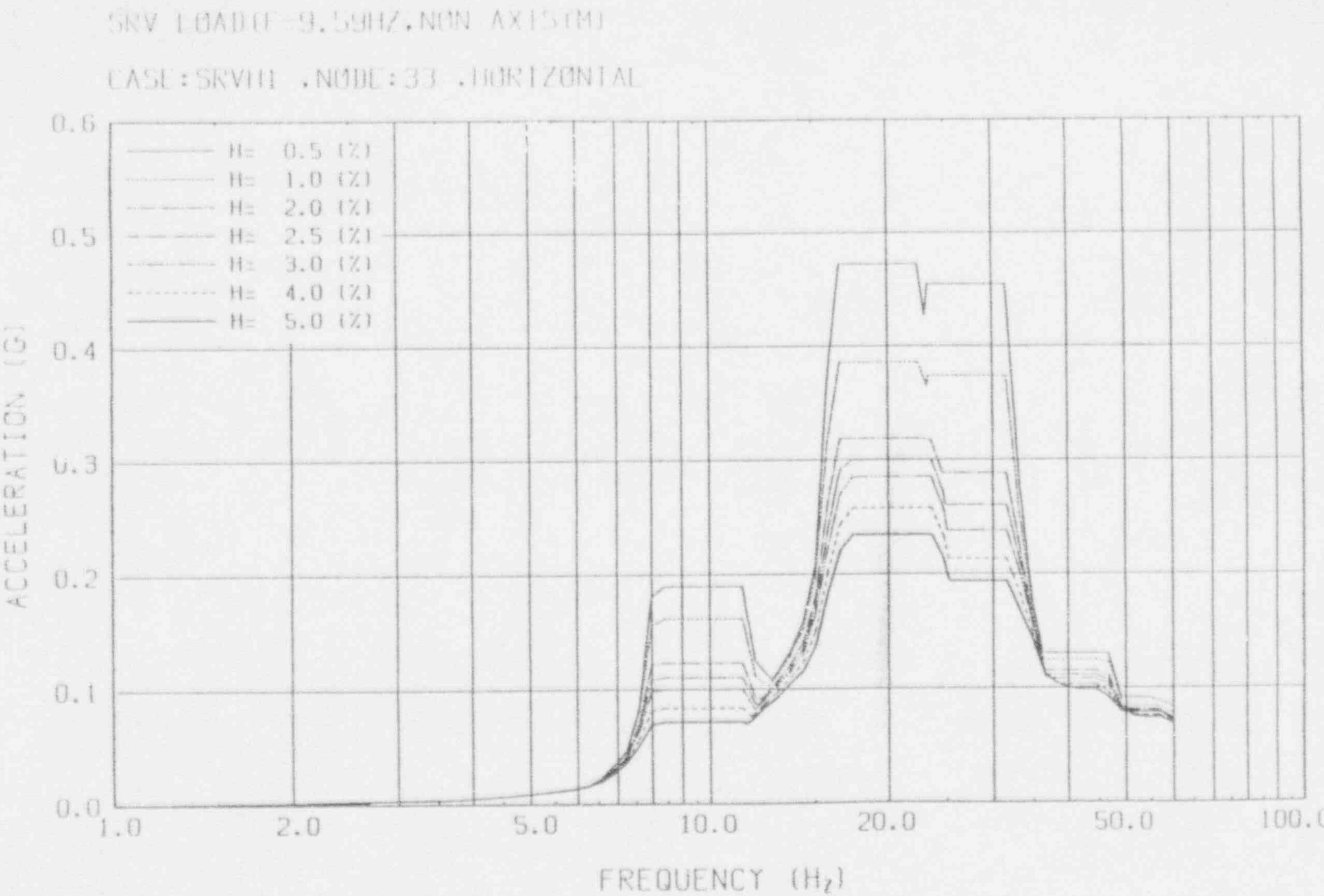


FIG. A-272 FLOOR RESPONSE SPECTRUM

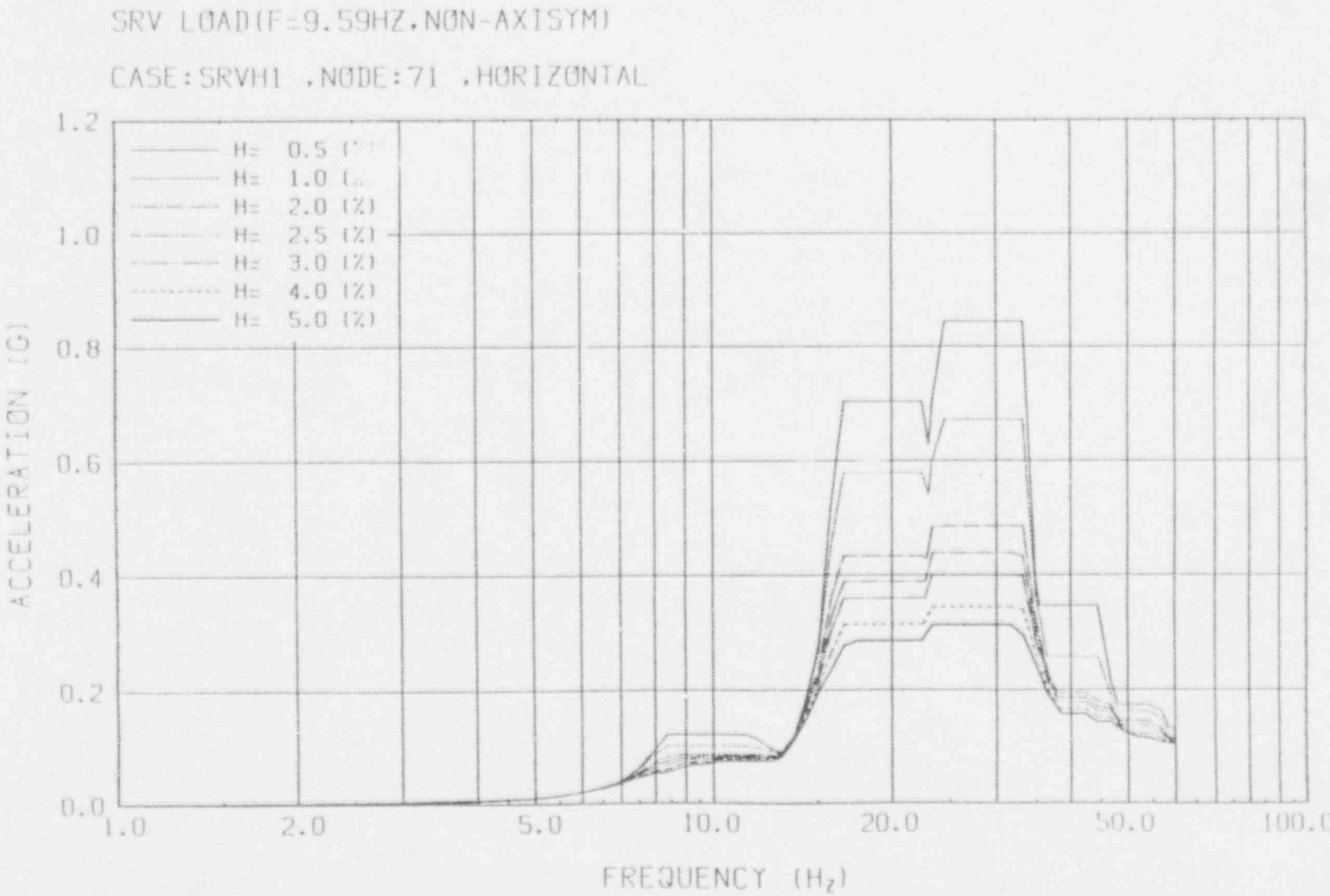


FIG. A-289 FLOOR RESPONSE SPECTRUM

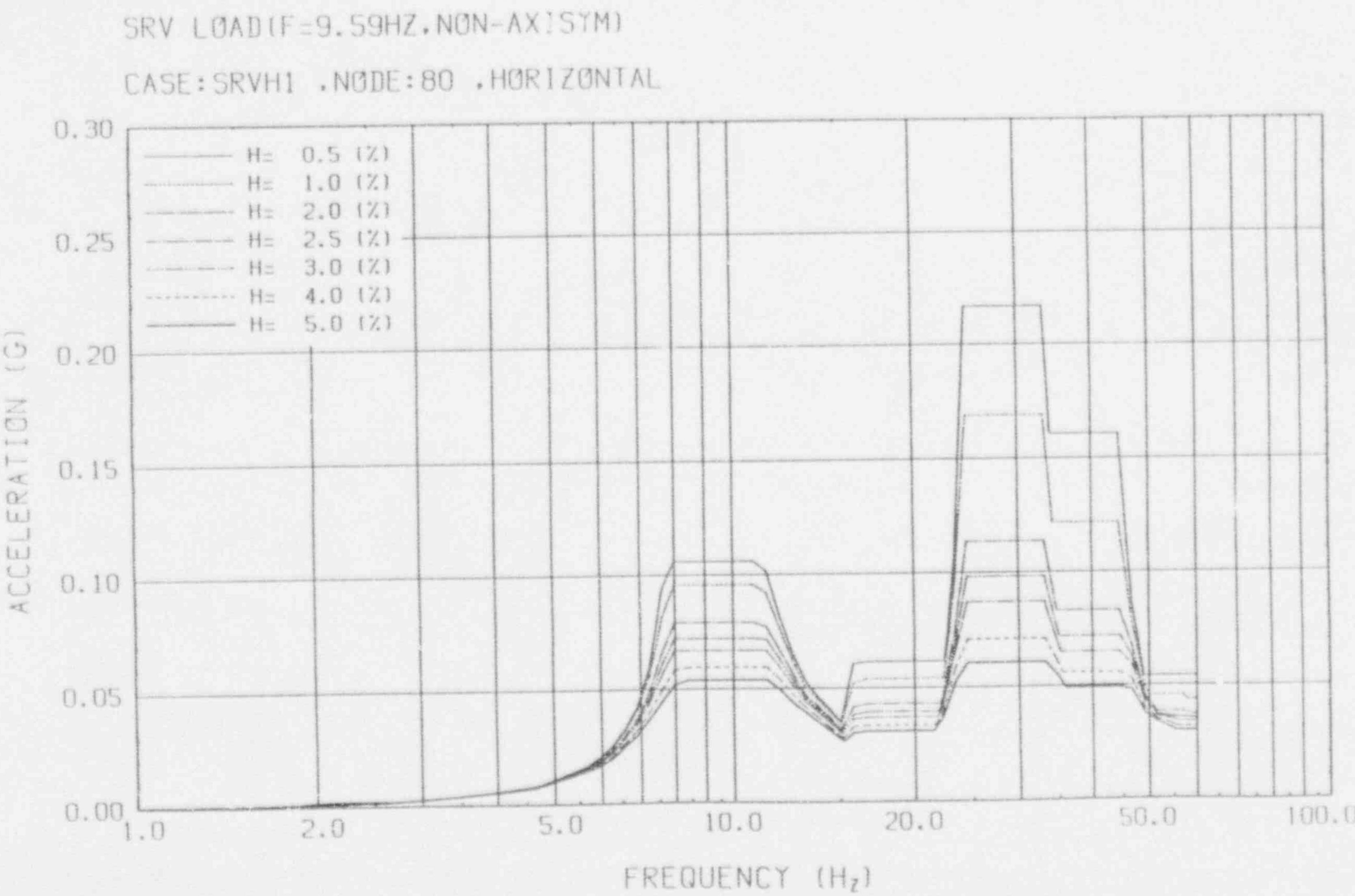


FIG. A-291 FLØØR RESPØNSE SPECTRUM

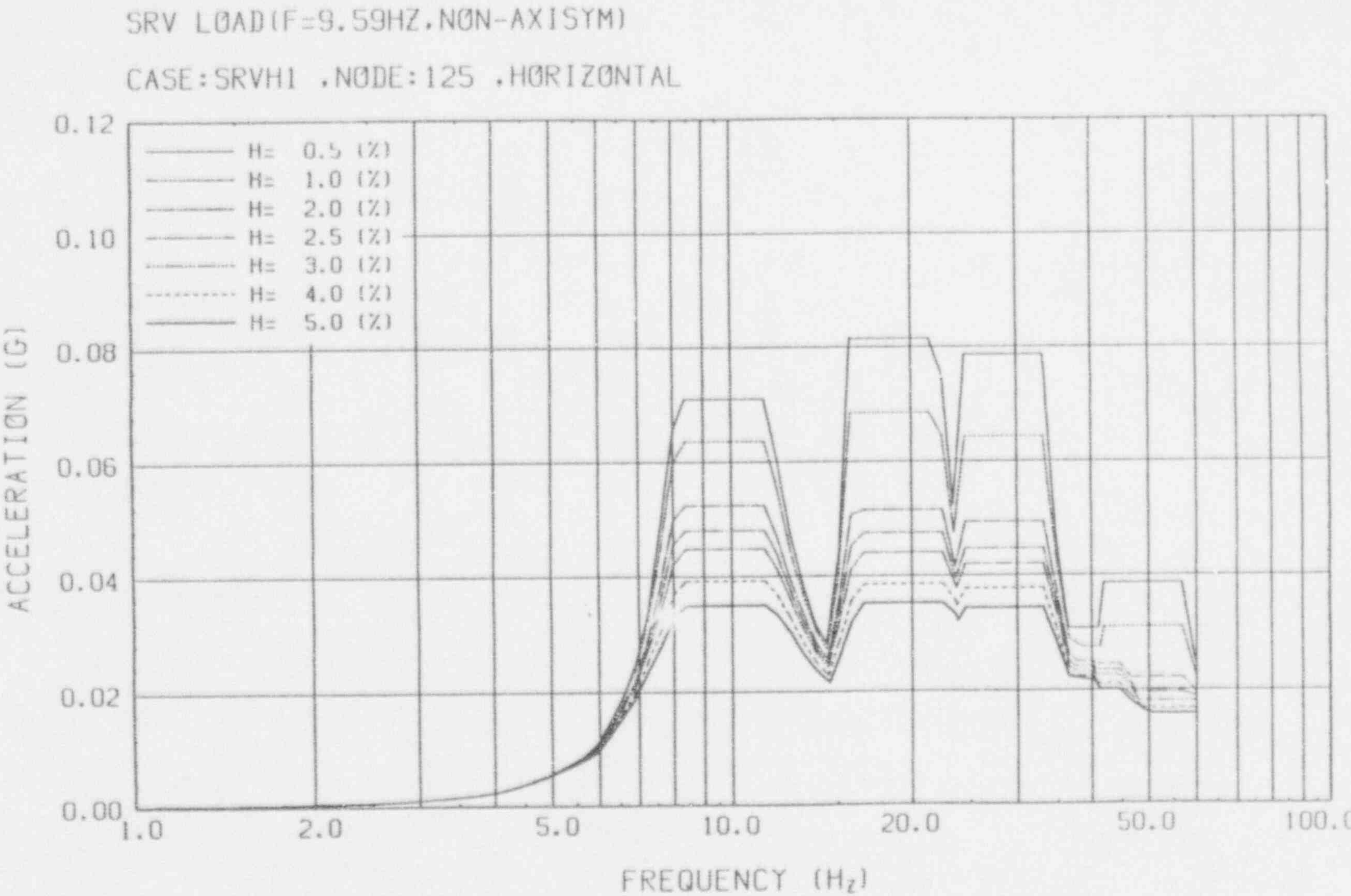


FIG. A-292 FLOOR RESPONSE SPECTRUM

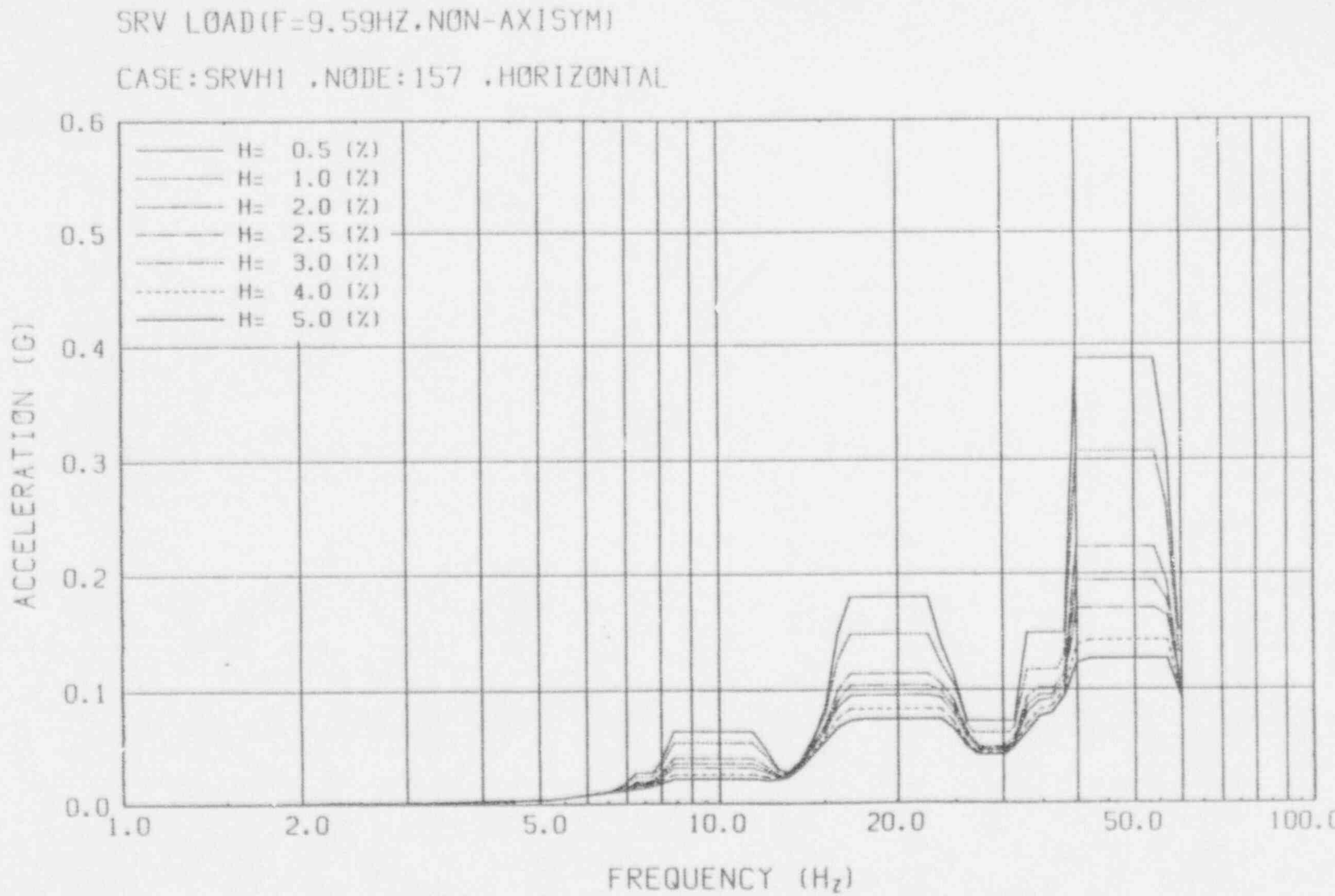


FIG. A-300 FLOOR RESPONSE SPECTRUM

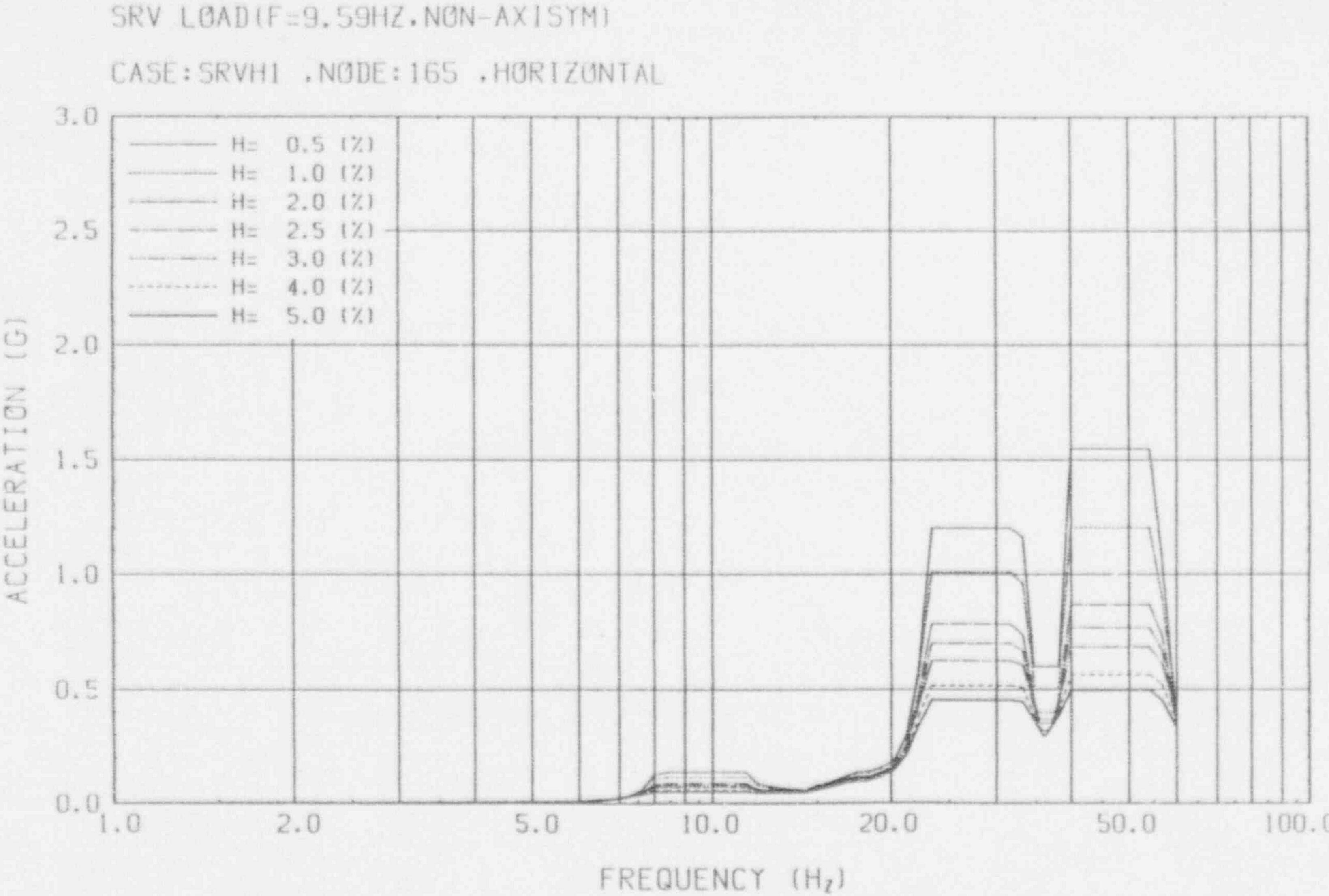


FIG. A-308 FLØØR RESPØNSE SPECTRUM

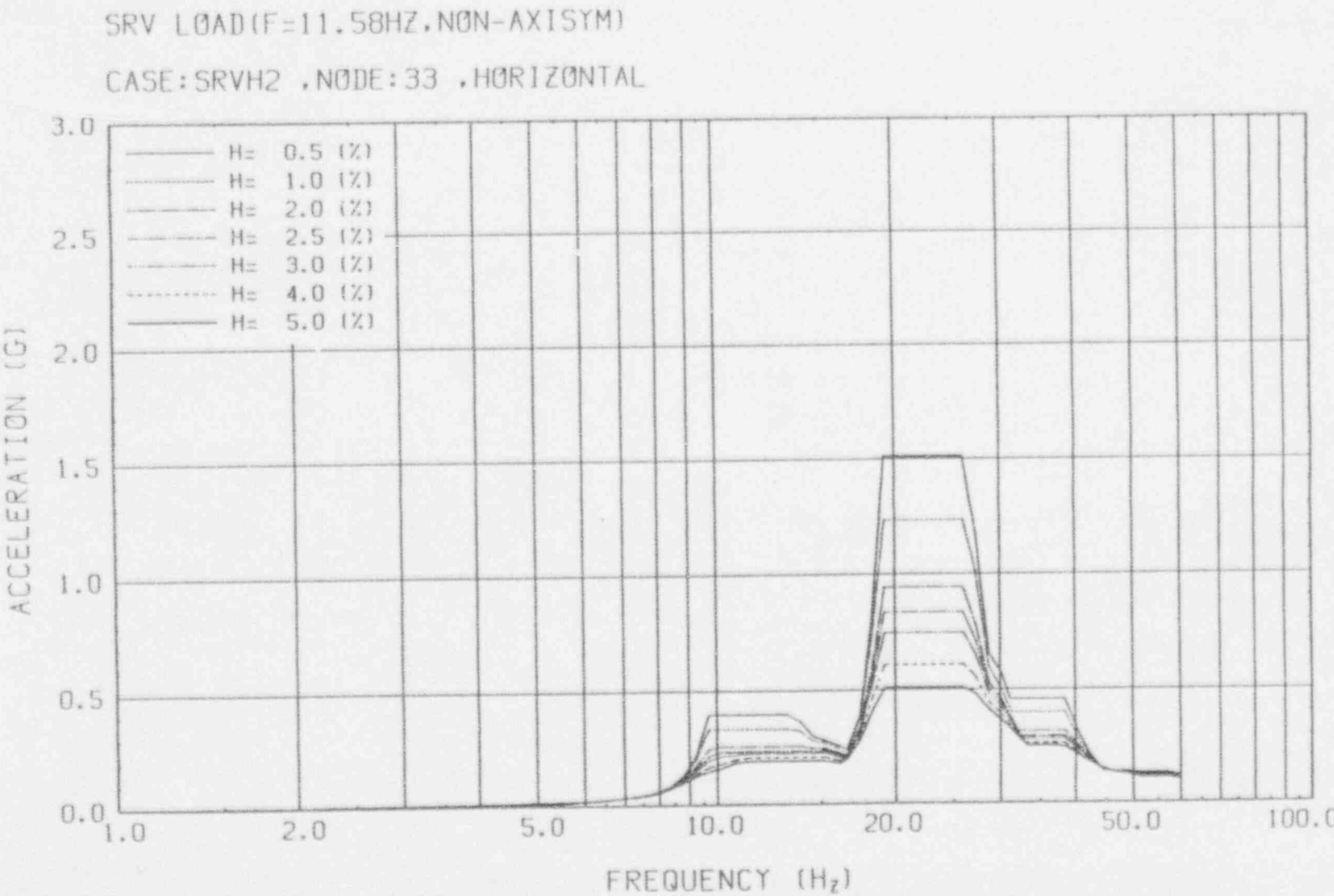


FIG. A-325 FLØØR RESPØNSE SPECTRUM

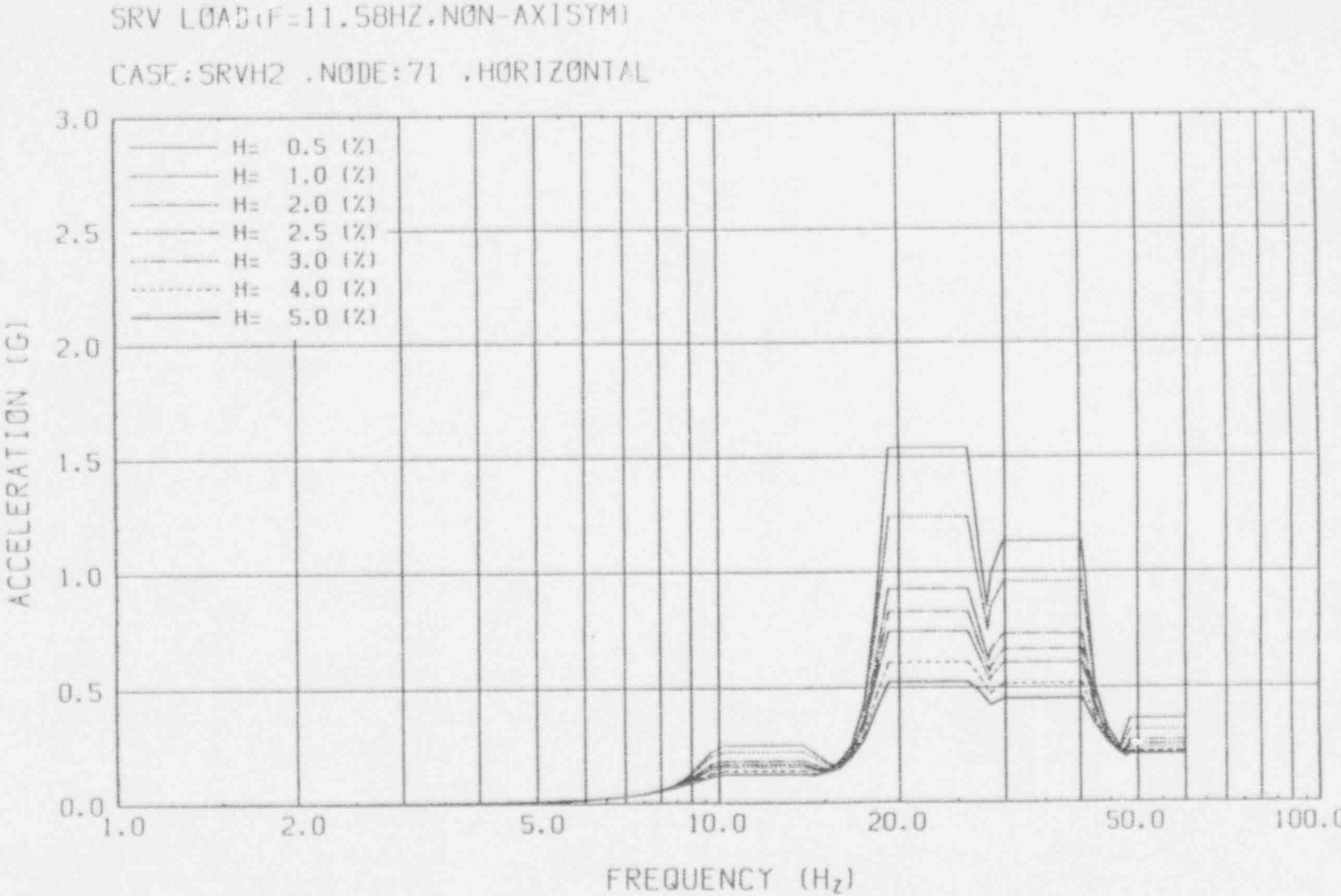


FIG. A-342 FLOOR RESPONSE SPECTRUM

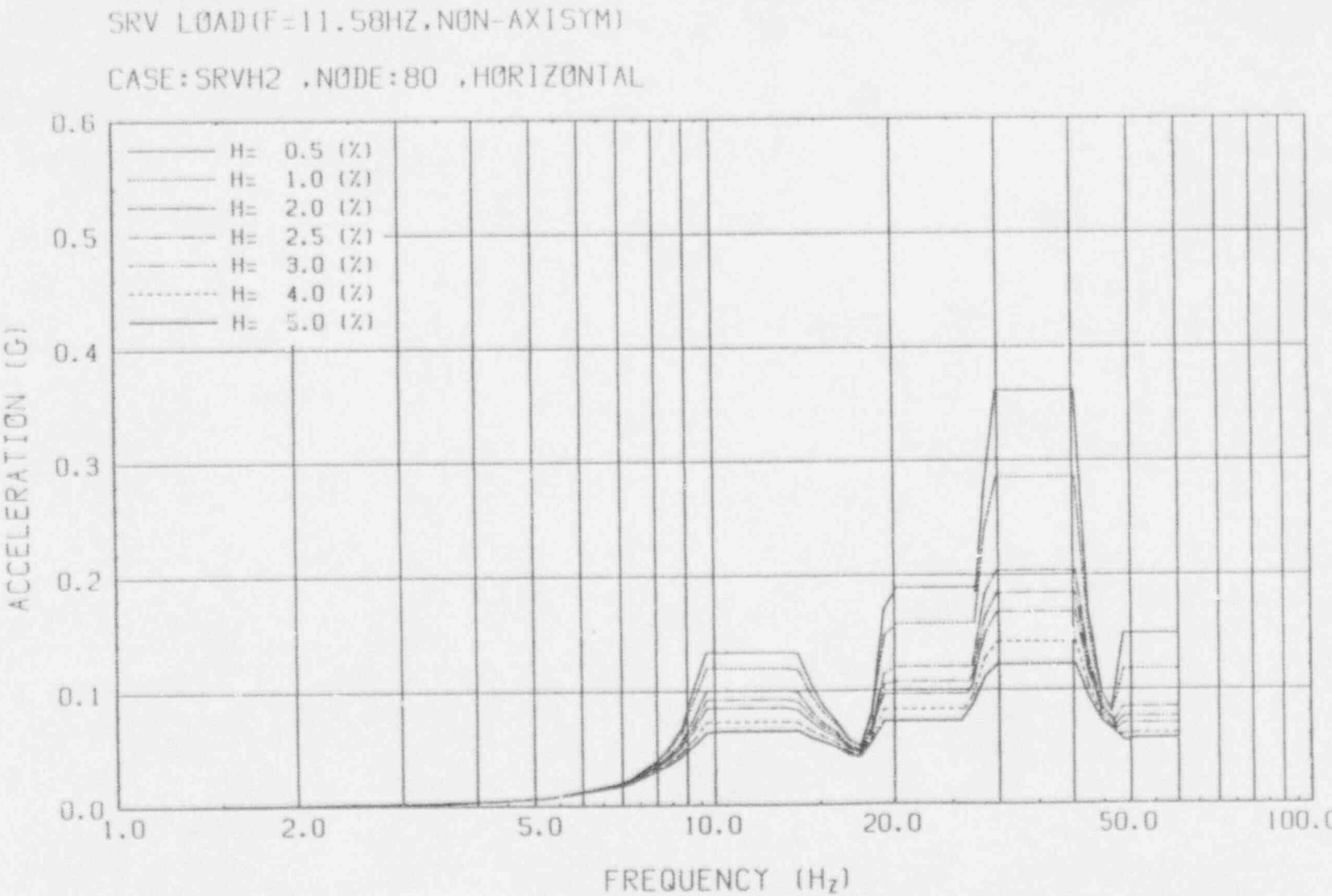


FIG. A-344 FLOOR RESPONSE SPECTRUM

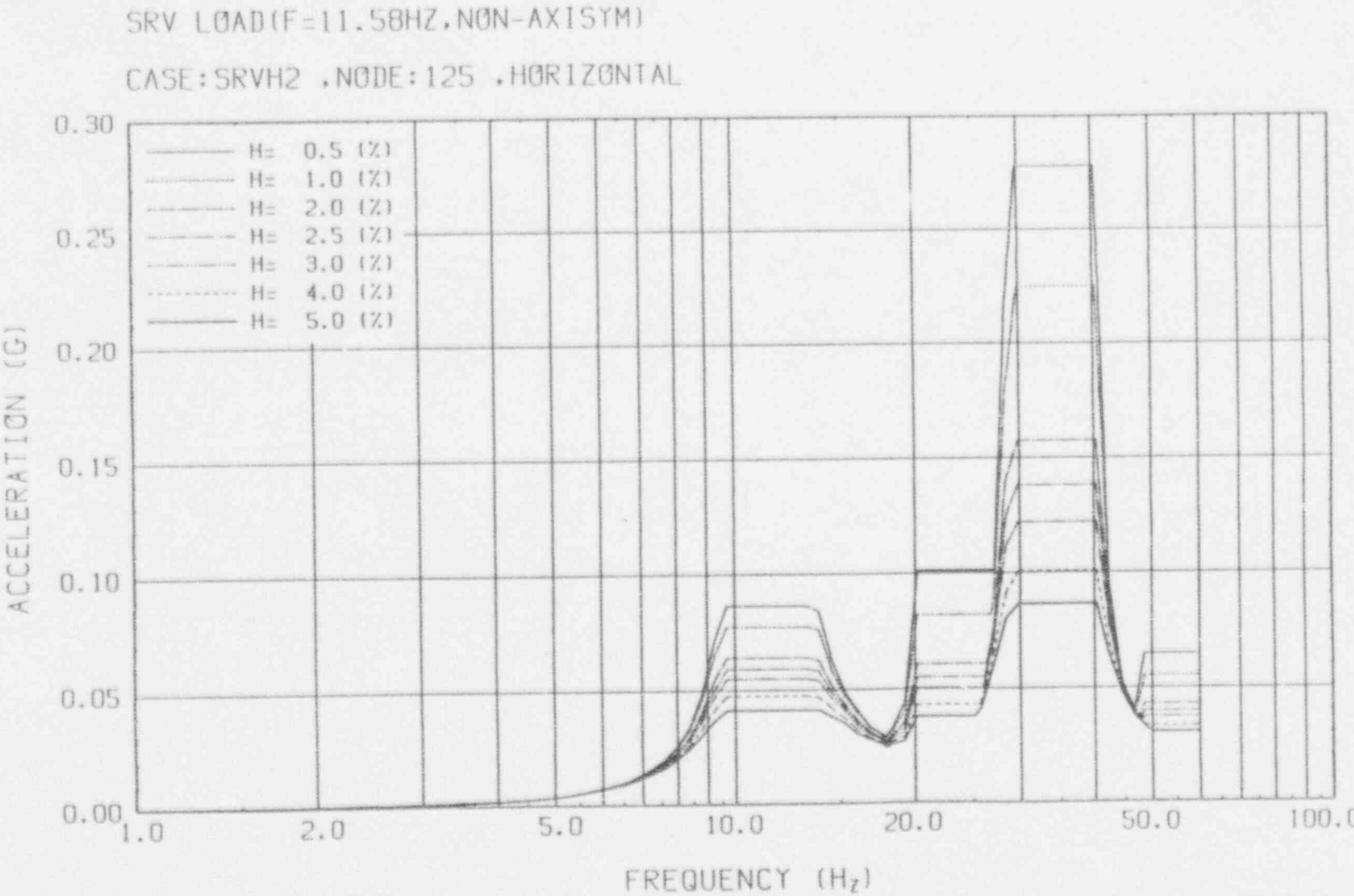


FIG. A-345 FLOOR RESPONSE SPECTRUM

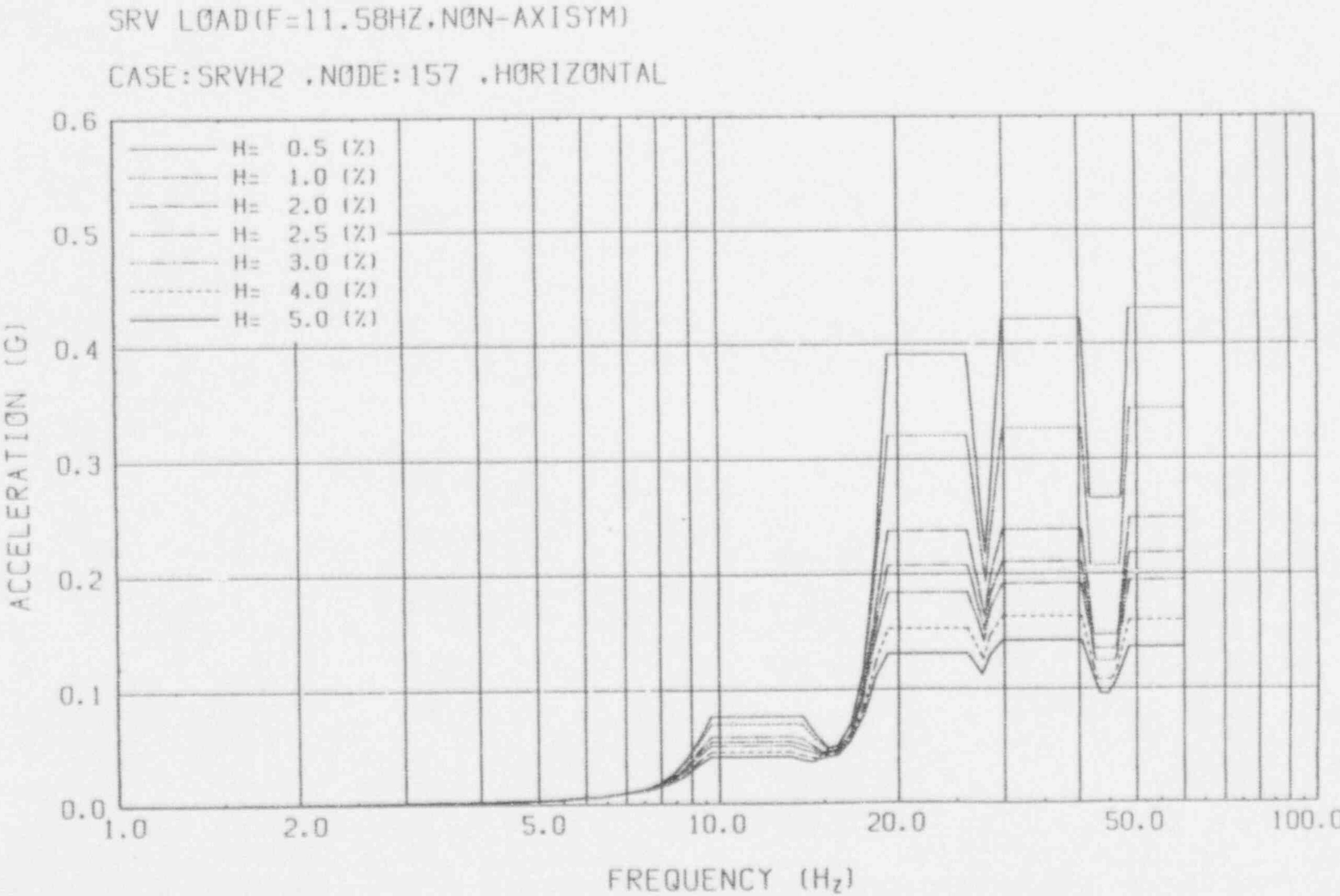


FIG. A-353 FLØØR RESPØNSE SPECTRUM

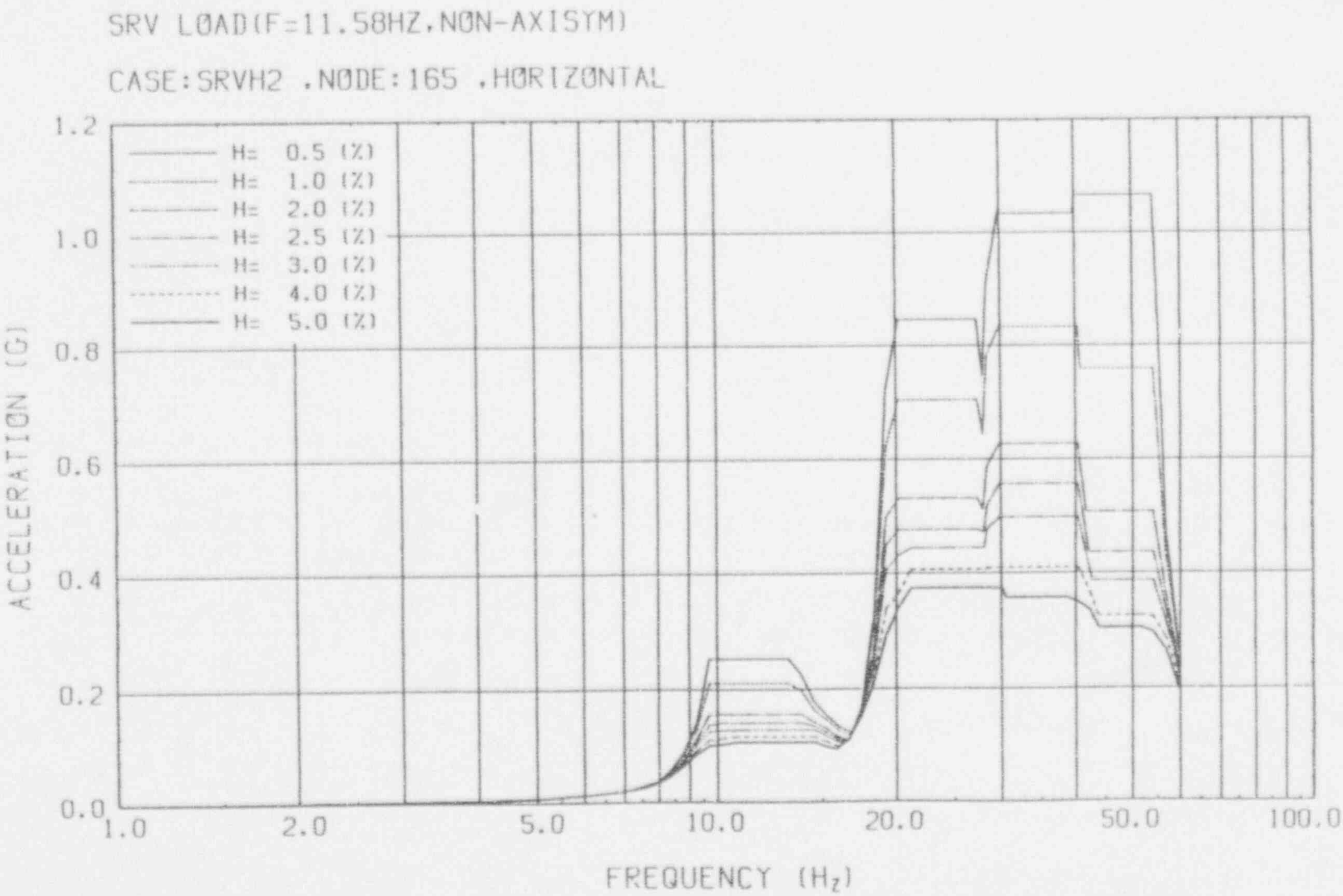


FIG. A-361 FLOOR RESPONSE SPECTRUM

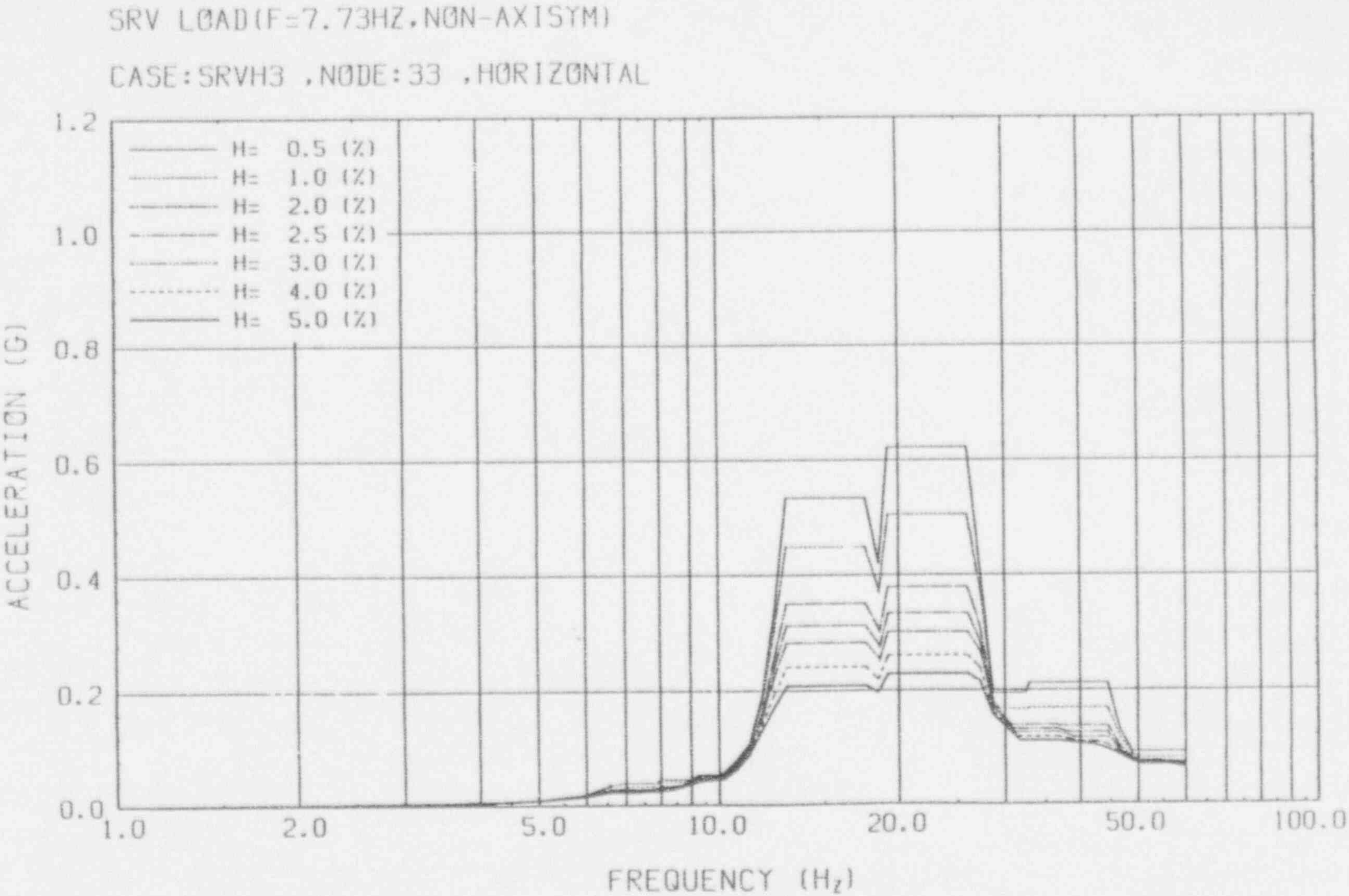


FIG. A-378 FLOOR RESPONSE SPECTRUM

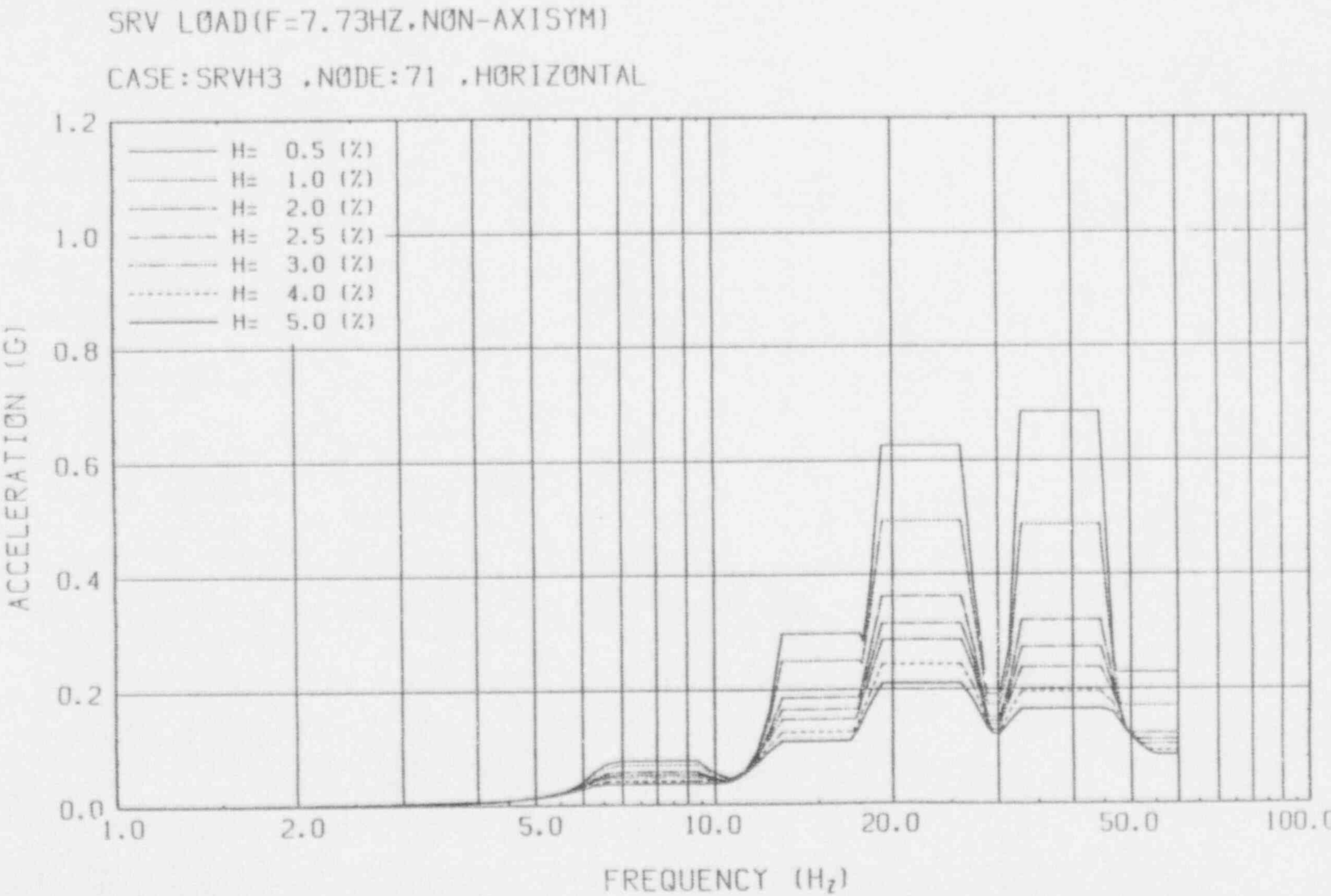


FIG. A-395 FLOOR RESPONSE SPECTRUM

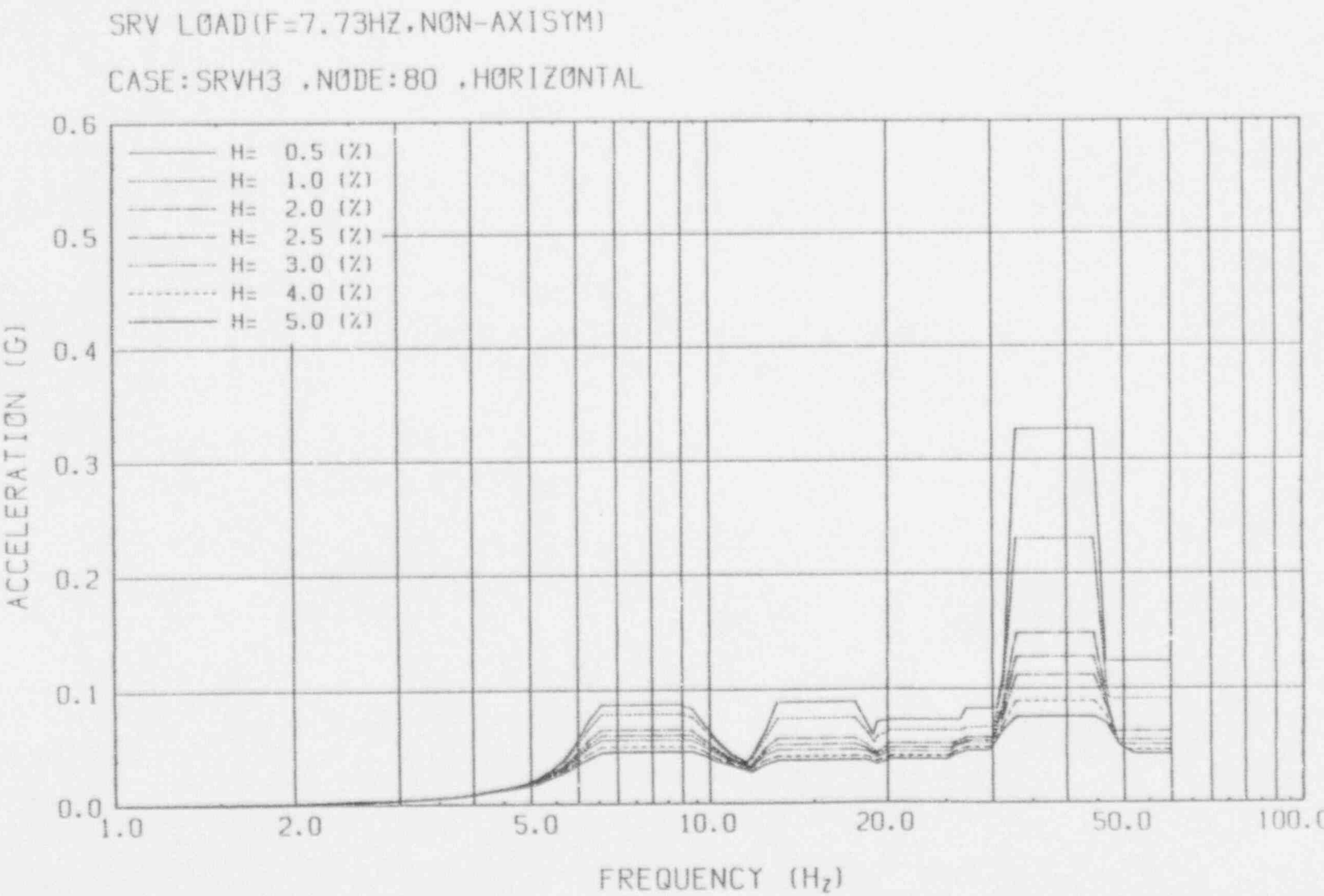


FIG. A-397 FLØØR RESPØNSE SPECTRUM

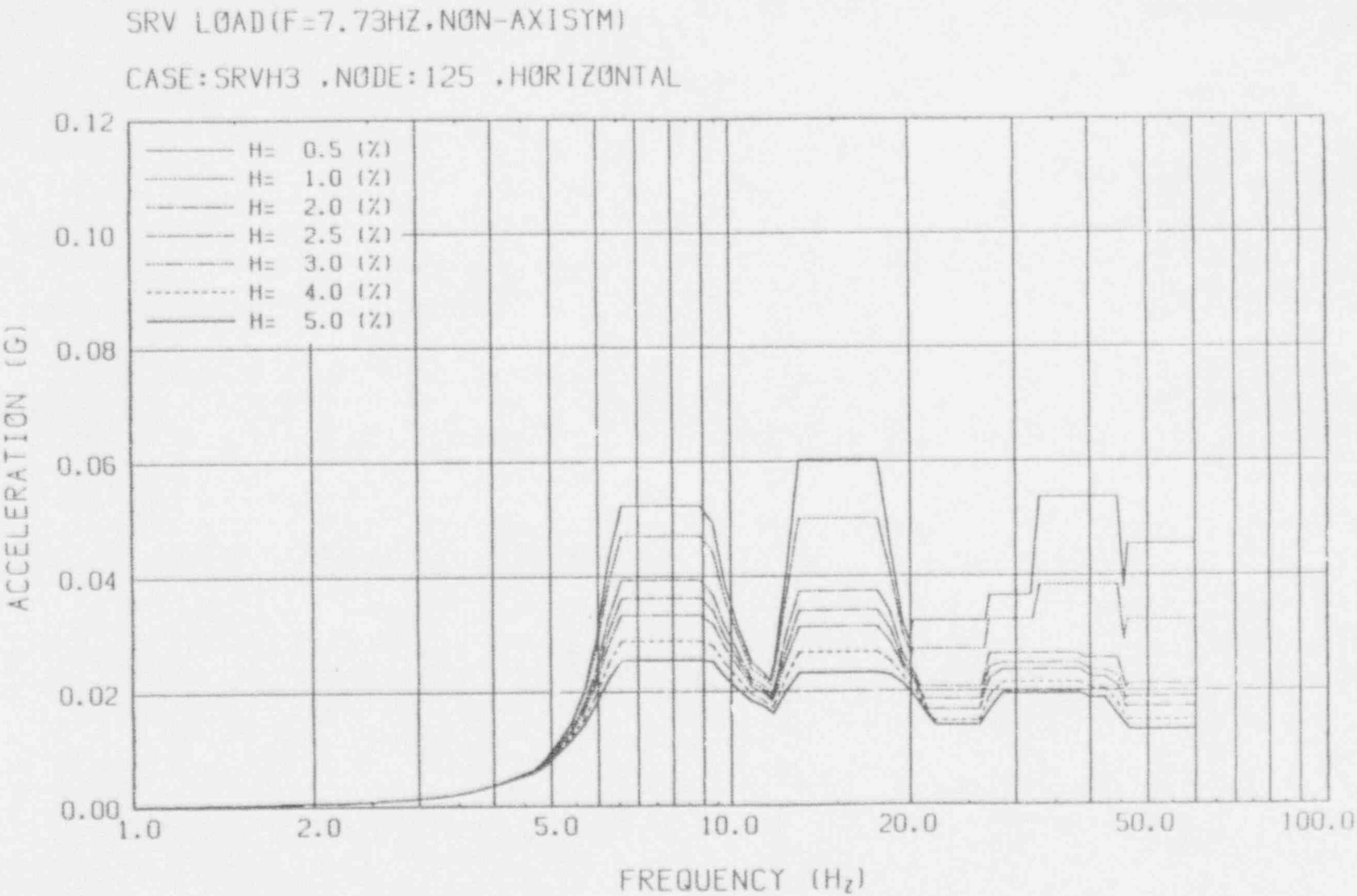


FIG. A-398 FLOOR RESPONSE SPECTRUM

SRV LØAD(F=7.73HZ.NØN-AXISYM)

CASE:SRVH3 .NØDE:157 .HØRIZØNTAL

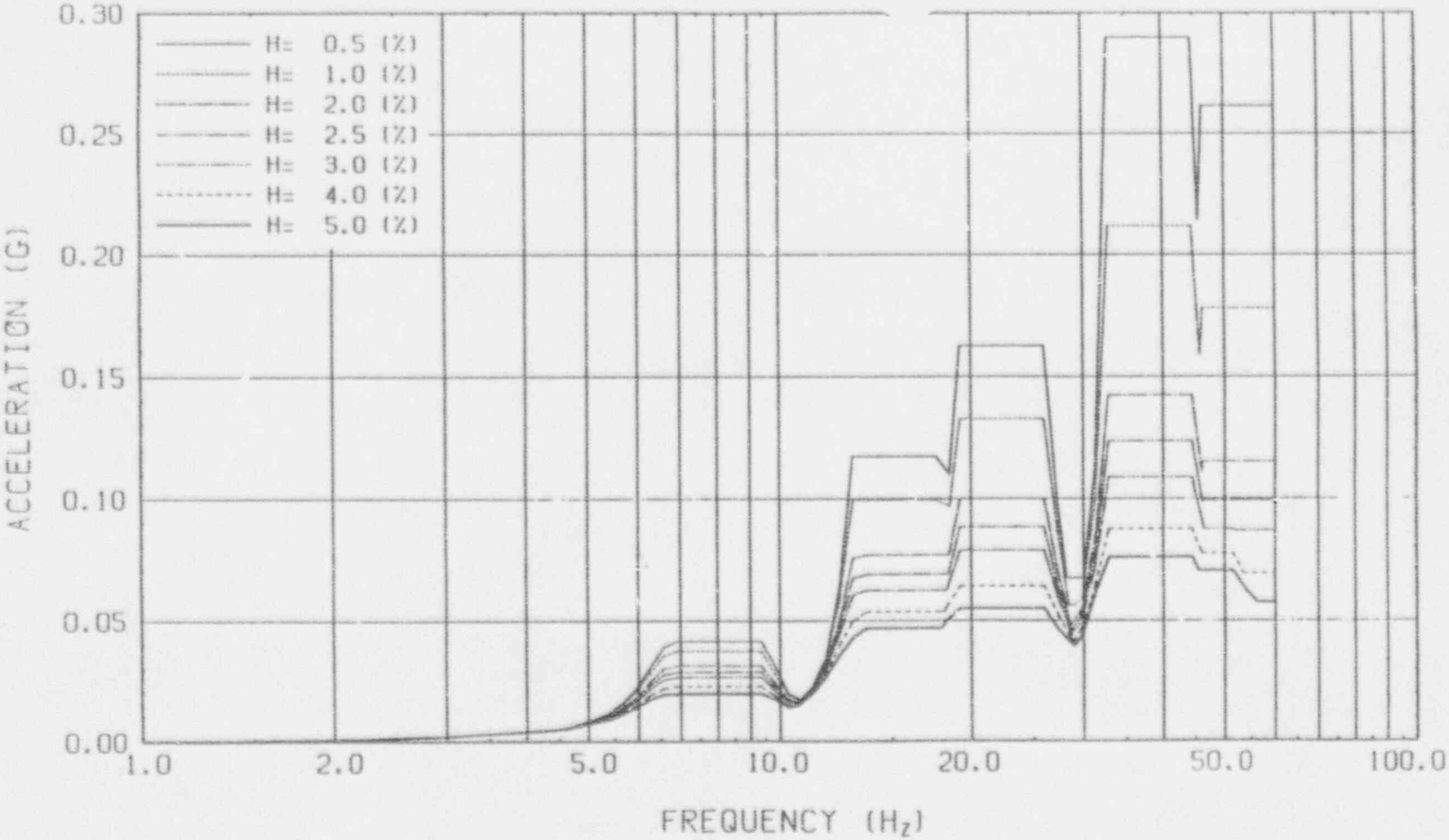


FIG. A-406 FLØØR RESPØNSE SPECTRUM

SRV LOAD(F=7.73HZ.NON-AXISYM)

CASE:SRVH3 .NODE:165 .HORIZONTAL

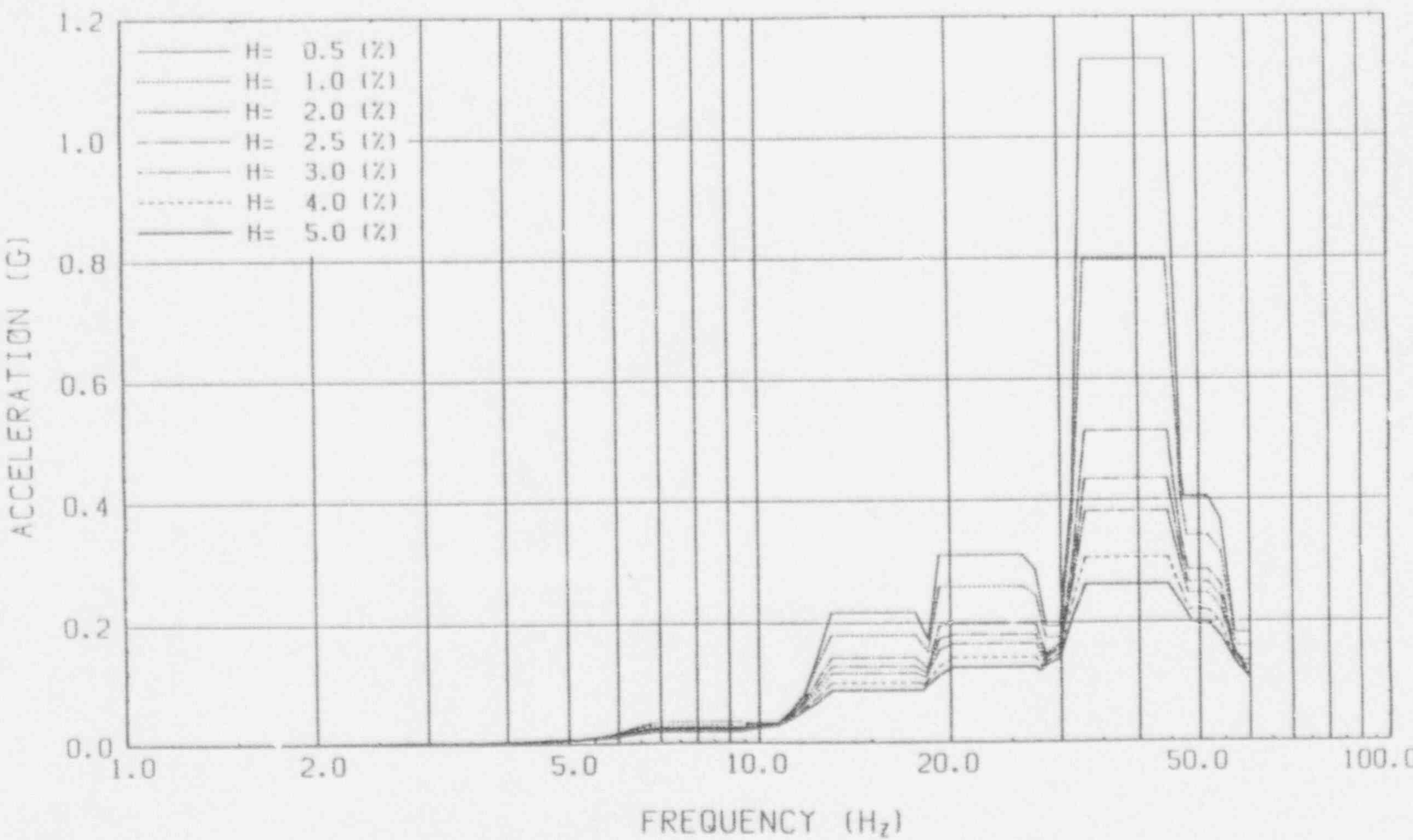


FIG. A-414 FLOOR RESPONSE SPECTRUM

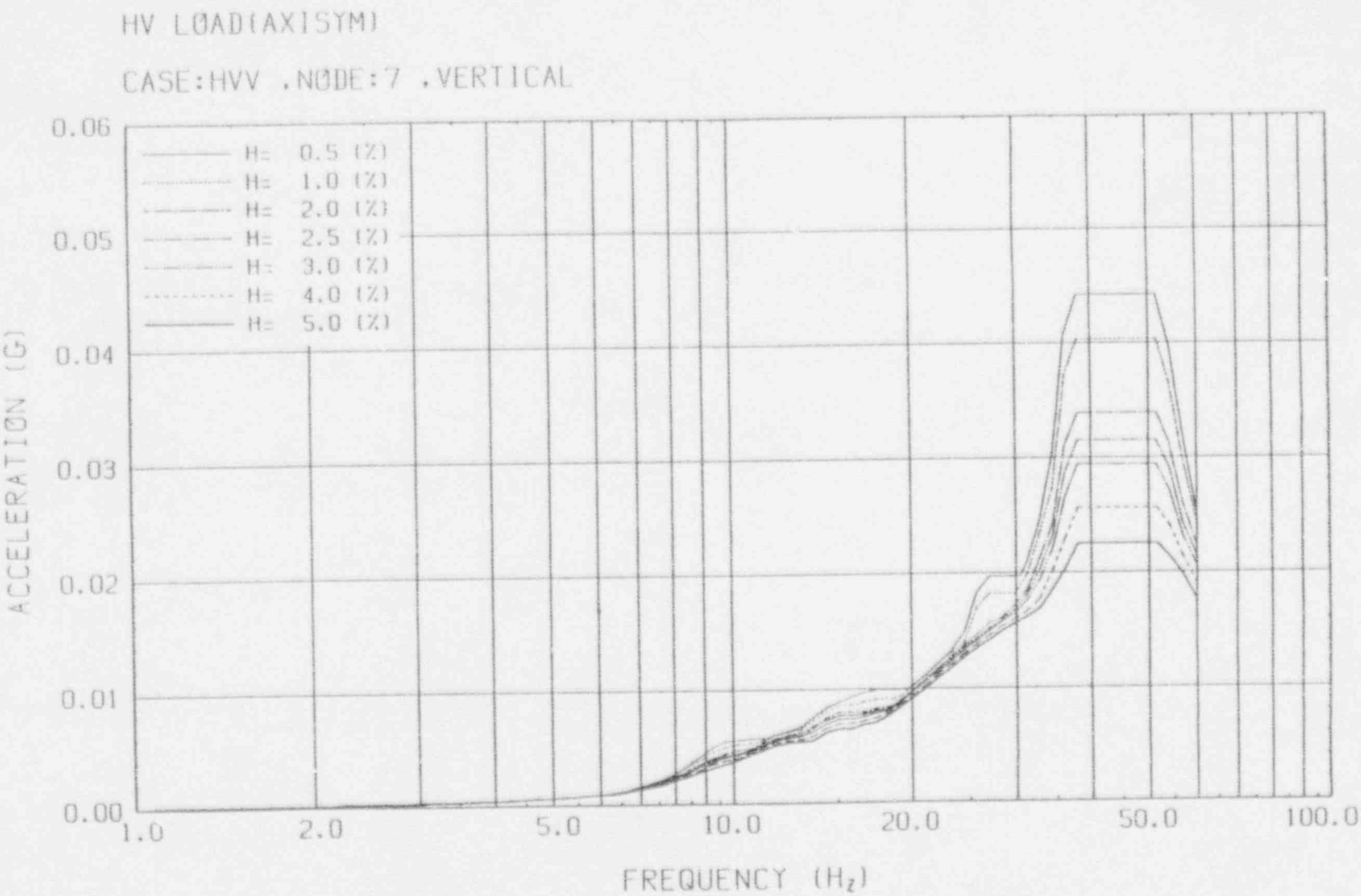


FIG. A-424 FLØØR RESPØNSE SPECTRUM

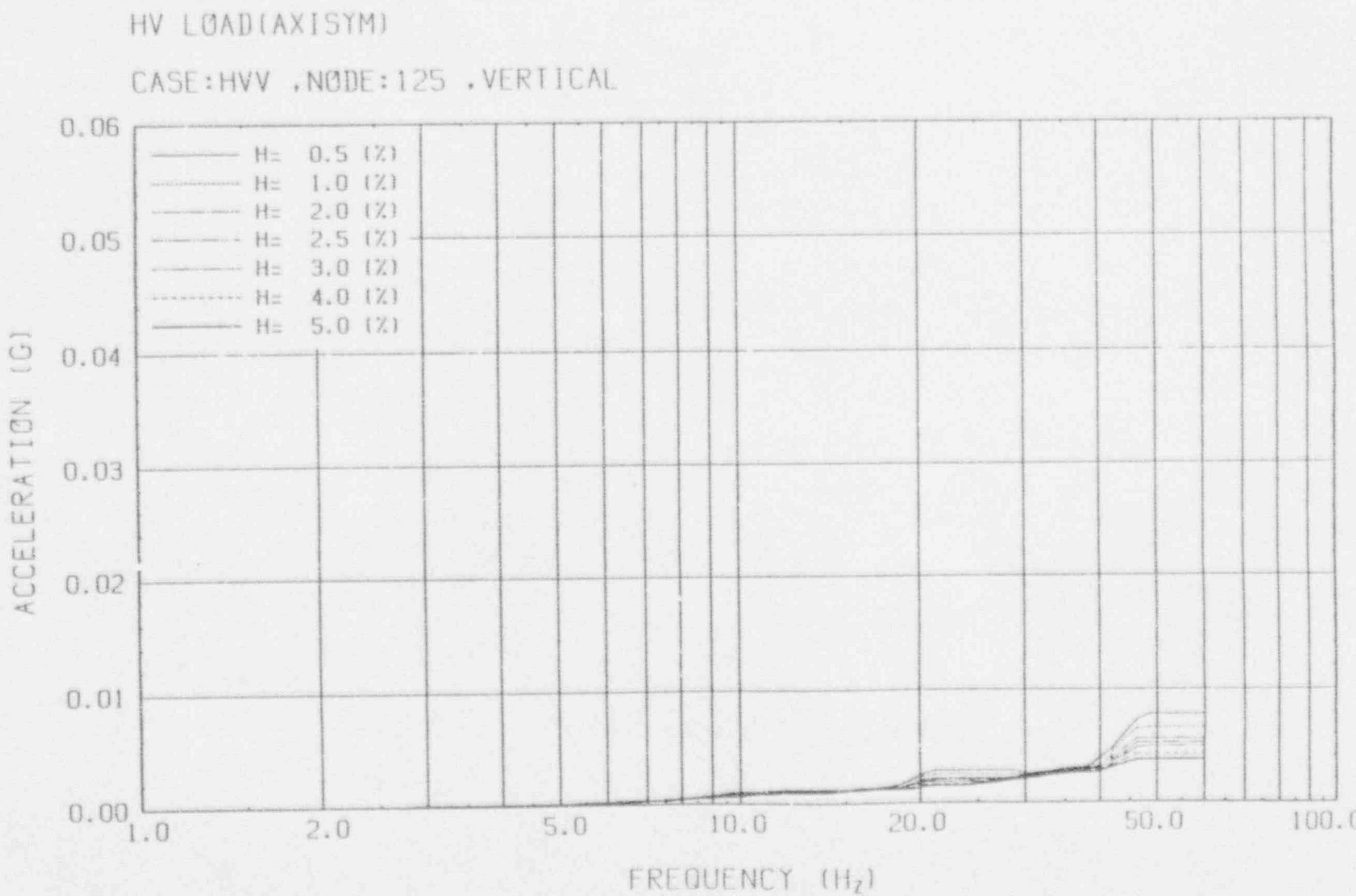


FIG. A-437 FLØØR RESPØNSE SPECTRUM

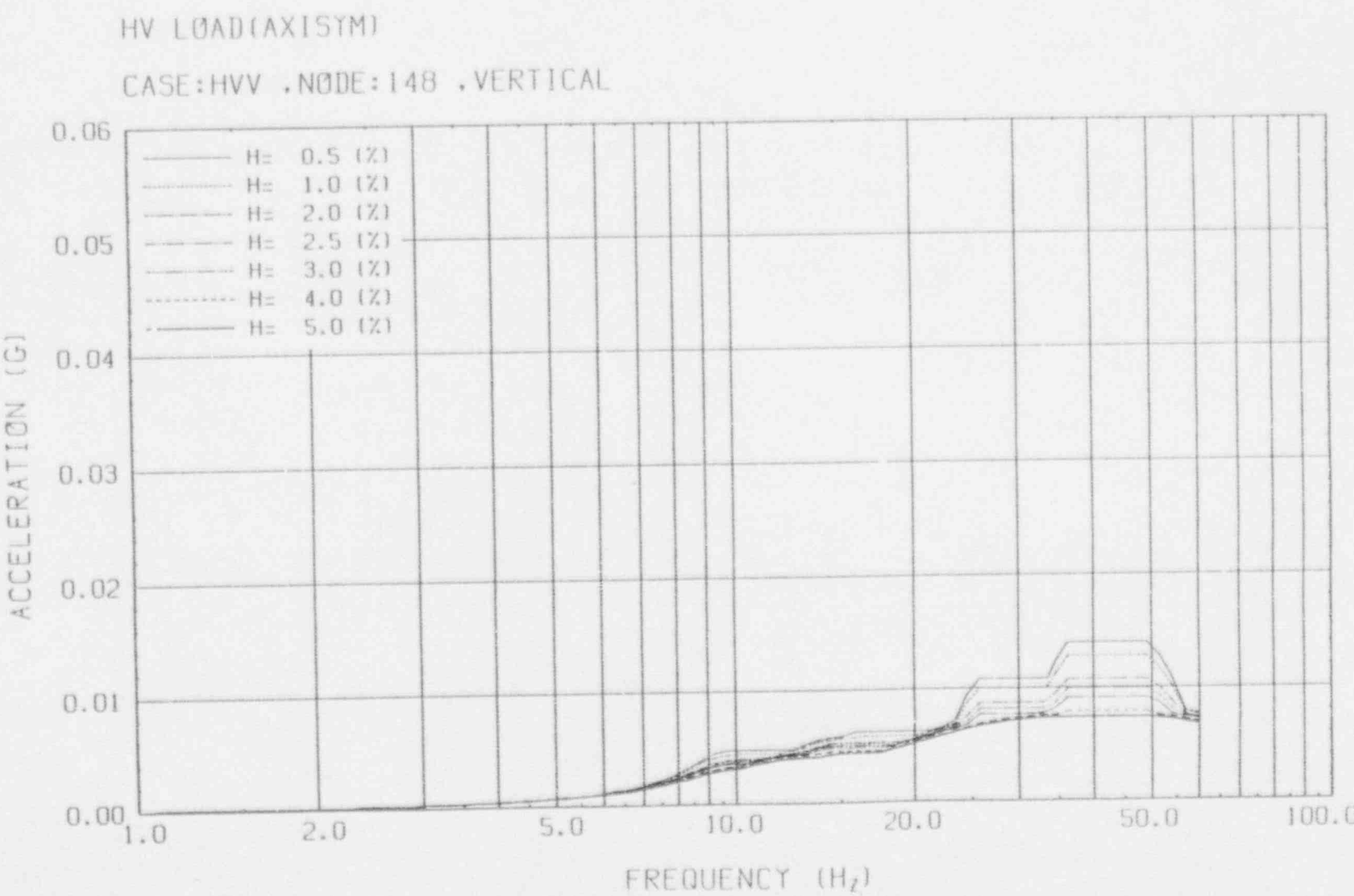


FIG. A-443 FLØØR RESPØNSE SPECTRUM

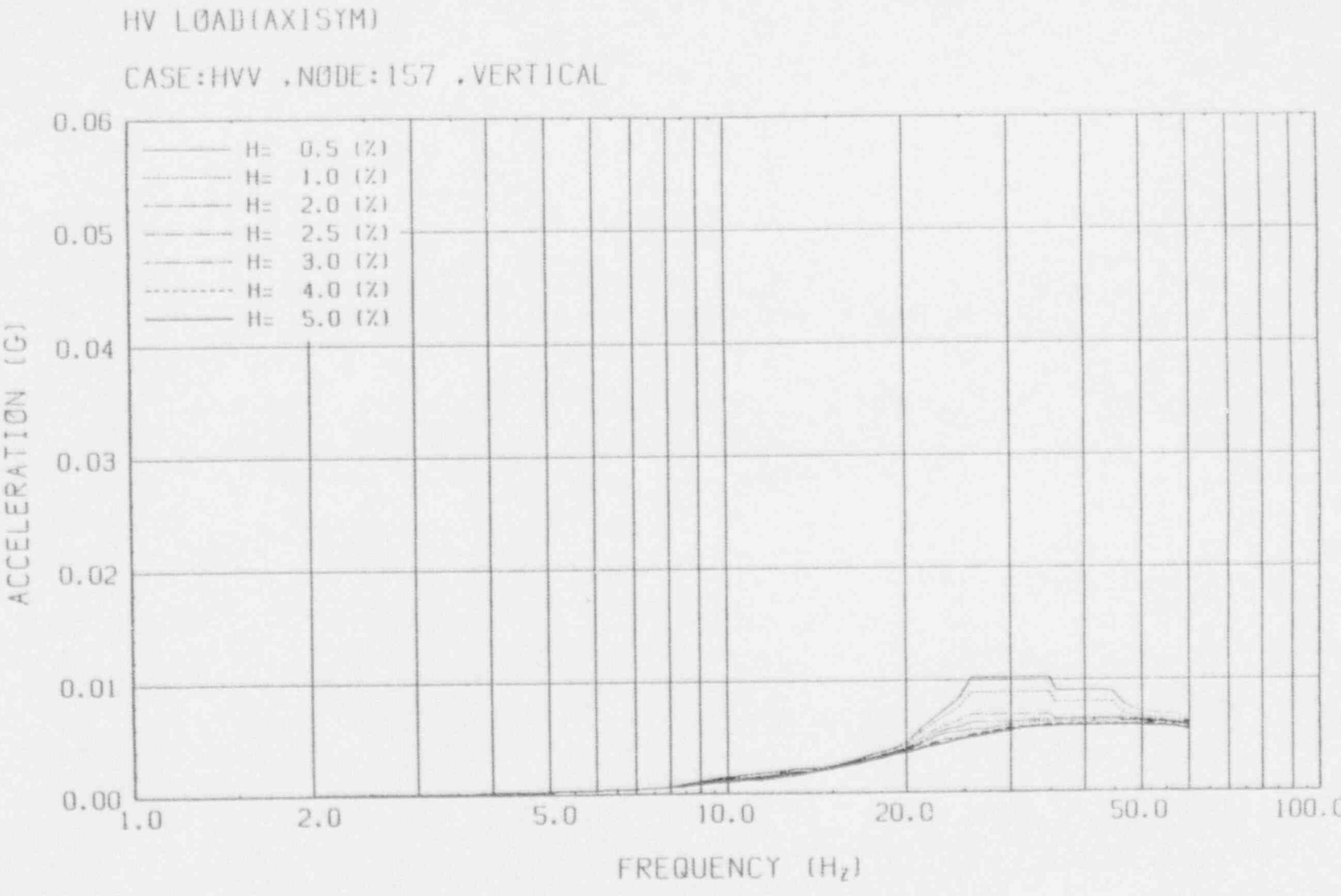


FIG. A-446 FLOOR RESPONSE SPECTRUM

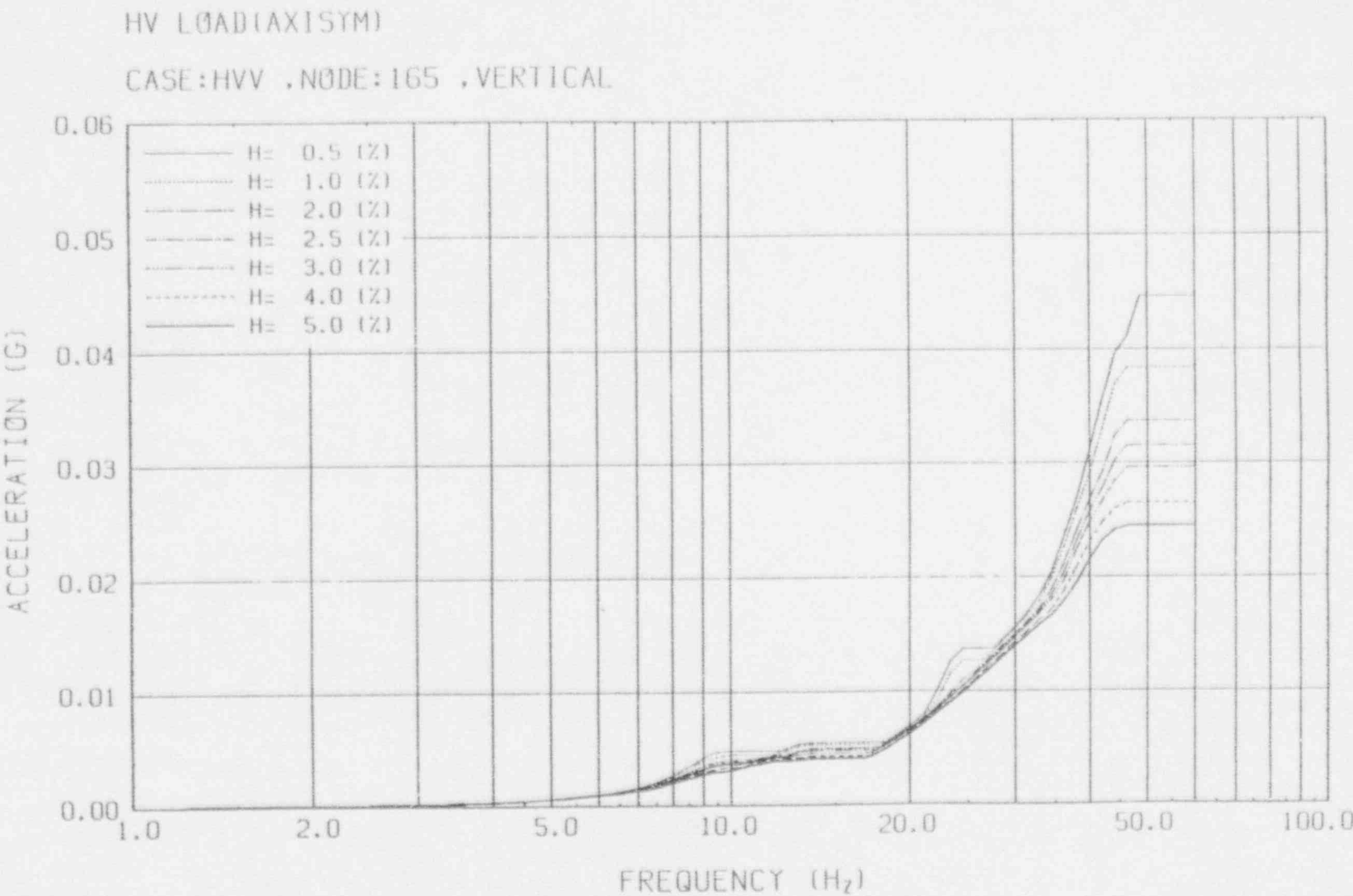


FIG. A-454 FLØØR RESPØNSE SPECTRUM

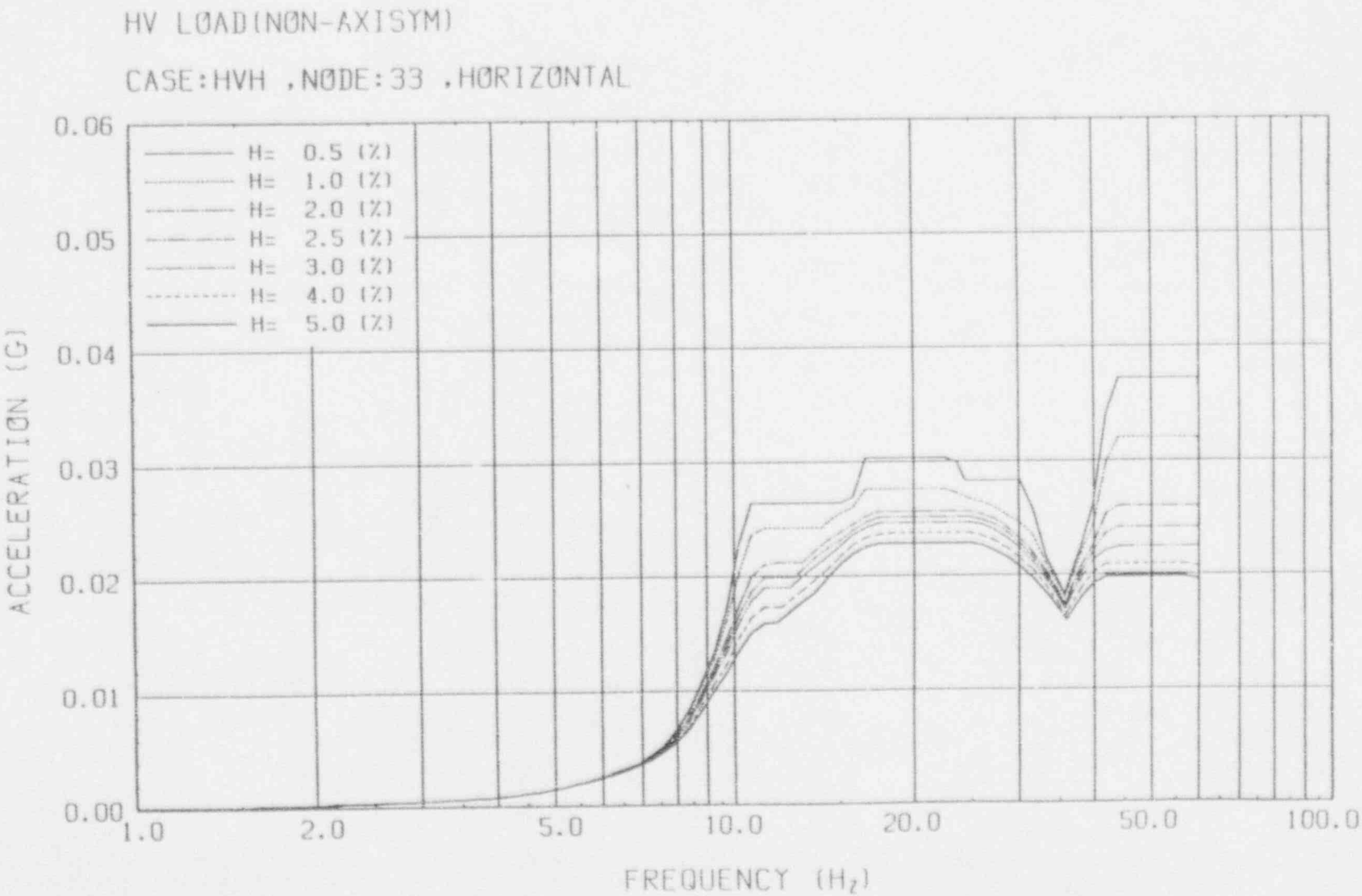


FIG. A-471 FLØØR RESPØNSE SPECTRUM

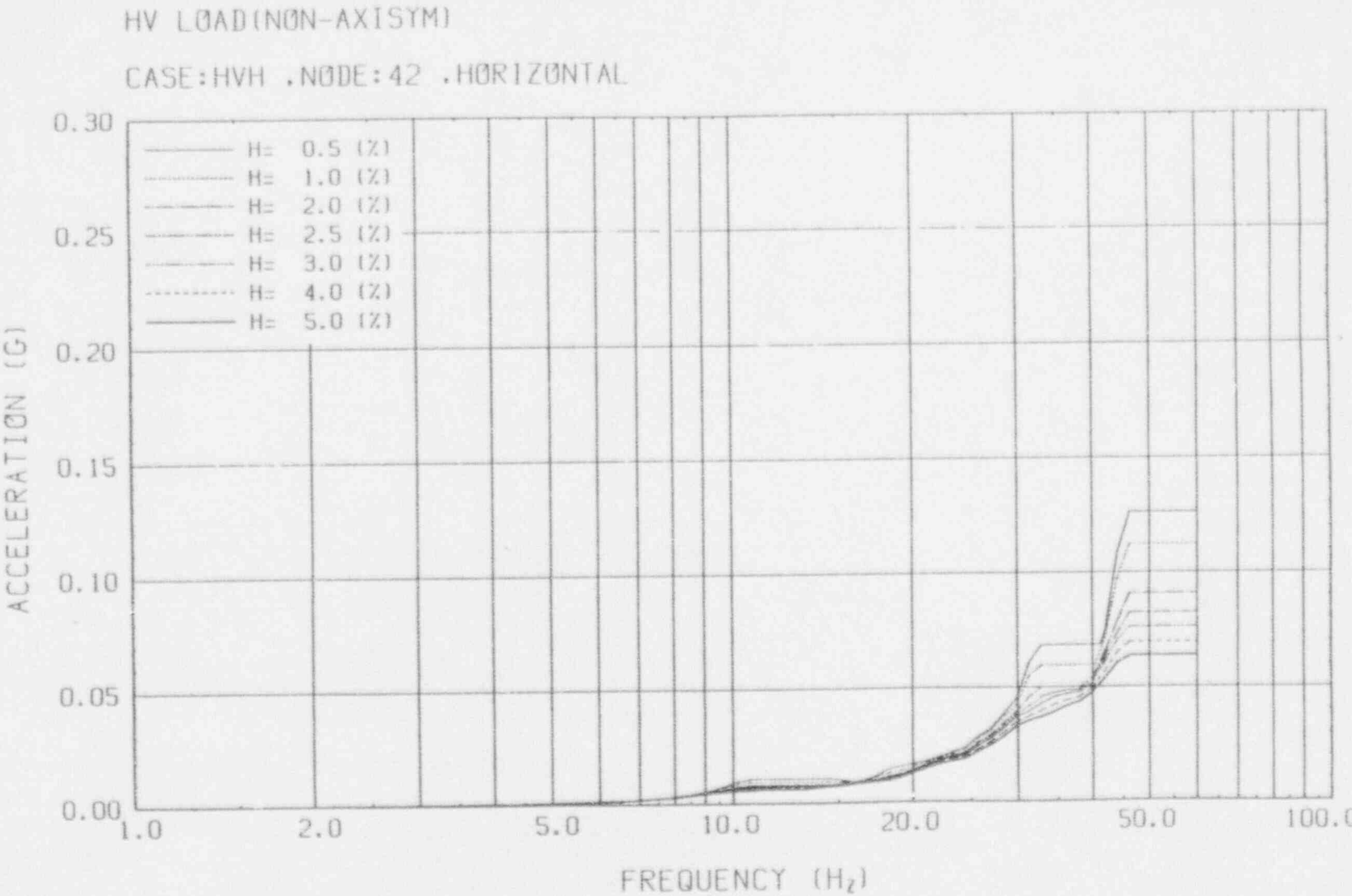


FIG. A-476 FLOOR RESPONSE SPECTRUM

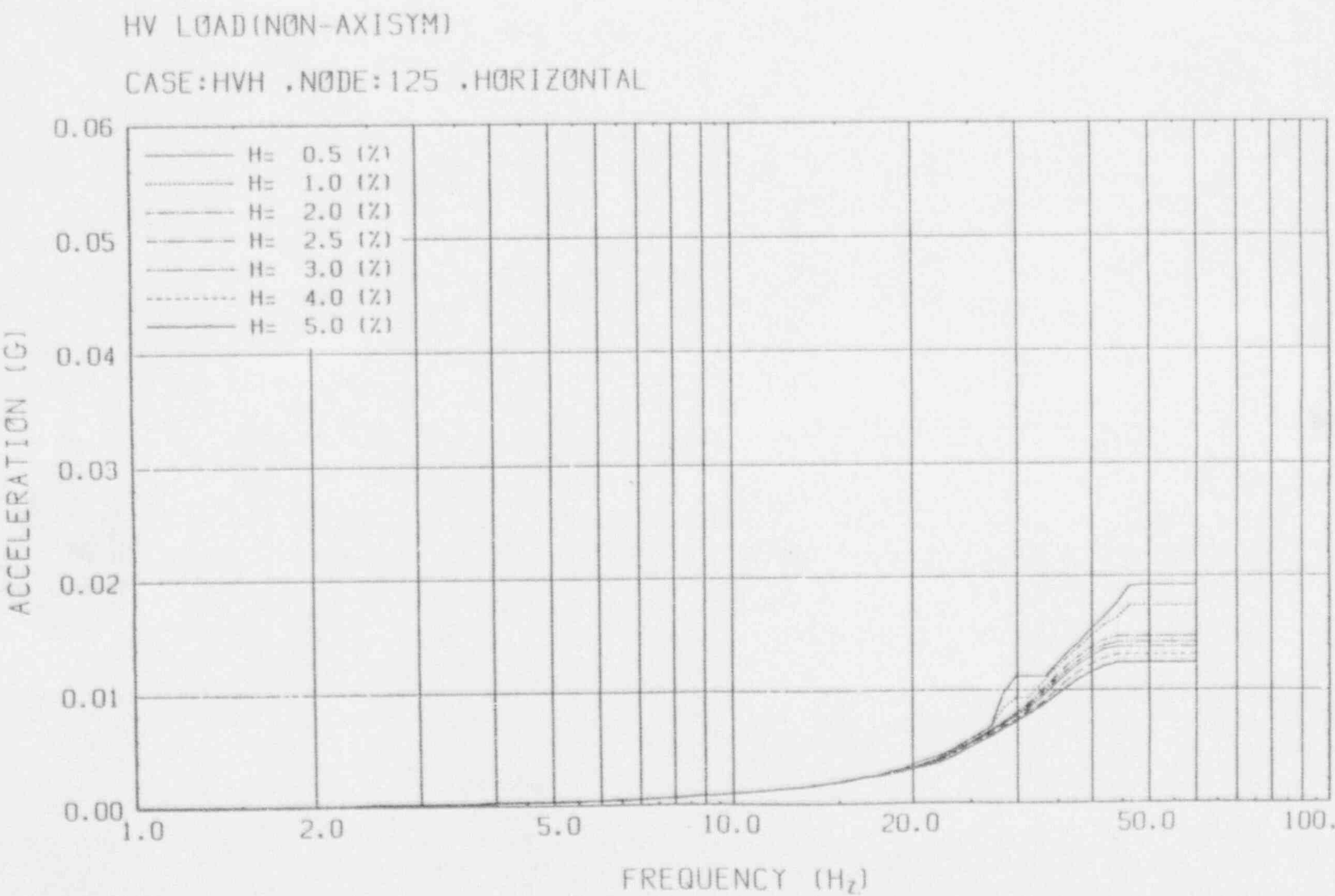


FIG. A-491 FLOOR RESPONSE SPECTRUM

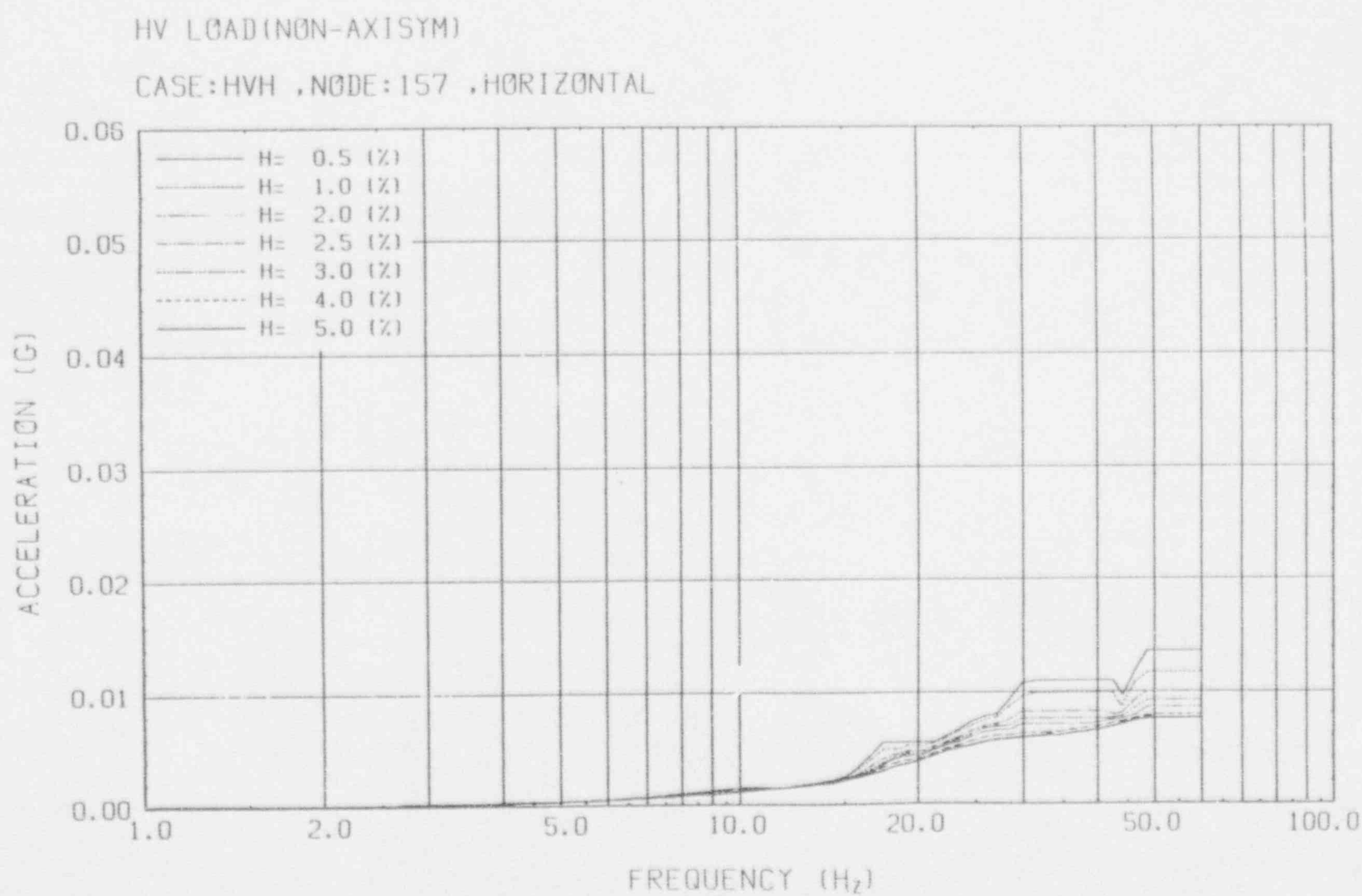


FIG. A-499 FLOOR RESPONSE SPECTRUM

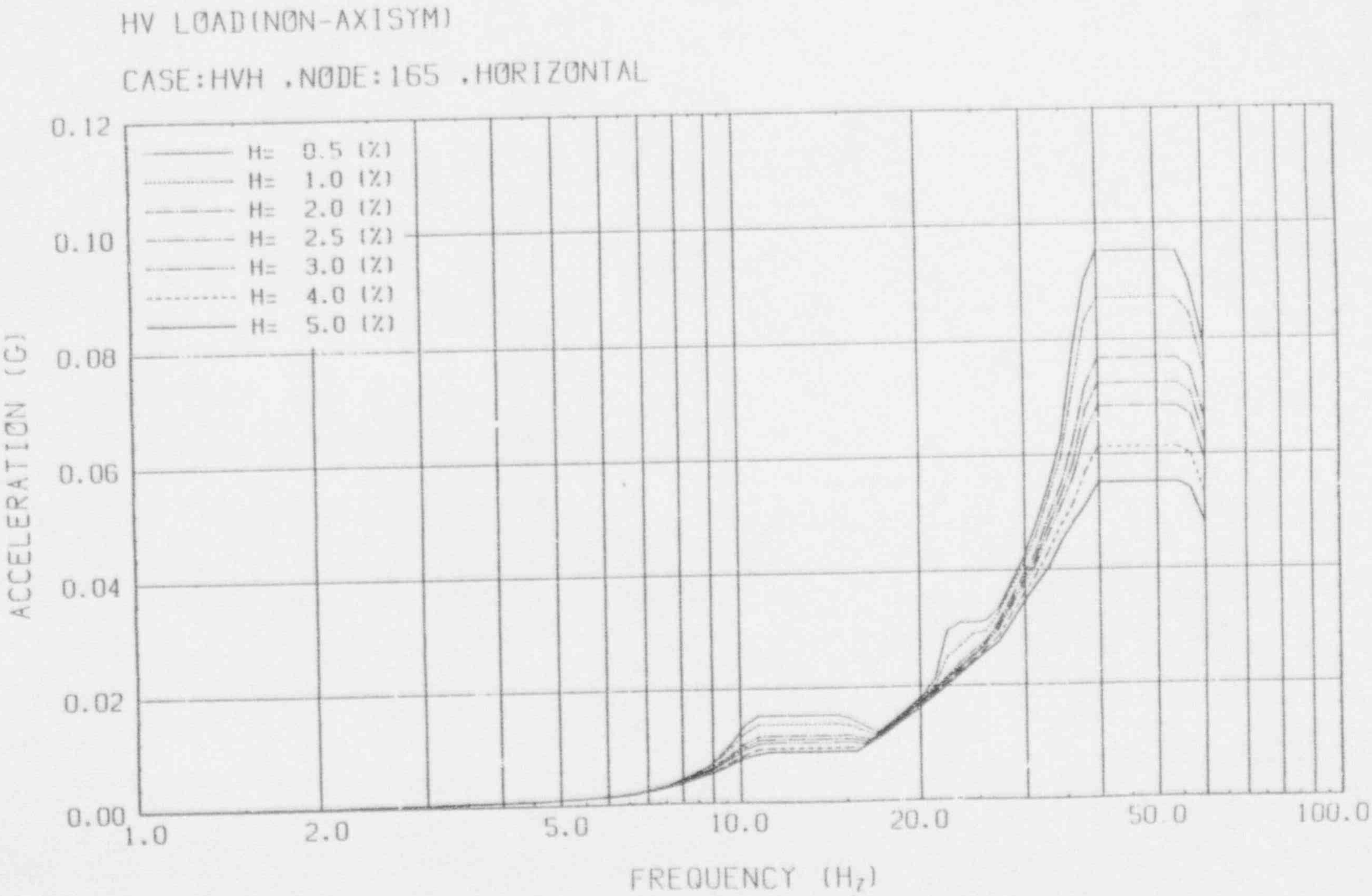


FIG. A-507 FLØØR RESPØNSE SPECTRUM

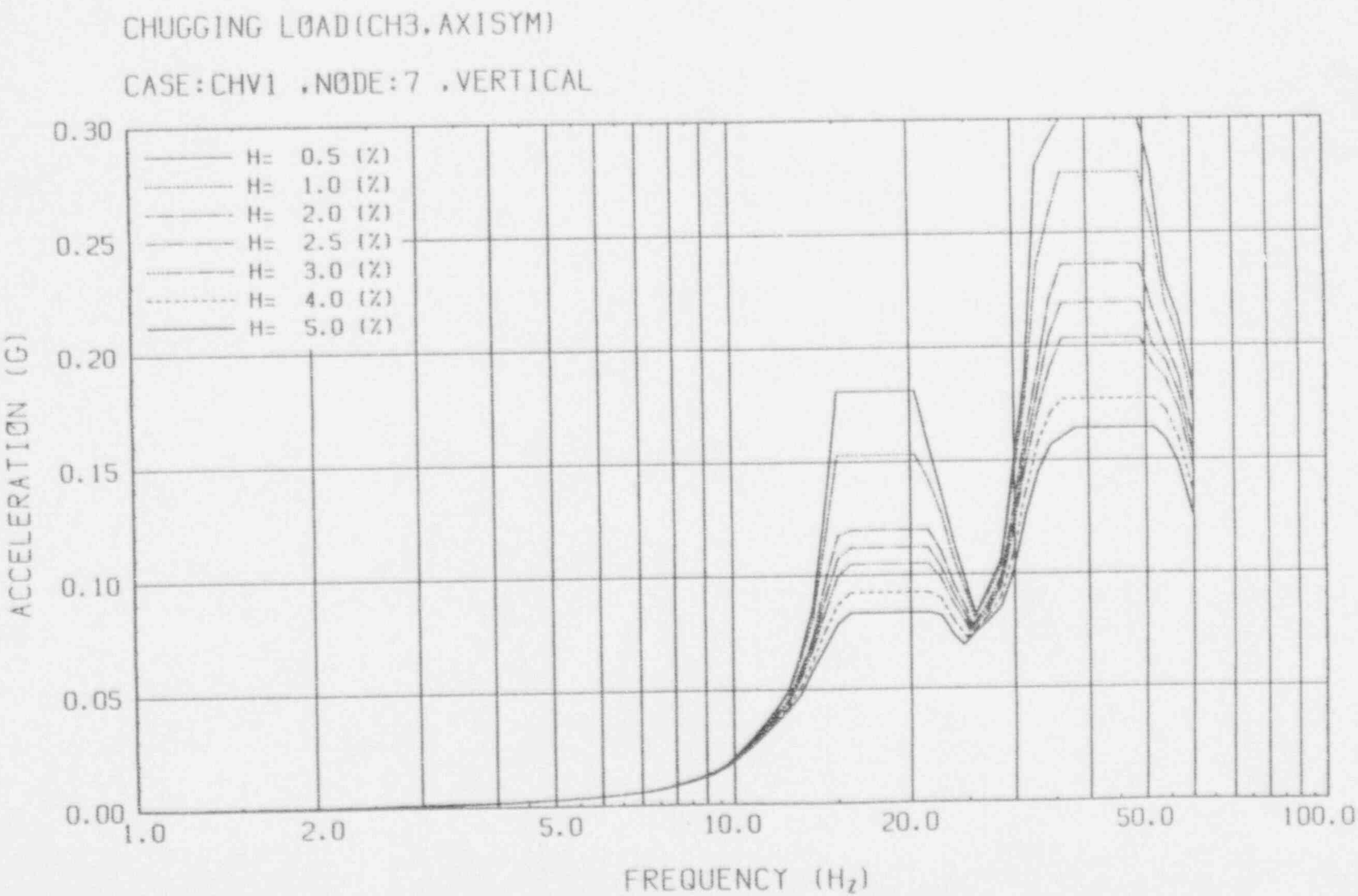


FIG. A-517 FLOOR RESPONSE SPECTRUM

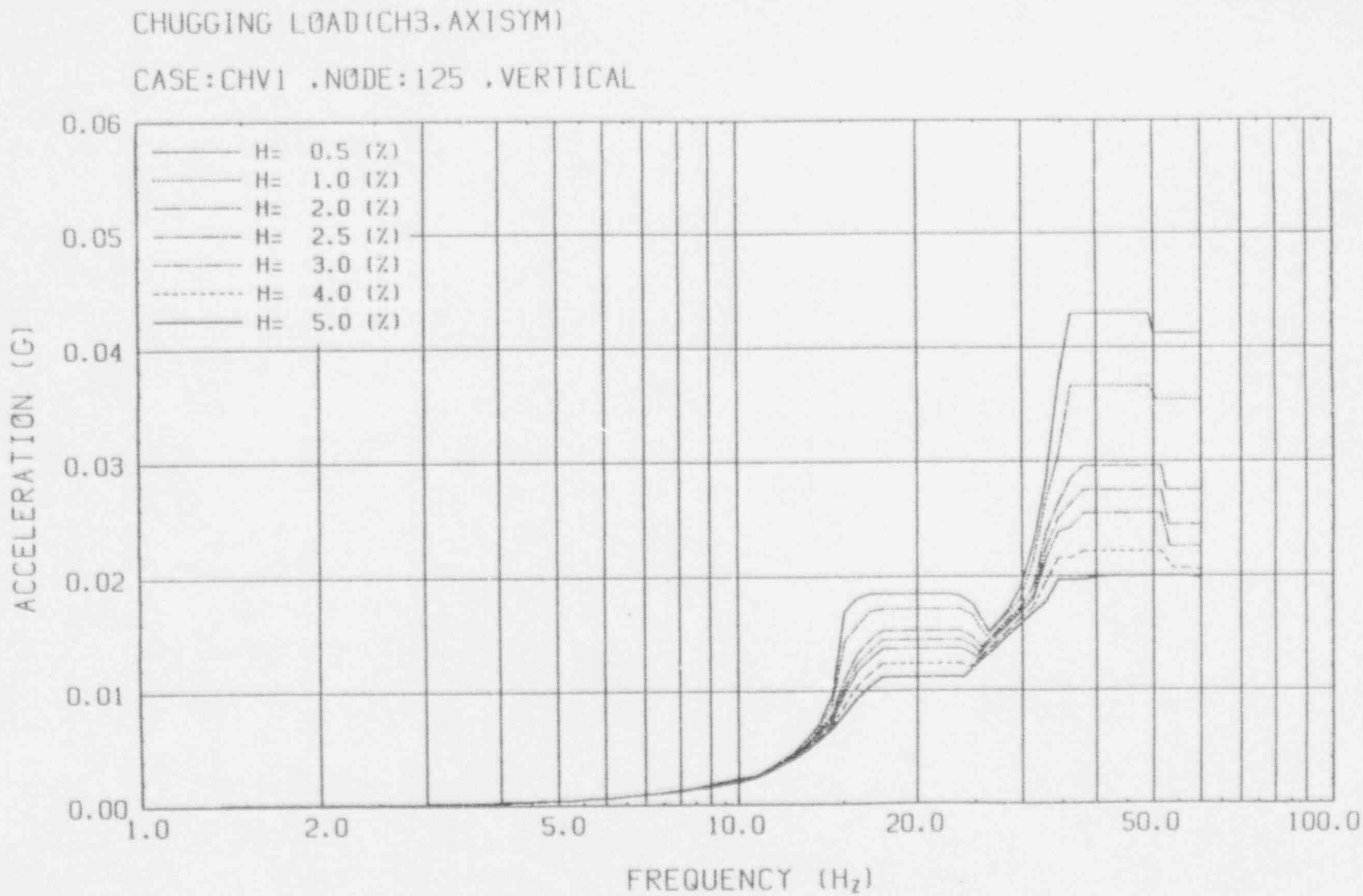


FIG. A-530 FLØØR RESPØNSE SPECTRUM

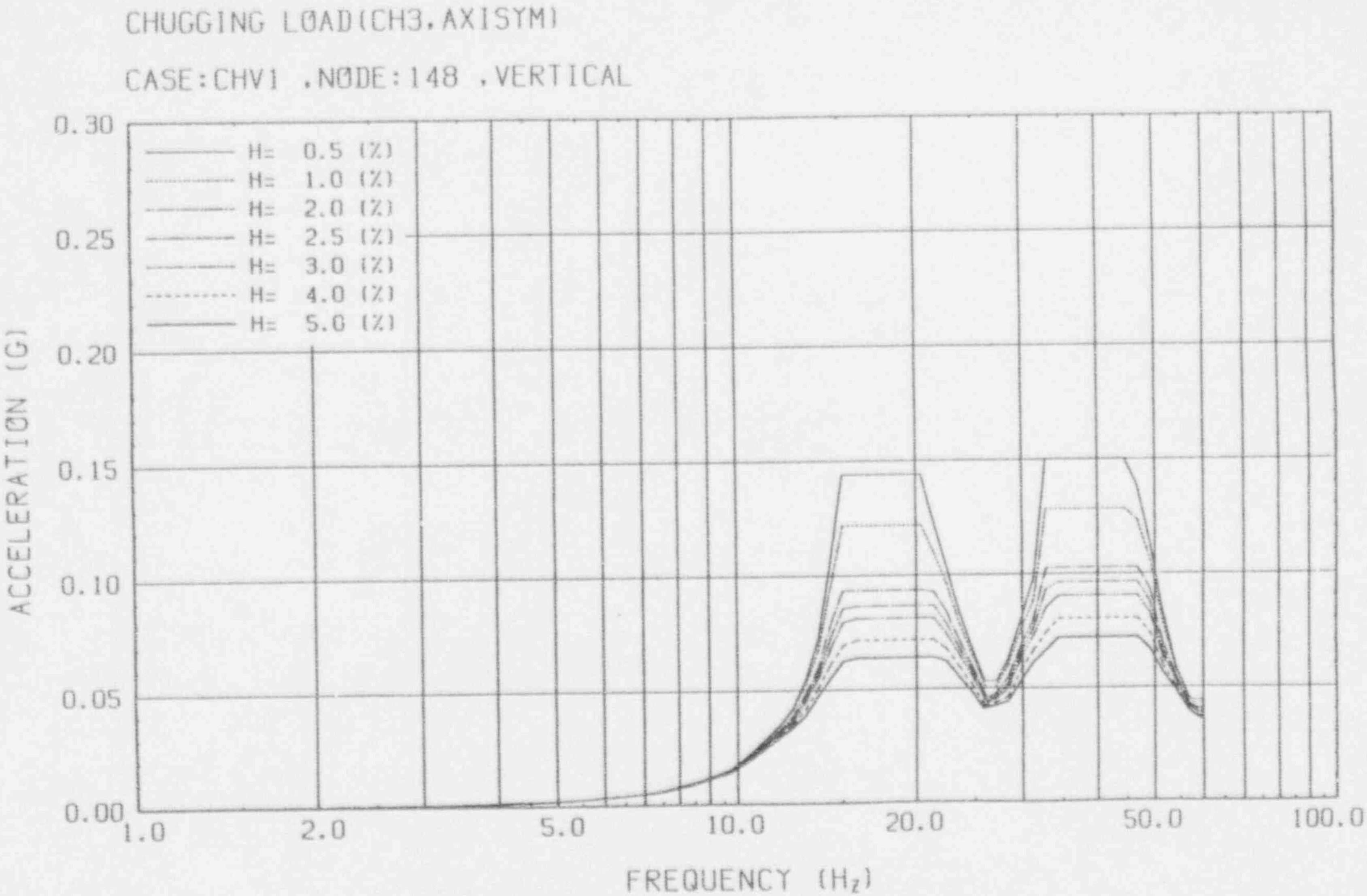


FIG. A-536 FLOOR RESPONSE SPECTRUM

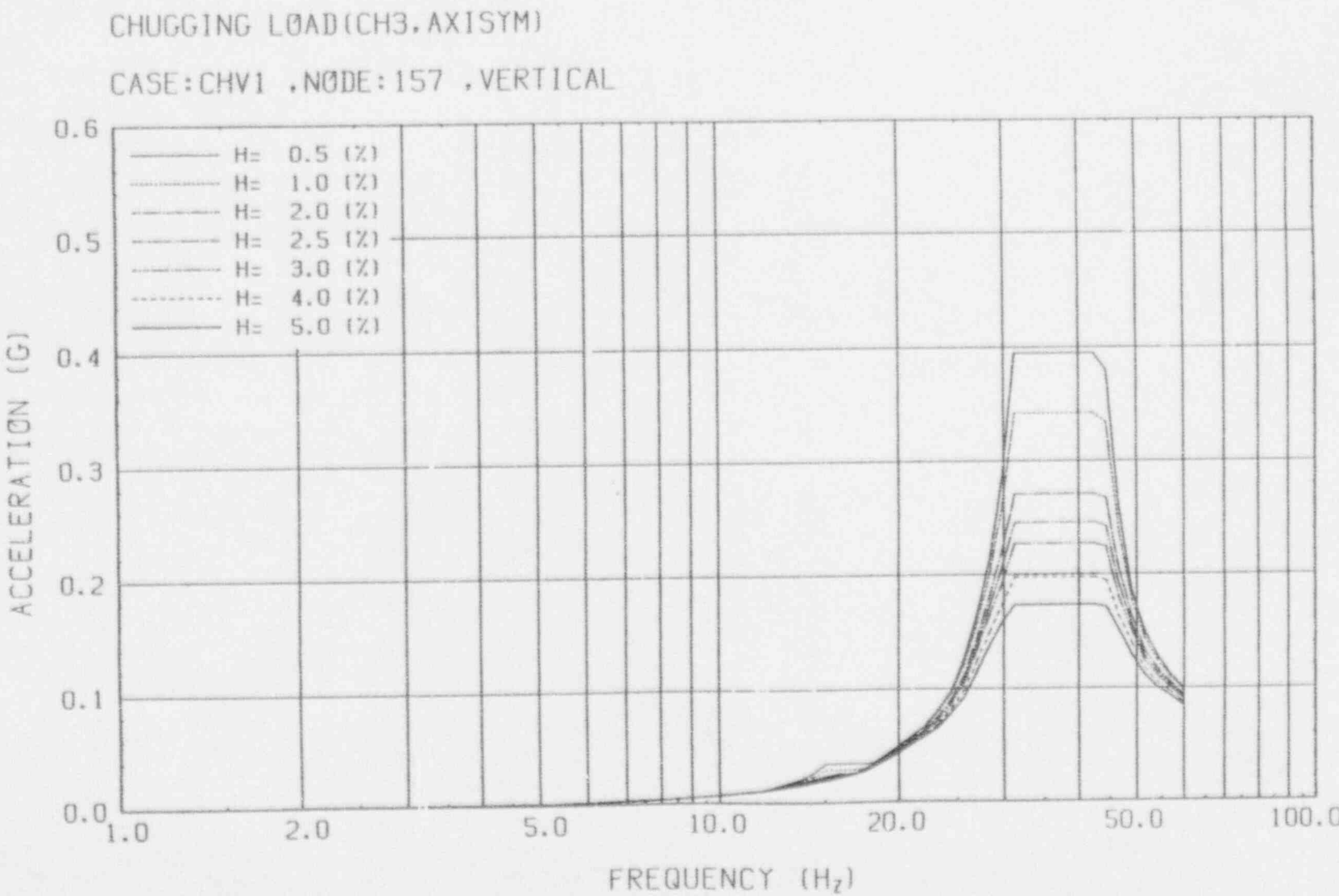


FIG. A-539 FLØØR RESPØNSE SPECTRUM

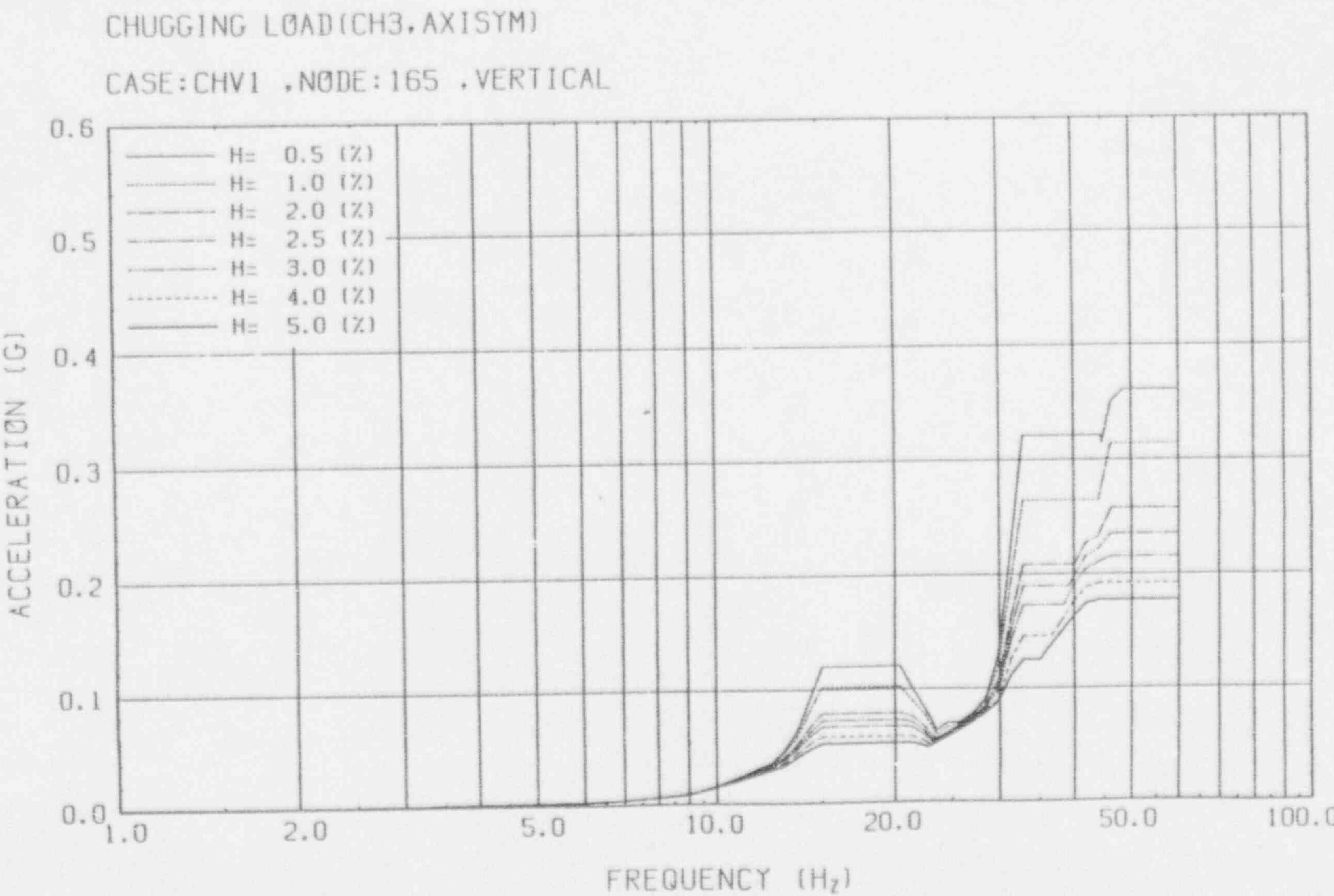


FIG. A-547 FLØØR RESPØNSE SPECTRUM

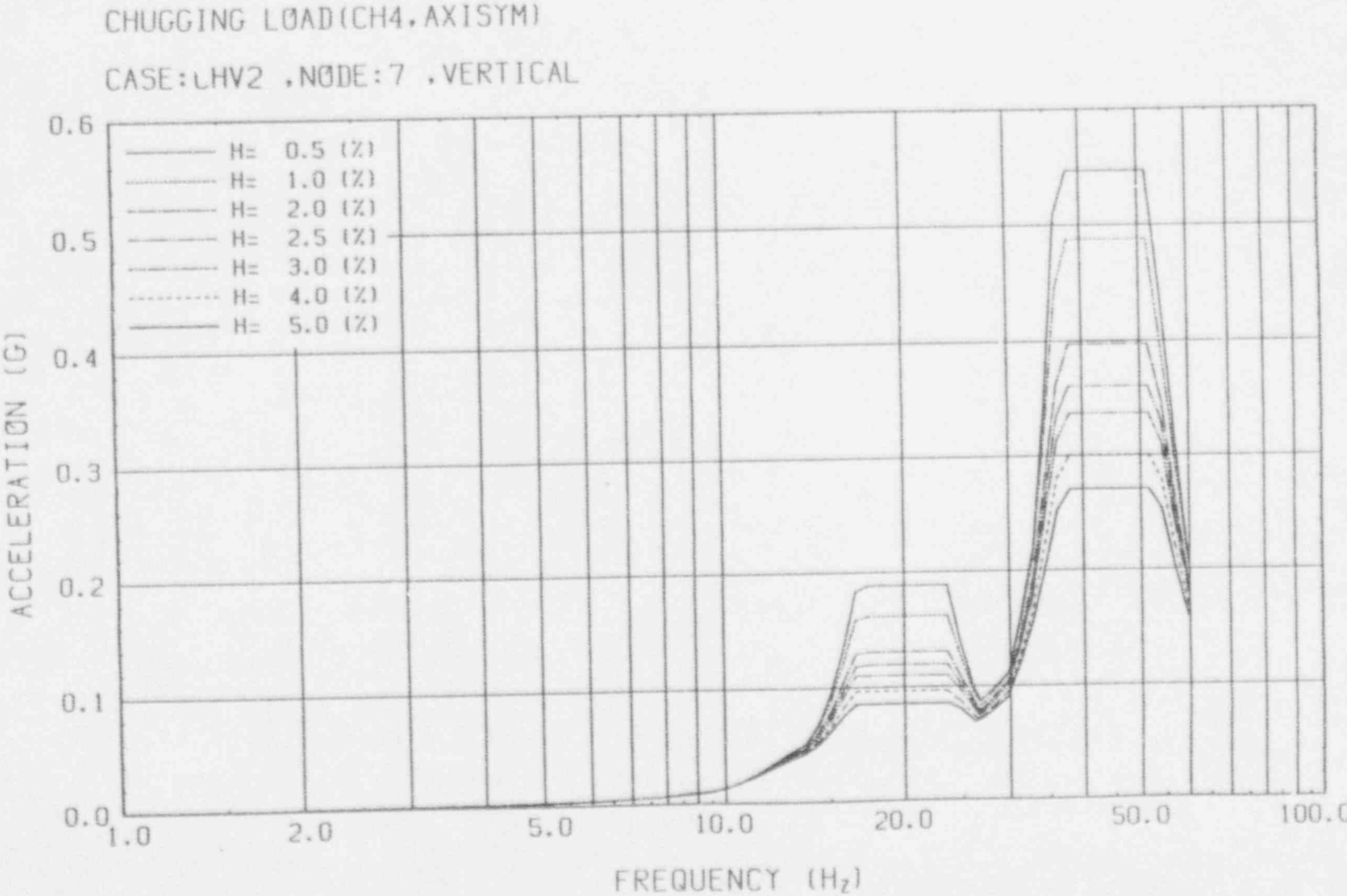


FIG. A-557 FLØØR RESPØNSE SPECTRUM

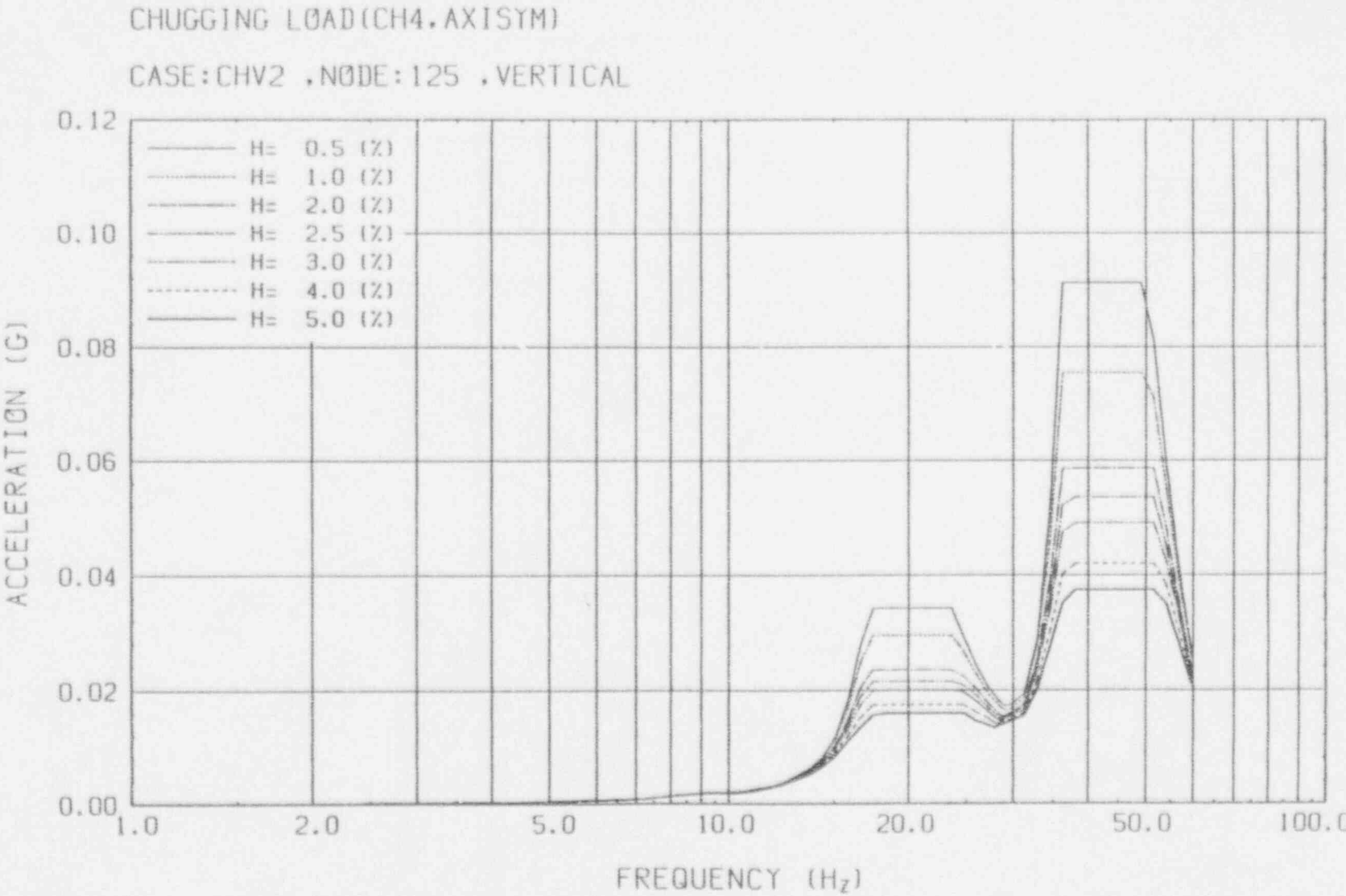


FIG. A-570 FLØØR RESPØNSE SPECTRUM

A-570

CHUGGING LØAD(CH4.AXISYM)

CASE:CHV2 .NØDE:148 .VERTICAL

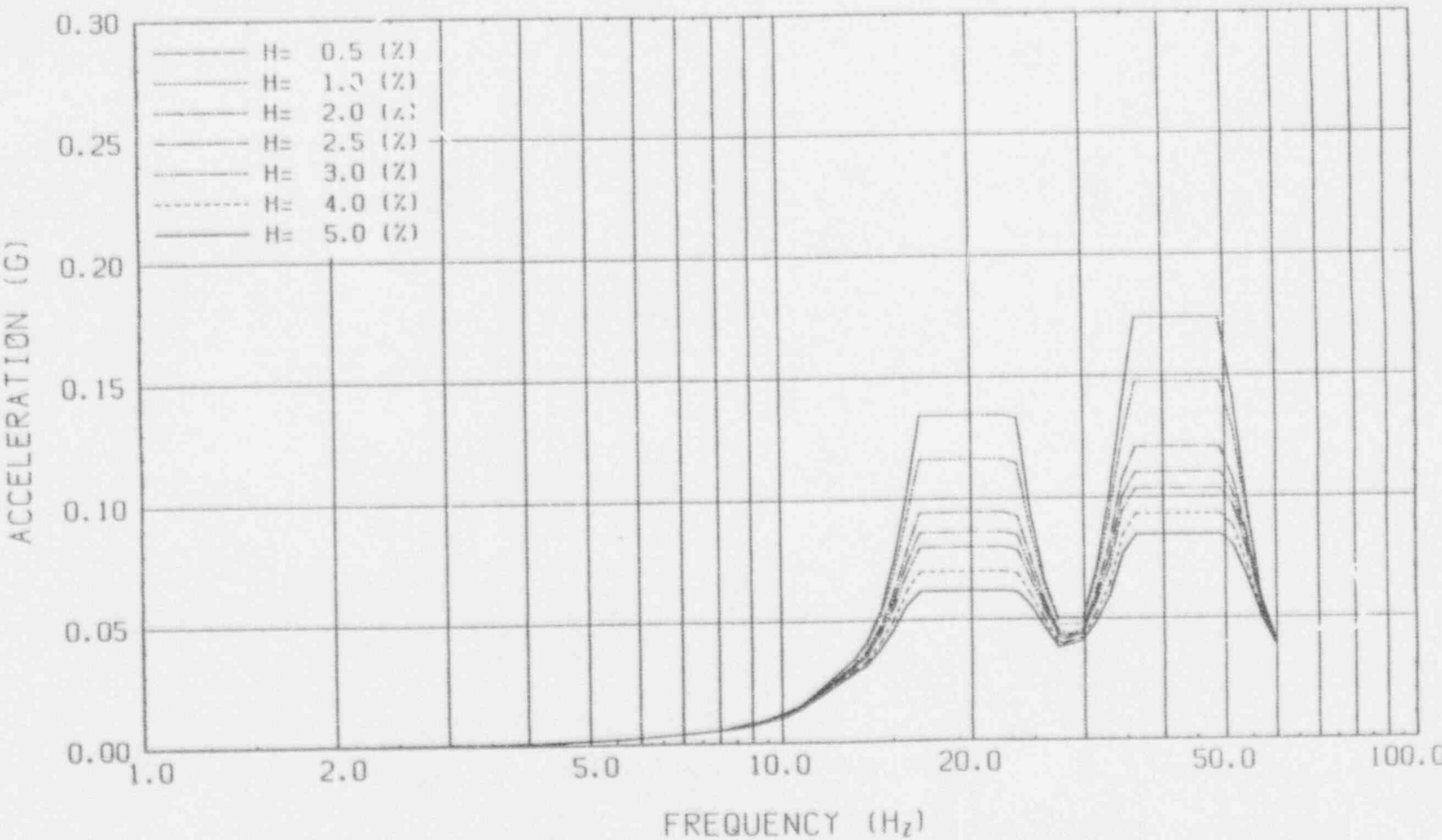


FIG. A-576 FLØØR RESPØNSE SPECTRUM

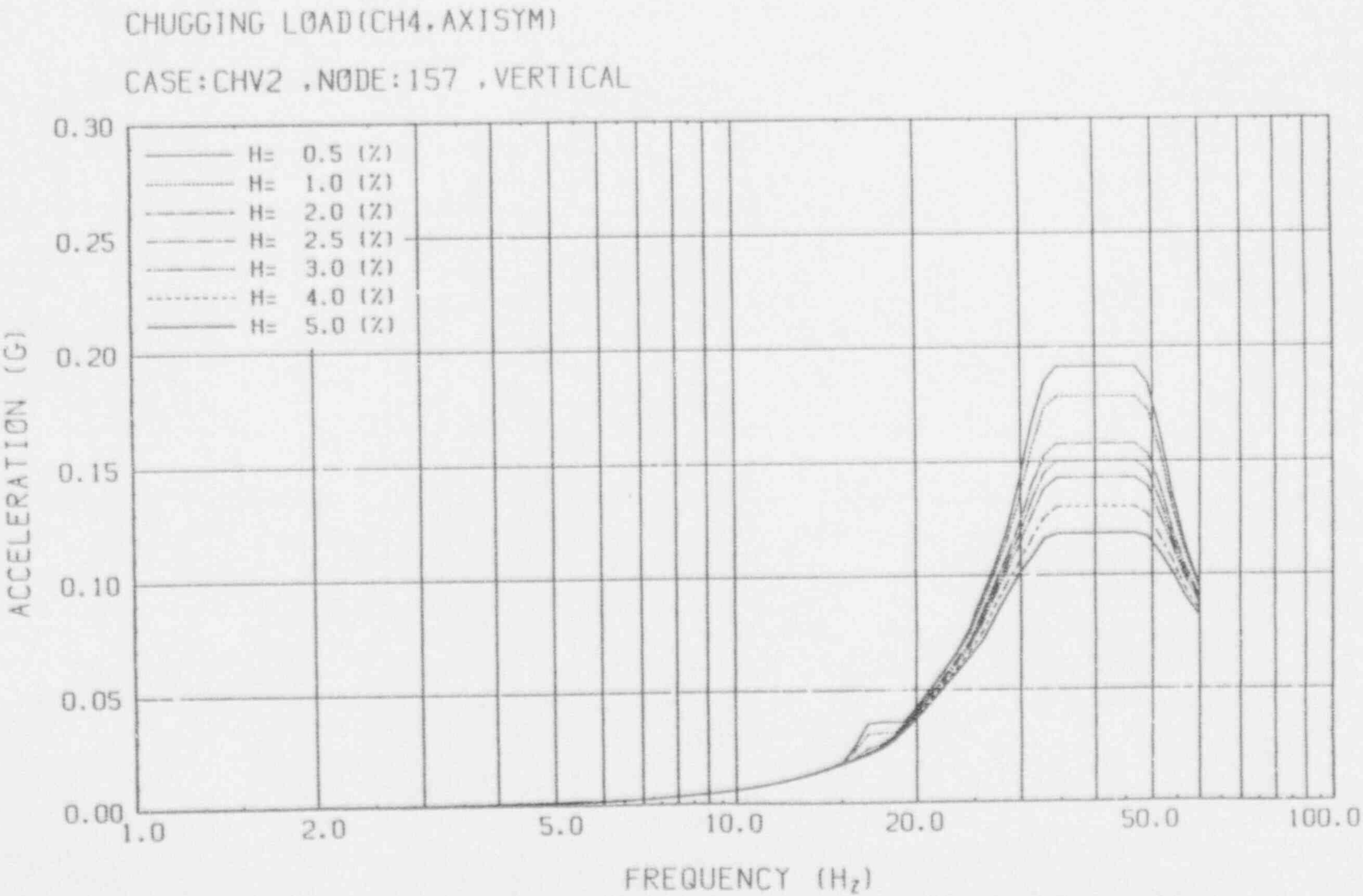


FIG. A-579 FLOOR RESPONSE SPECTRUM

CHUGGING LOAD(CH4.AXISYM)

CASE:CHV2 .NODE:165 .VERTICAL

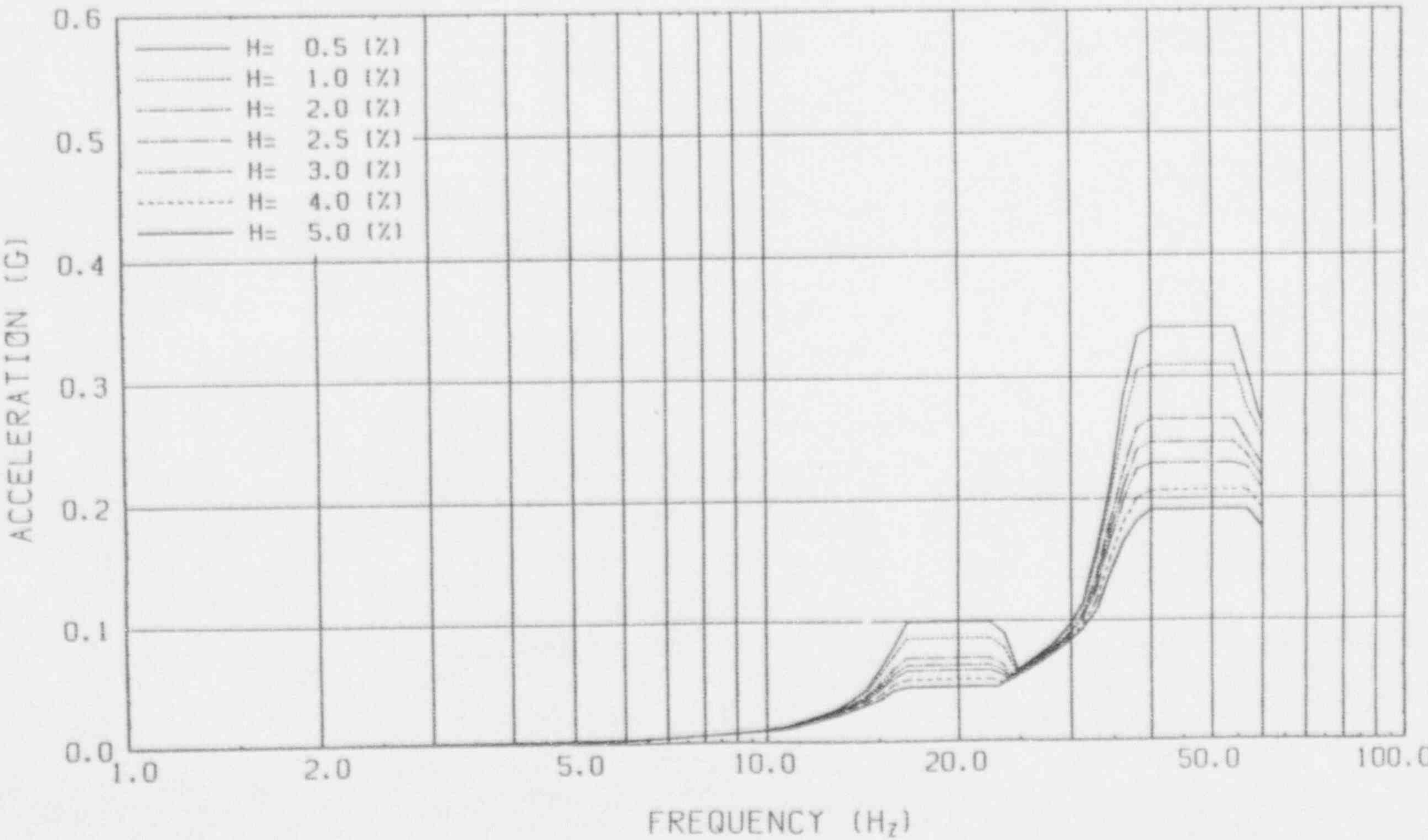


FIG. A-587 FLOOR RESPONSE SPECTRUM

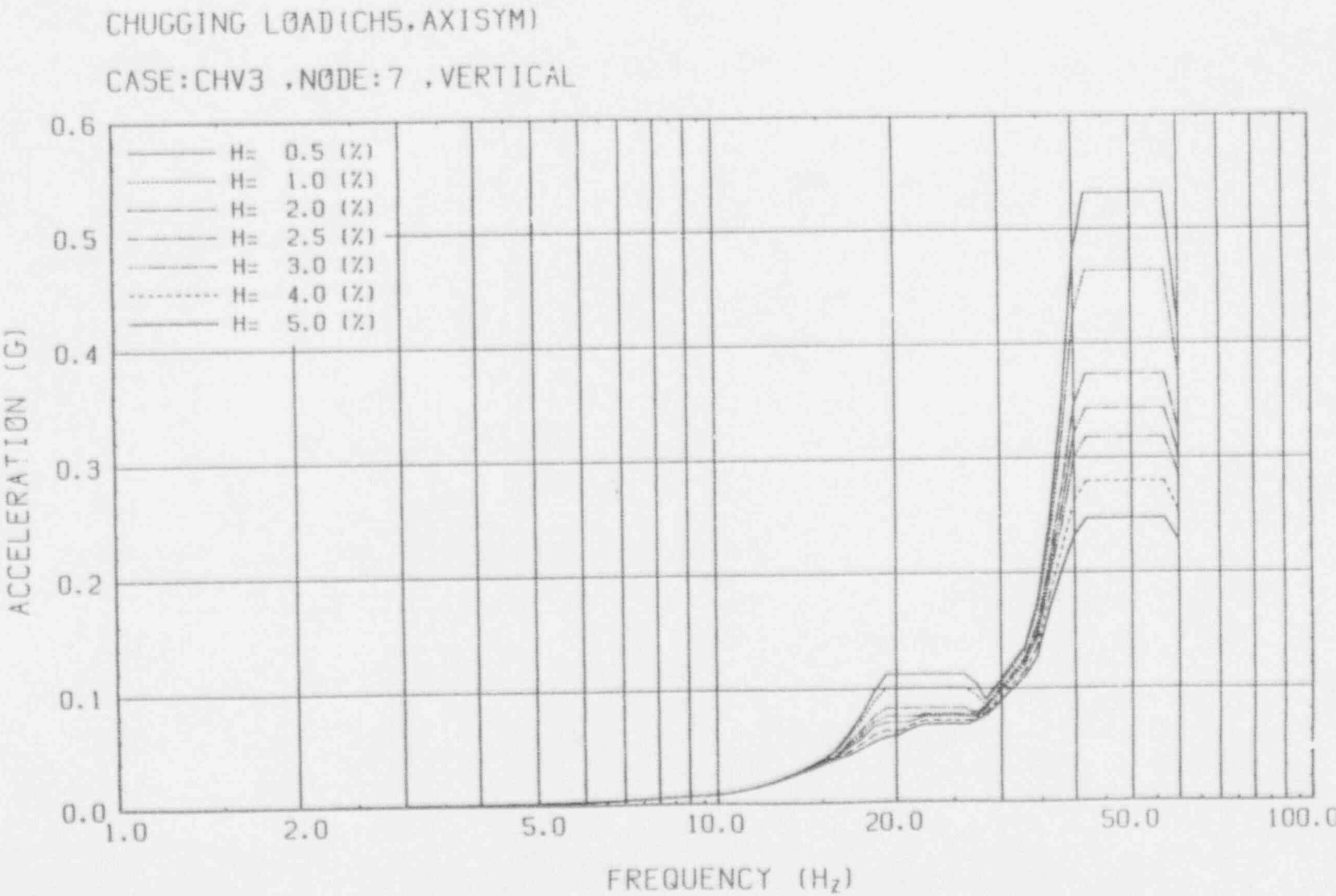


FIG. A-597 FLOOR RESPONSE SPECTRUM

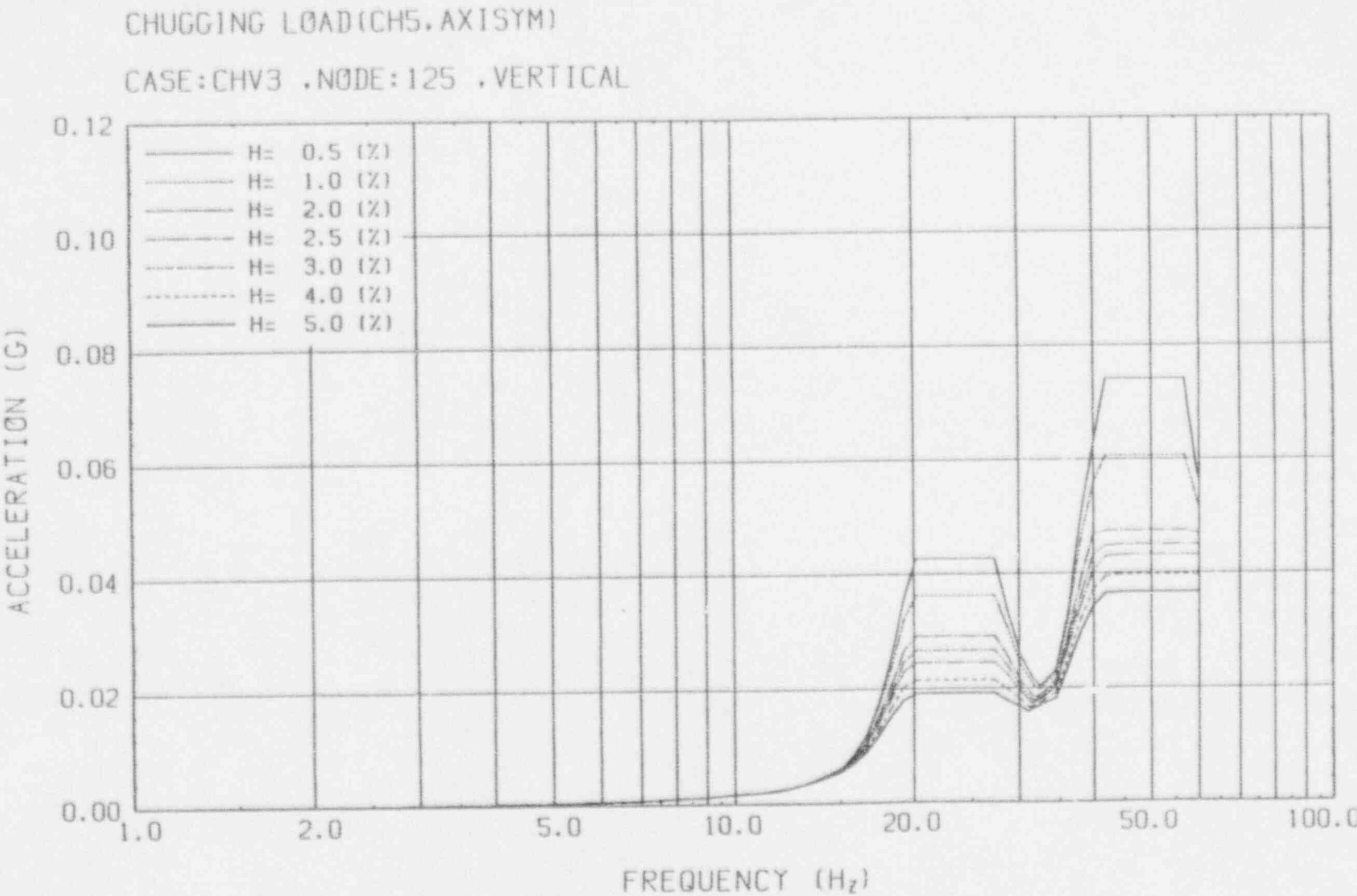


FIG. A-610 FLOOR RESPONSE SPECTRUM

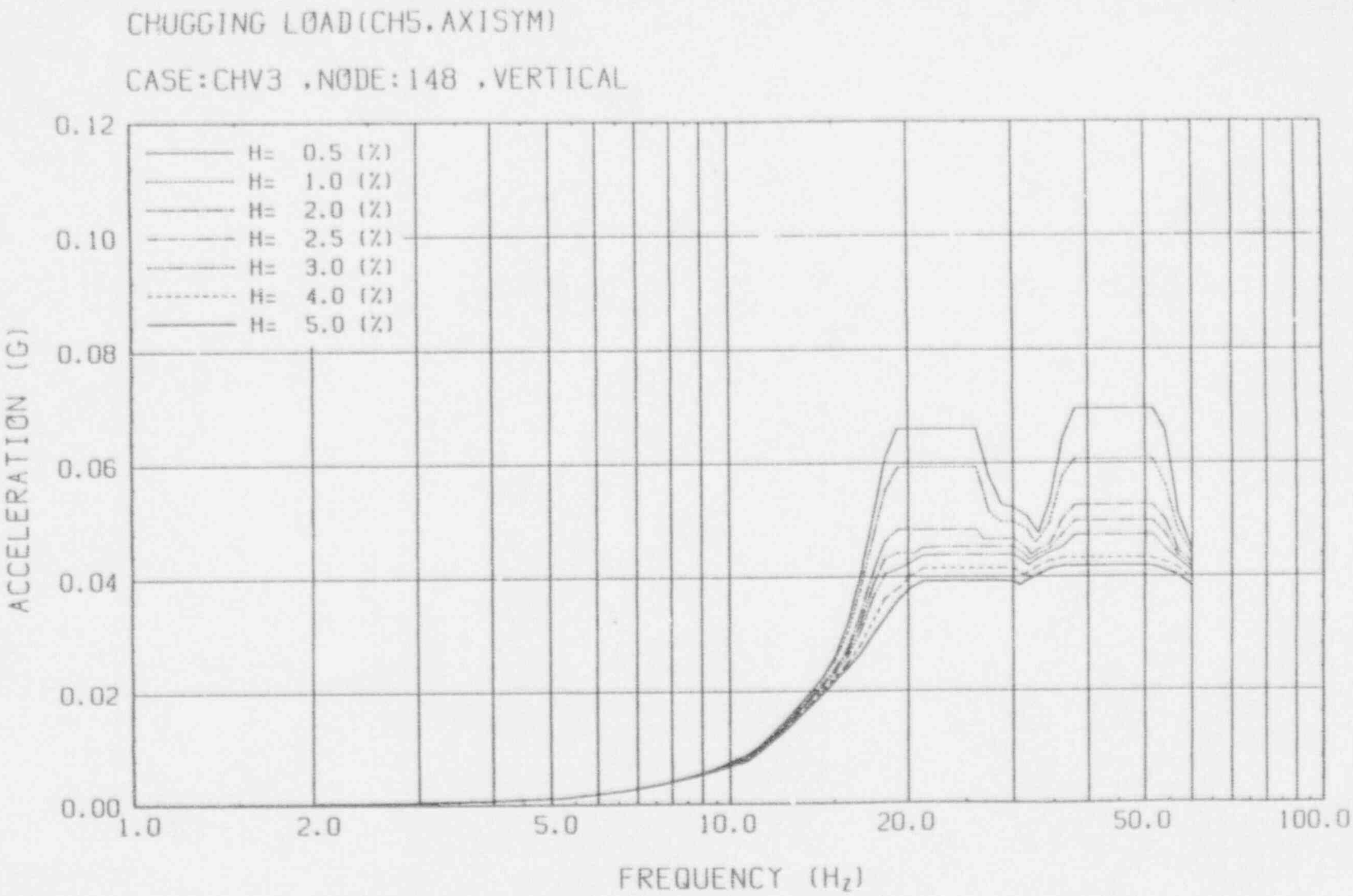


FIG. A-616 FLØØR RESPØNSE SPECTRUM

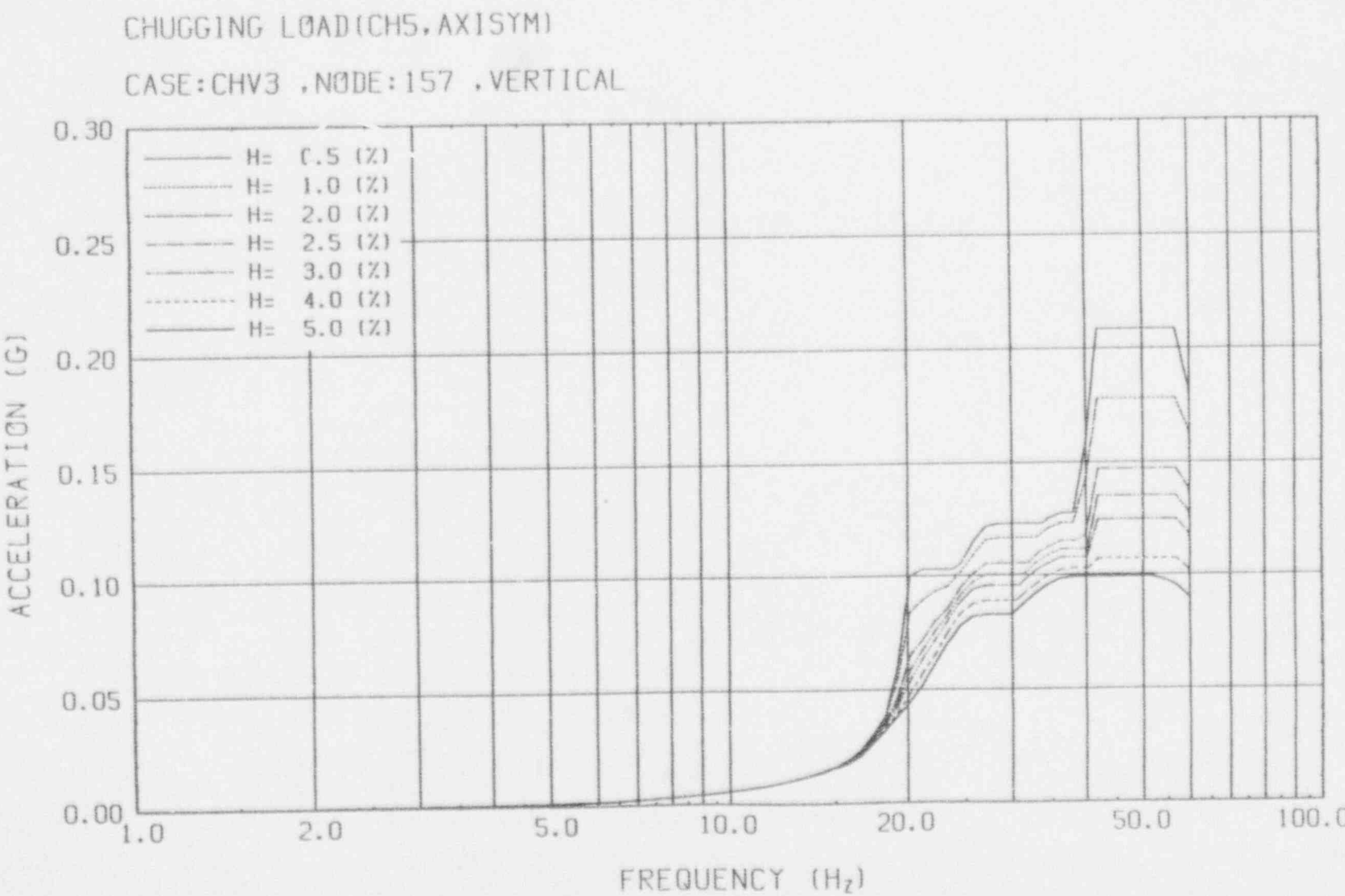


FIG. A-619 FLOOR RESPONSE SPECTRUM

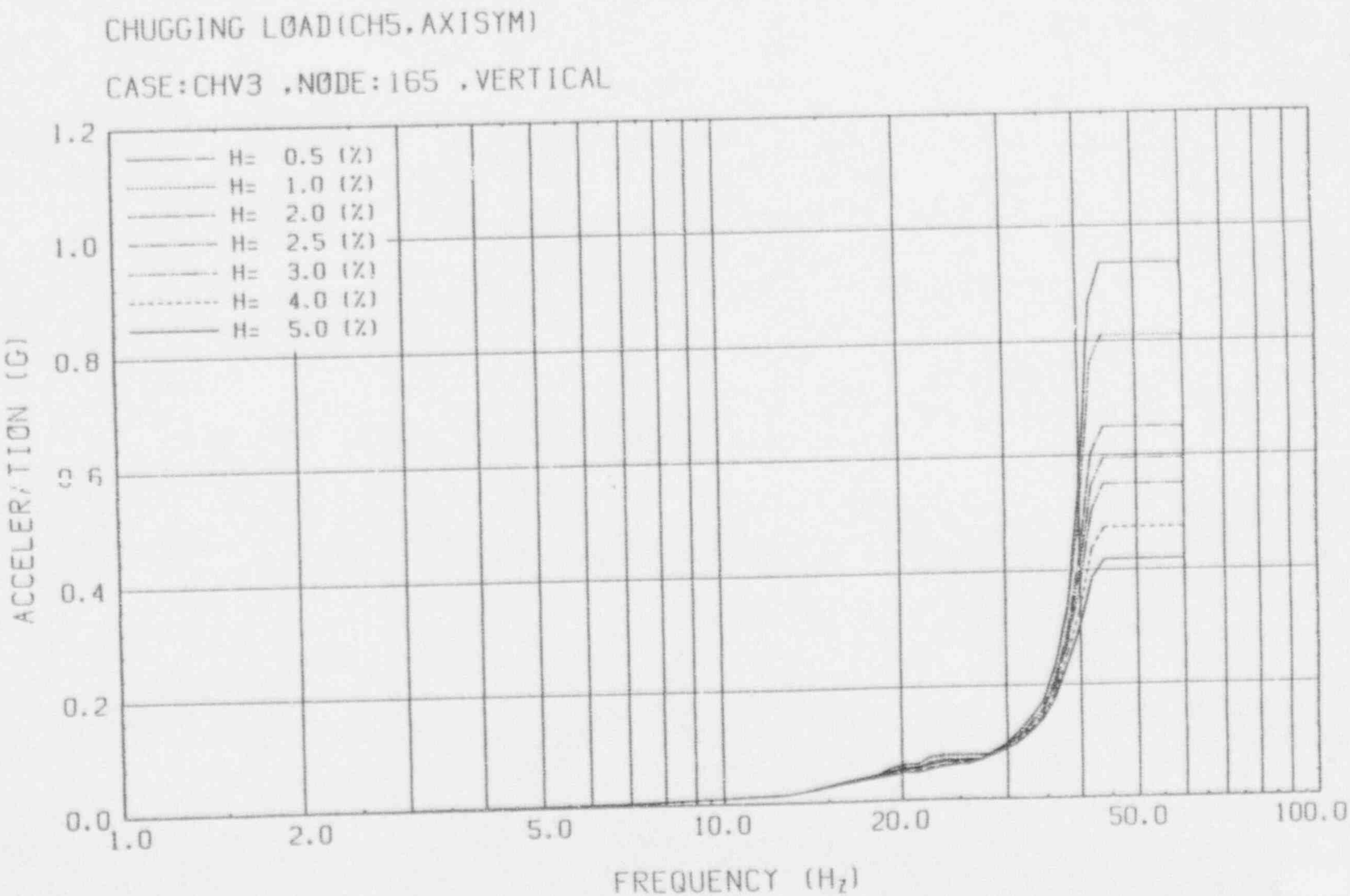


FIG. A-627 FLOOR RESPONSE SPECTRUM

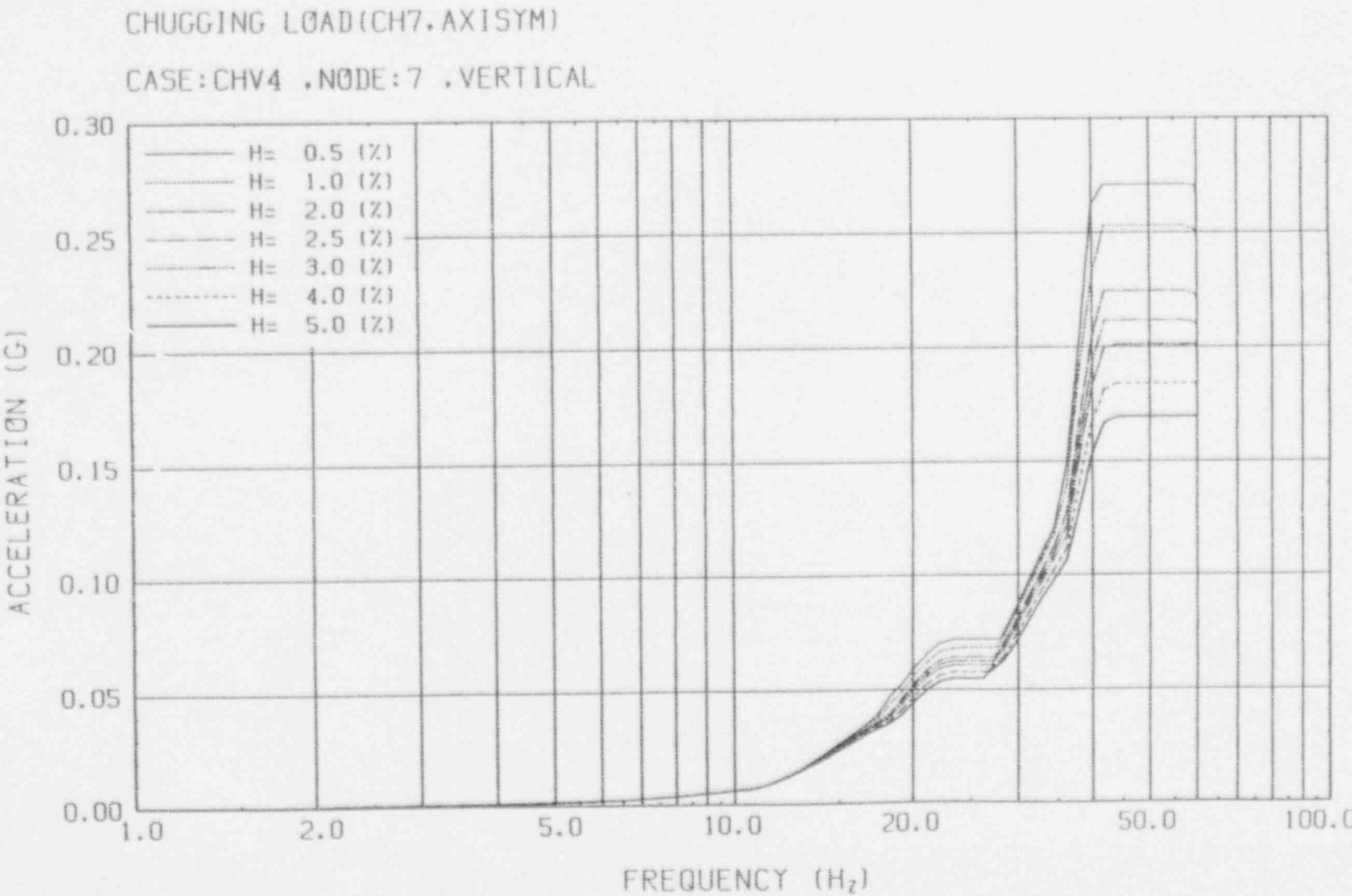


FIG. A-637 FLØØR RESPØNSE SPECTRUM

A-637

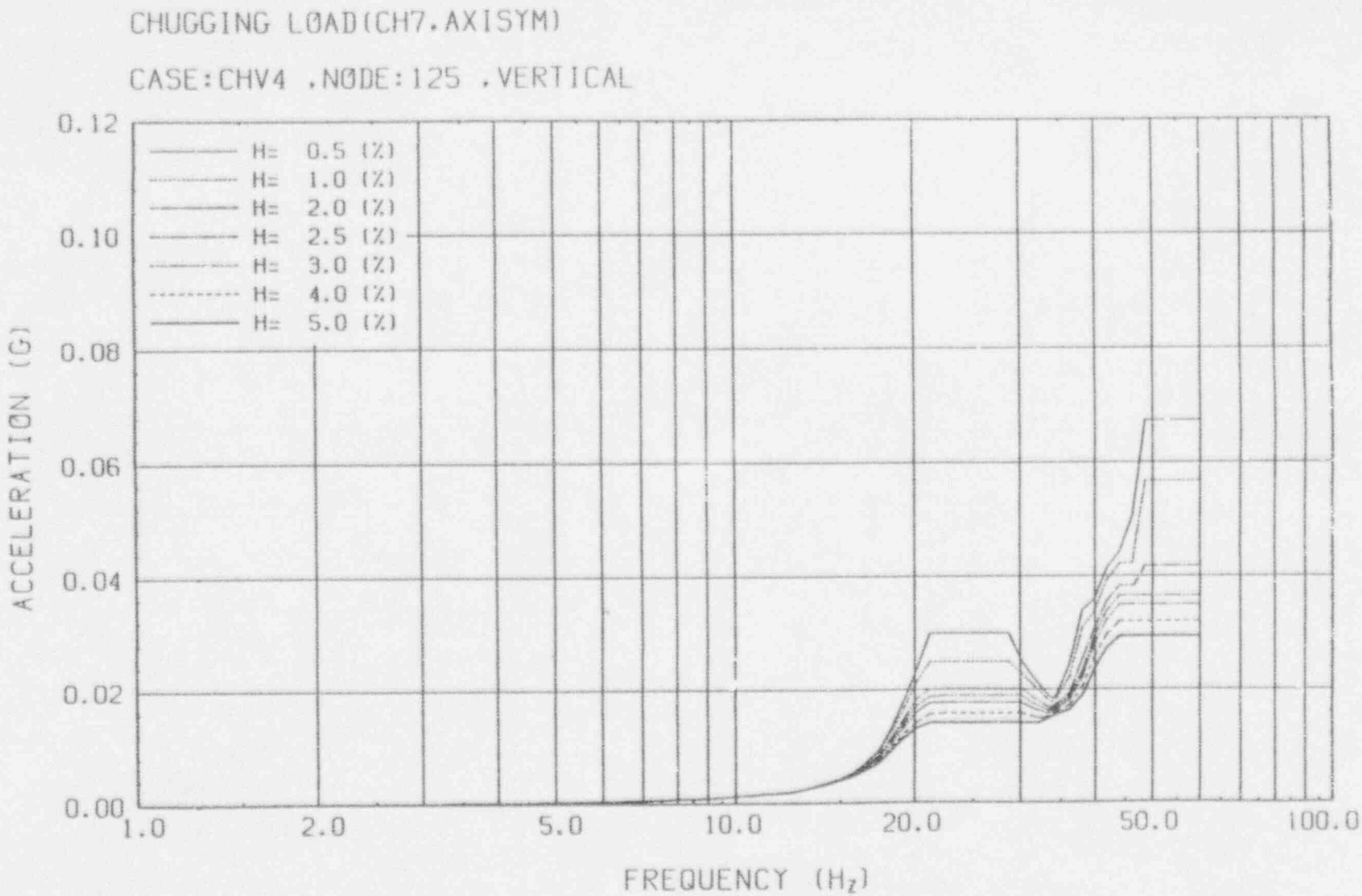


FIG. A-650 FLØØR RESPØNSE SPECTRUM

CHUGGING LOAD(CH7.AXISYM)

CASE:CHV4 .NODE:148 .VERTICAL

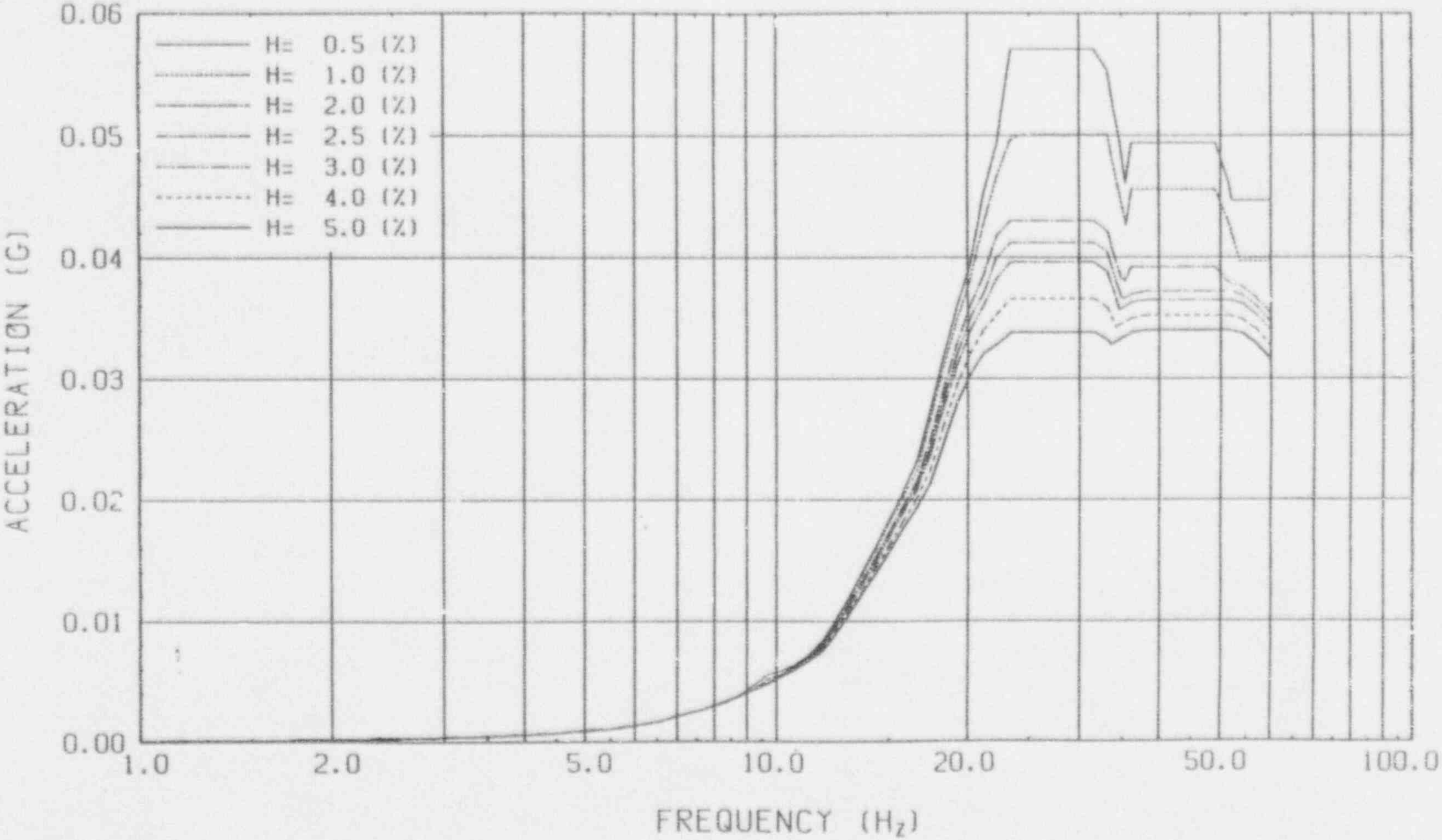


FIG. A-656 FLOOR RESPONSE SPECTRUM

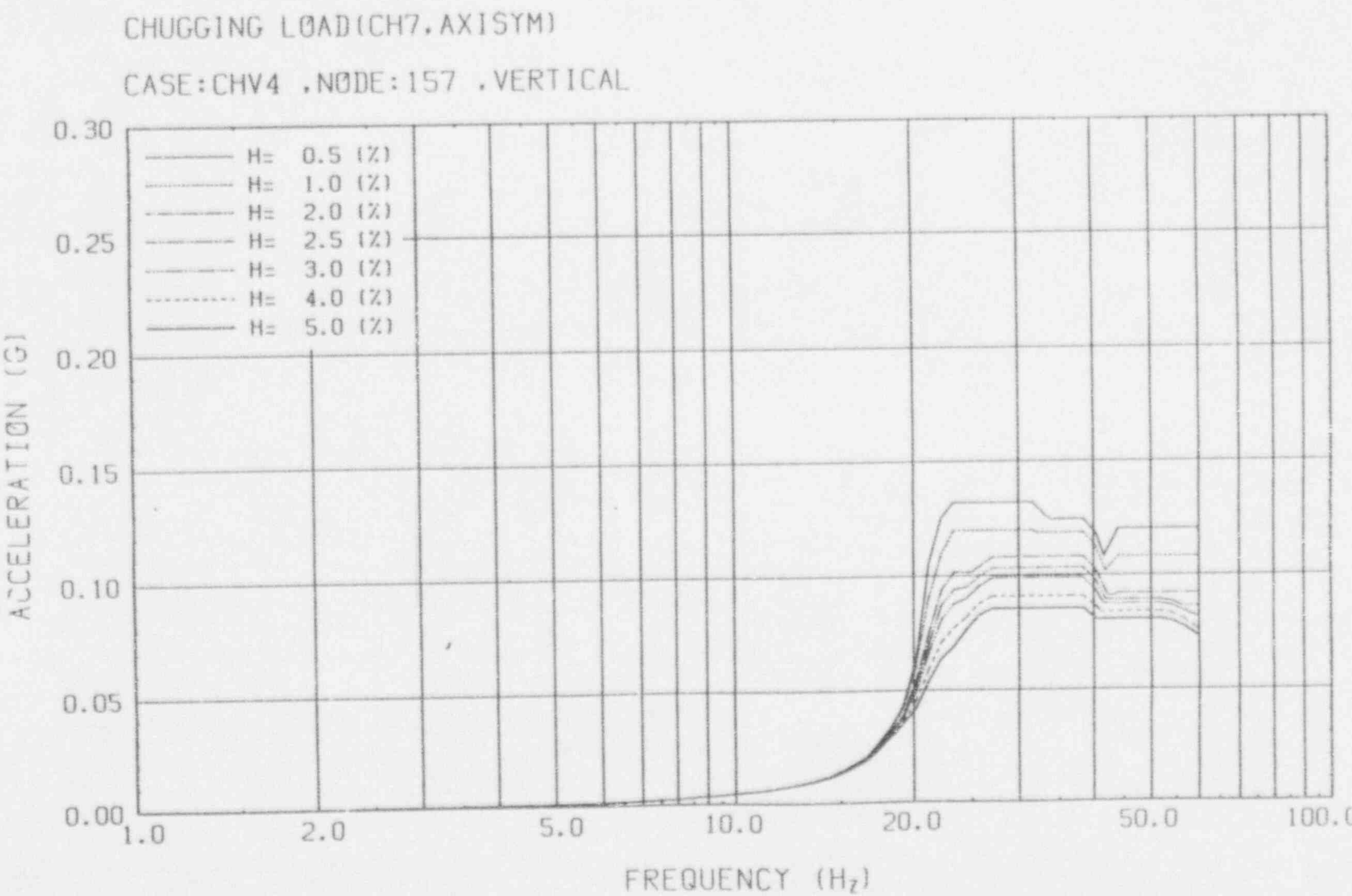


FIG. A-659 FLØØR RESPØNSE SPECTRUM

A-659

CHUGGING LØAD(CH7,AXISYM)

CASE:CHV4 ,NØDE:165 ,VERTICAL

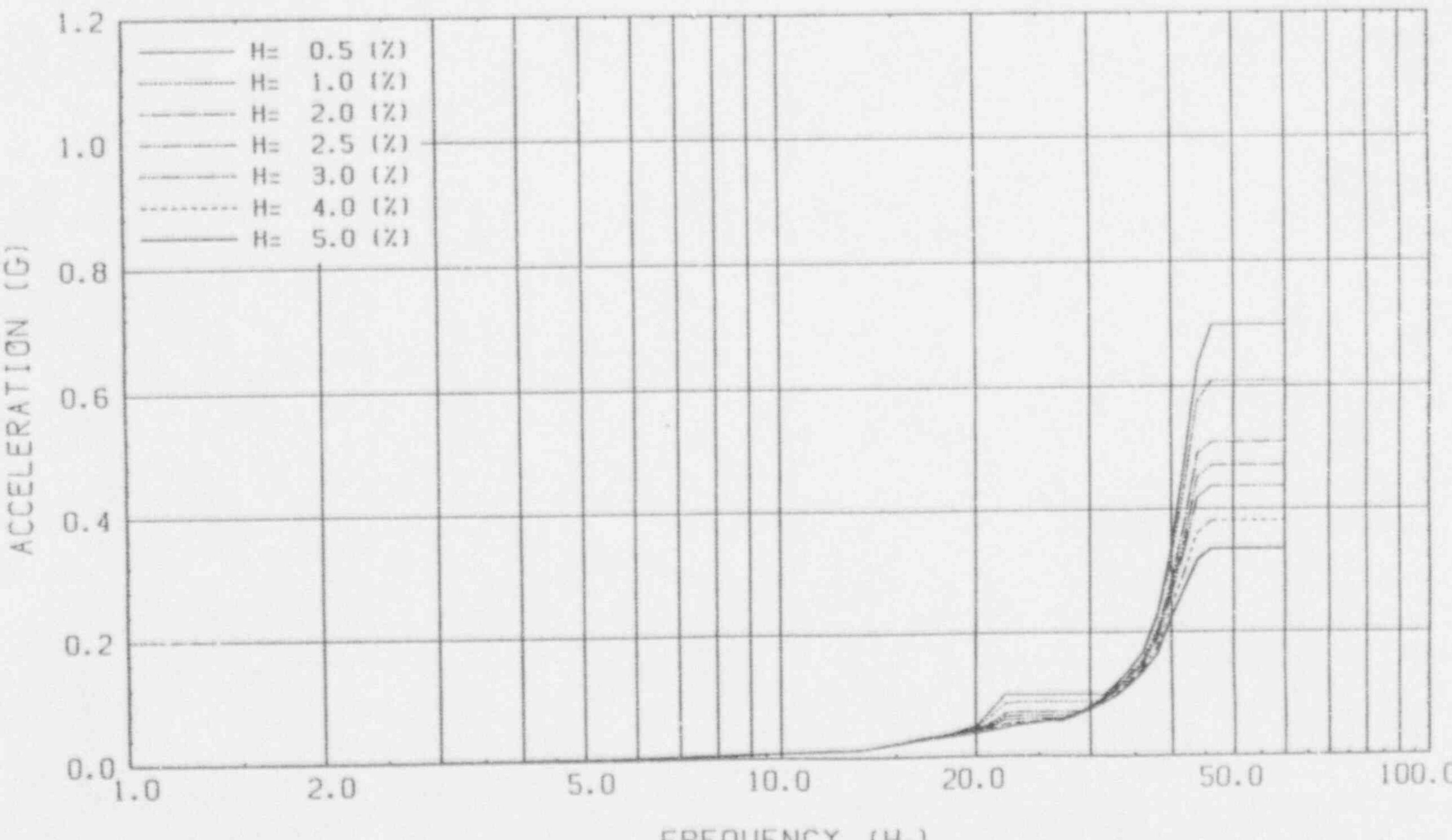


FIG. A-667 FLØØR RESPØNSE SPECTRUM

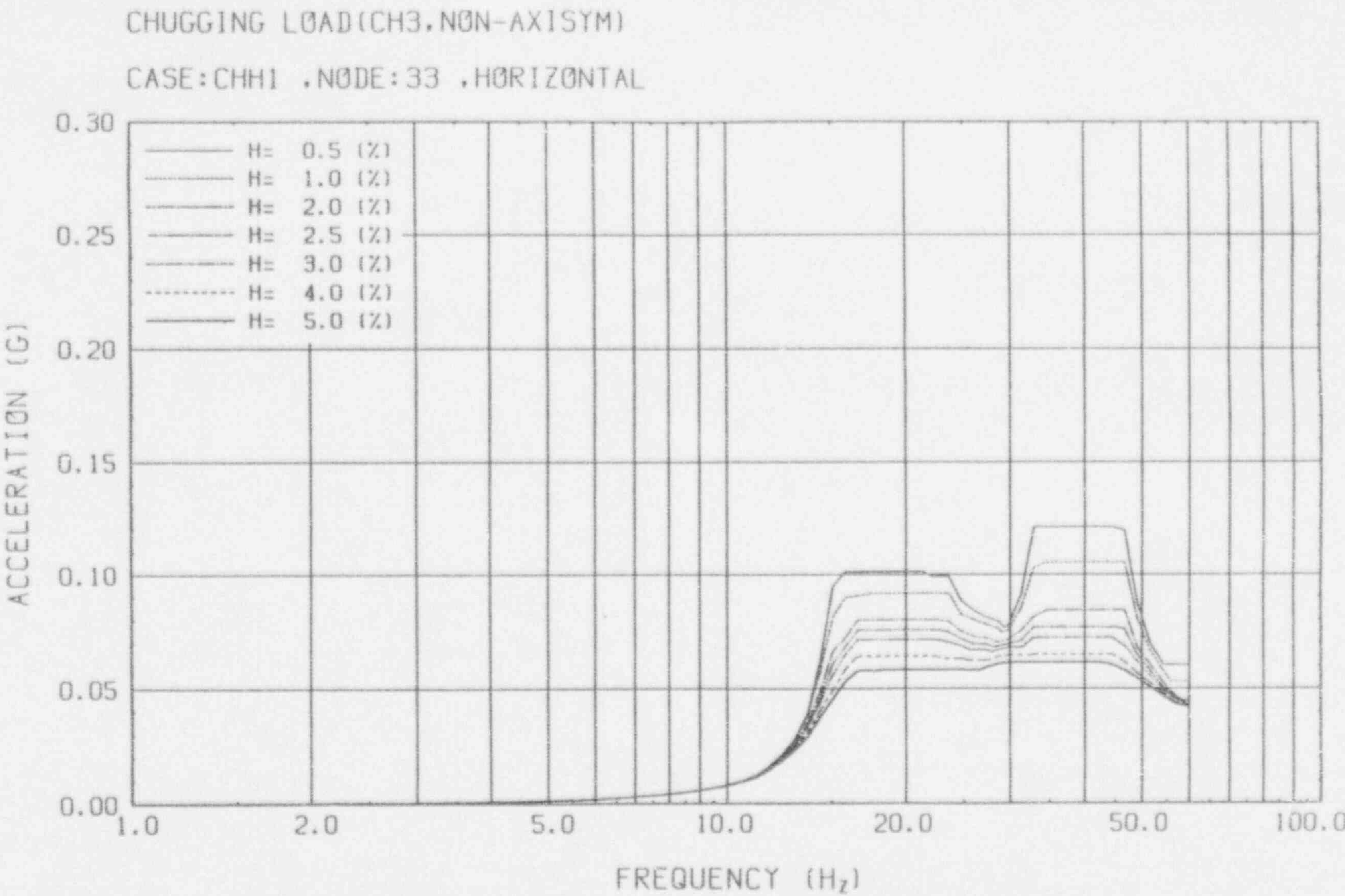


FIG. A-684 FLOOR RESPONSE SPECTRUM

CHUGGING LØAD(CH3.NØN-AXISYM)

CASE:CHH1 .NØDE:71 .HØRIZØNTAL

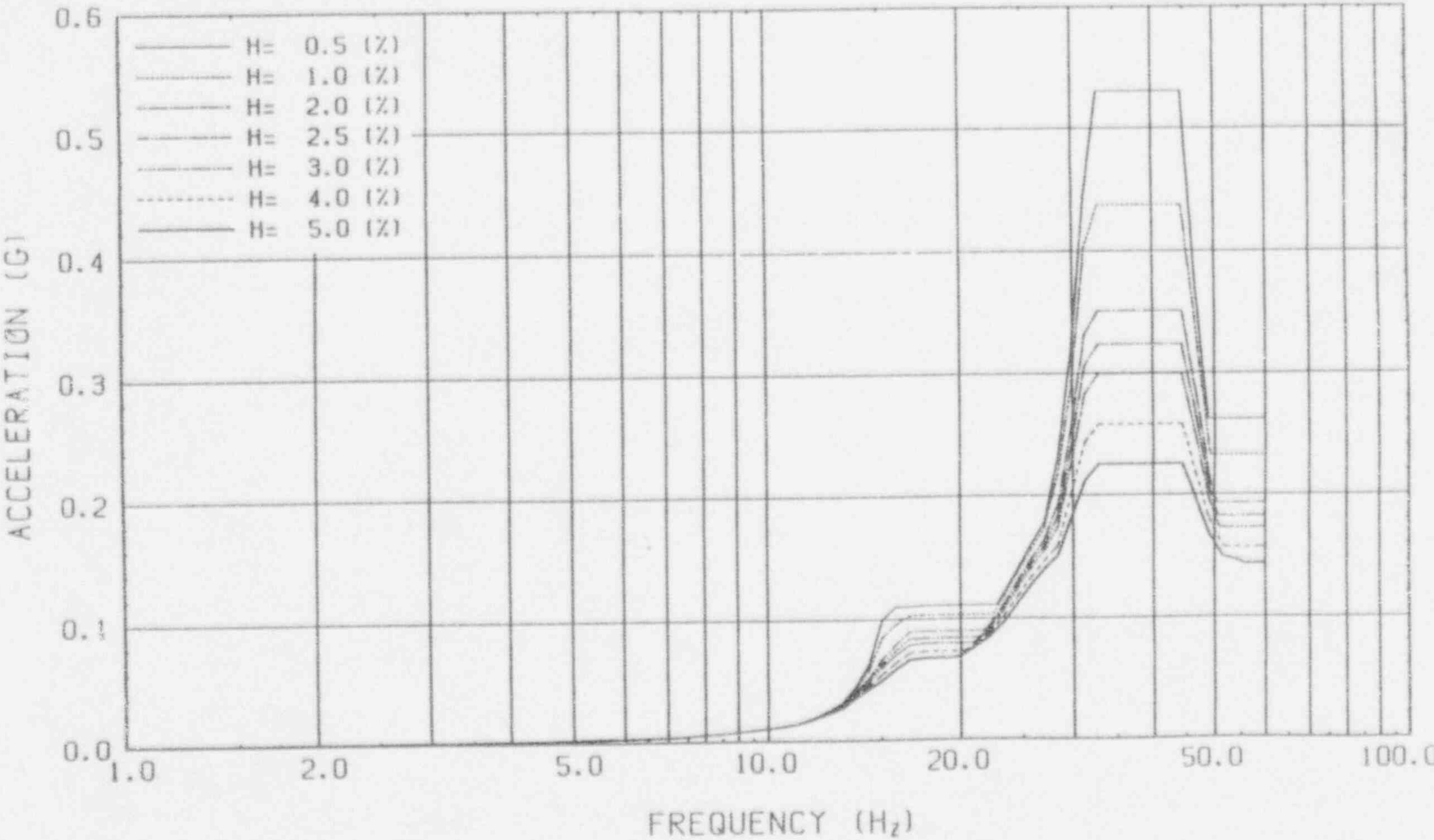


FIG. A-701 FLØØR RESPØNSE SPECTRUM

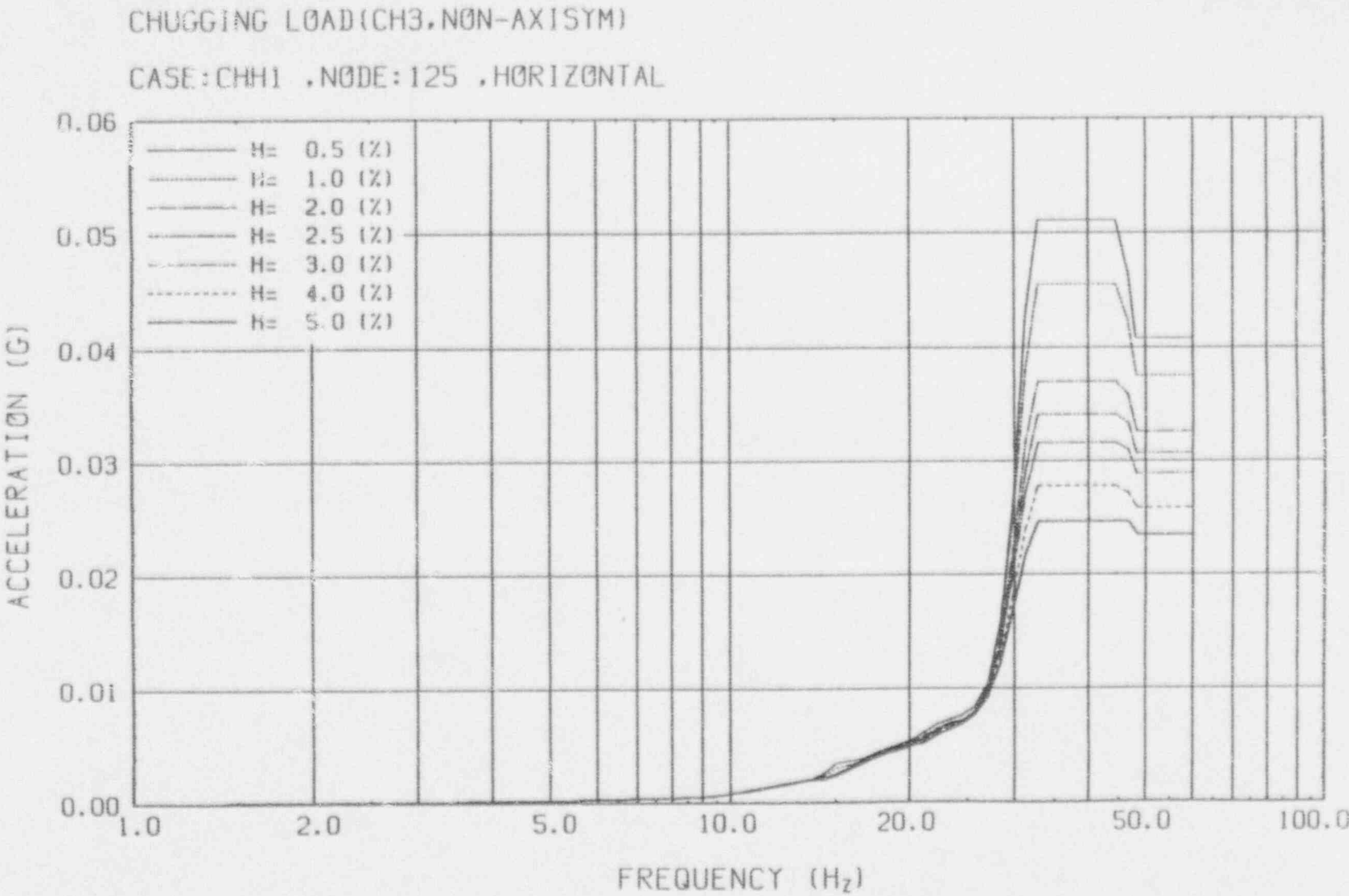


FIG. A-704 FLOOR RESPONSE SPECTRUM

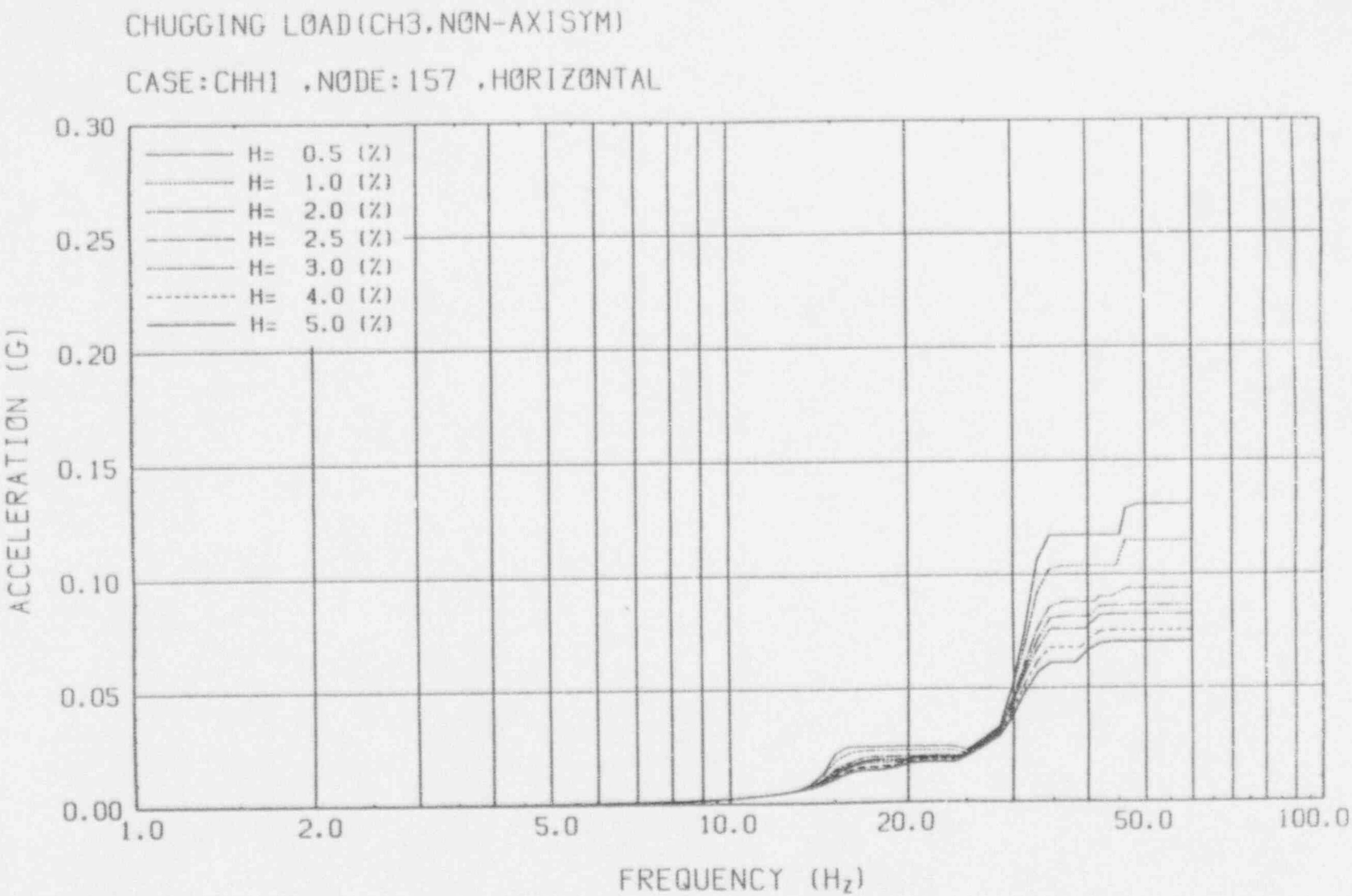


FIG. A-712 FLØØR RESPØNSE SPECTRUM

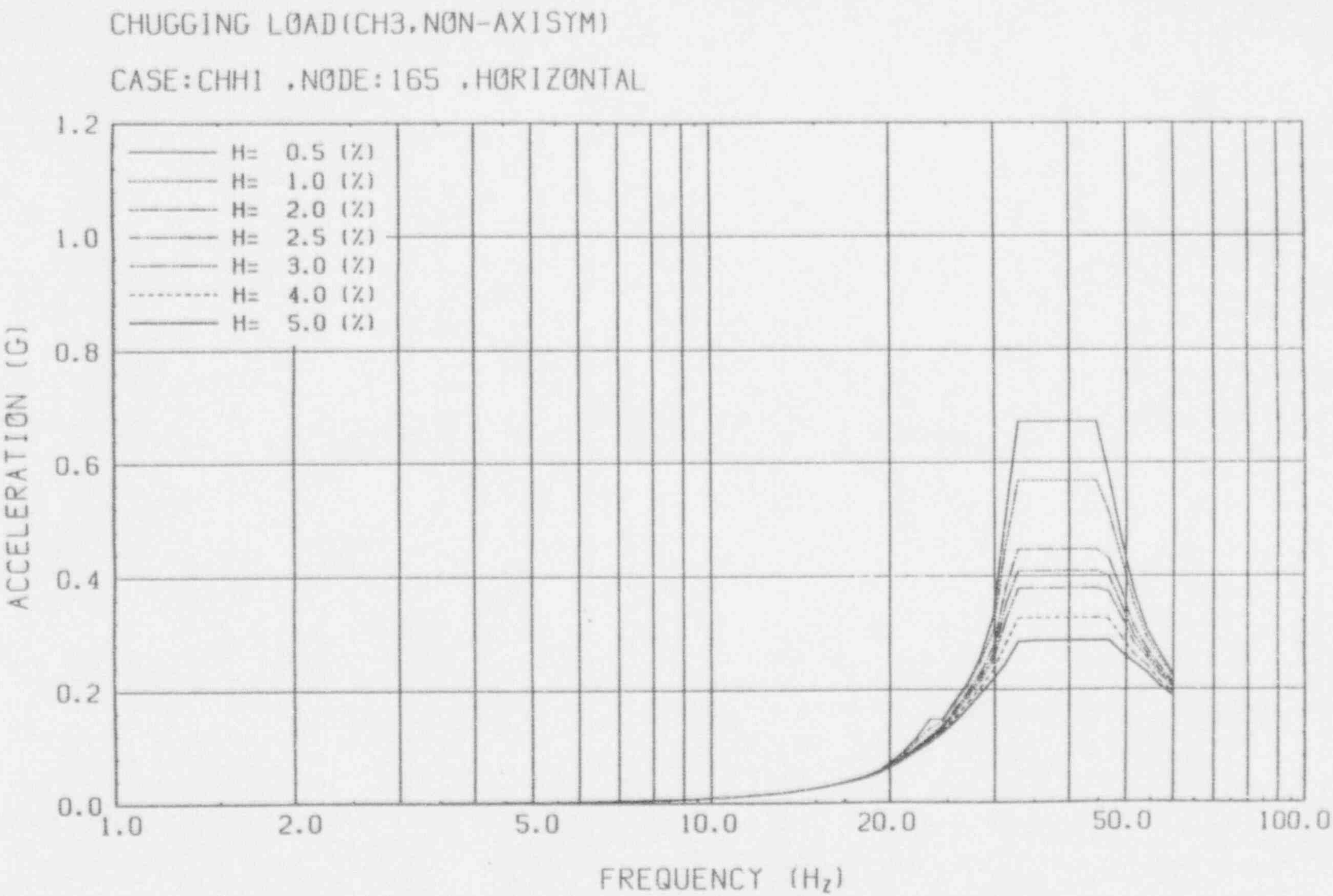


FIG. A-720 FLØØR RESPØNSE SPECTRUM

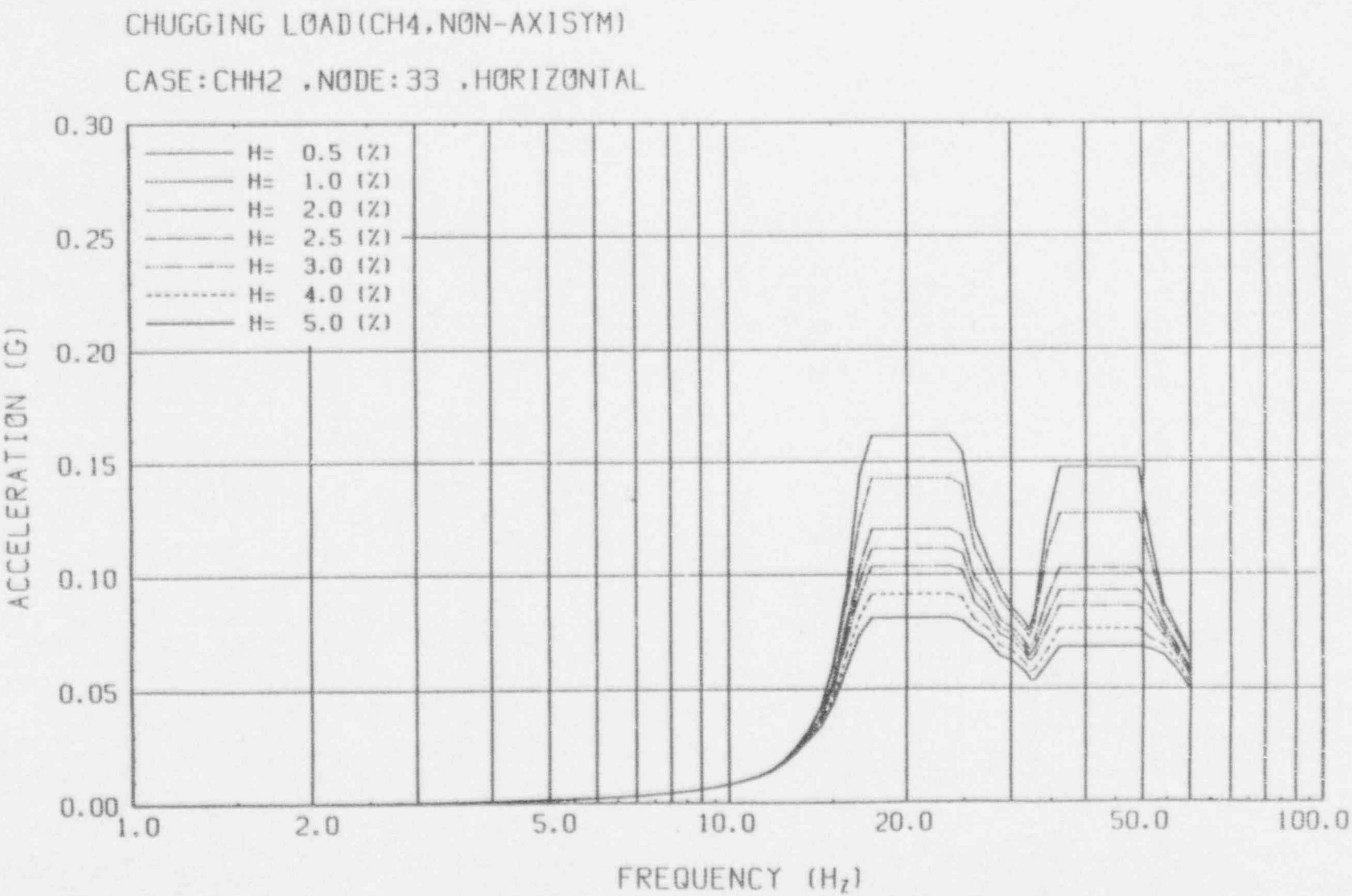


FIG. A-737 FLØØR RESPØNSE SPECTRUM

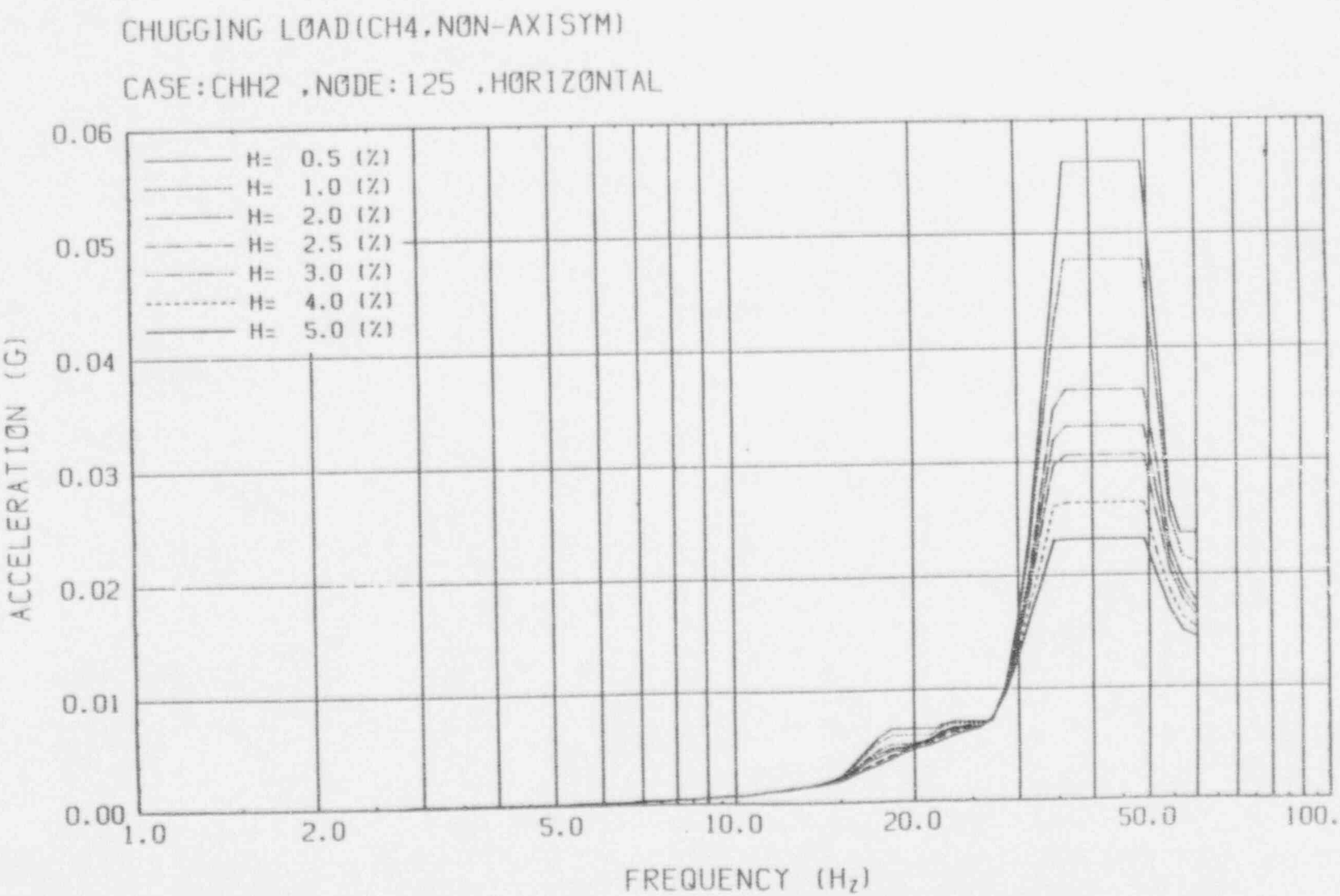


FIG. A-757 FLØØR RESPØNSE SPECTRUM

A-757

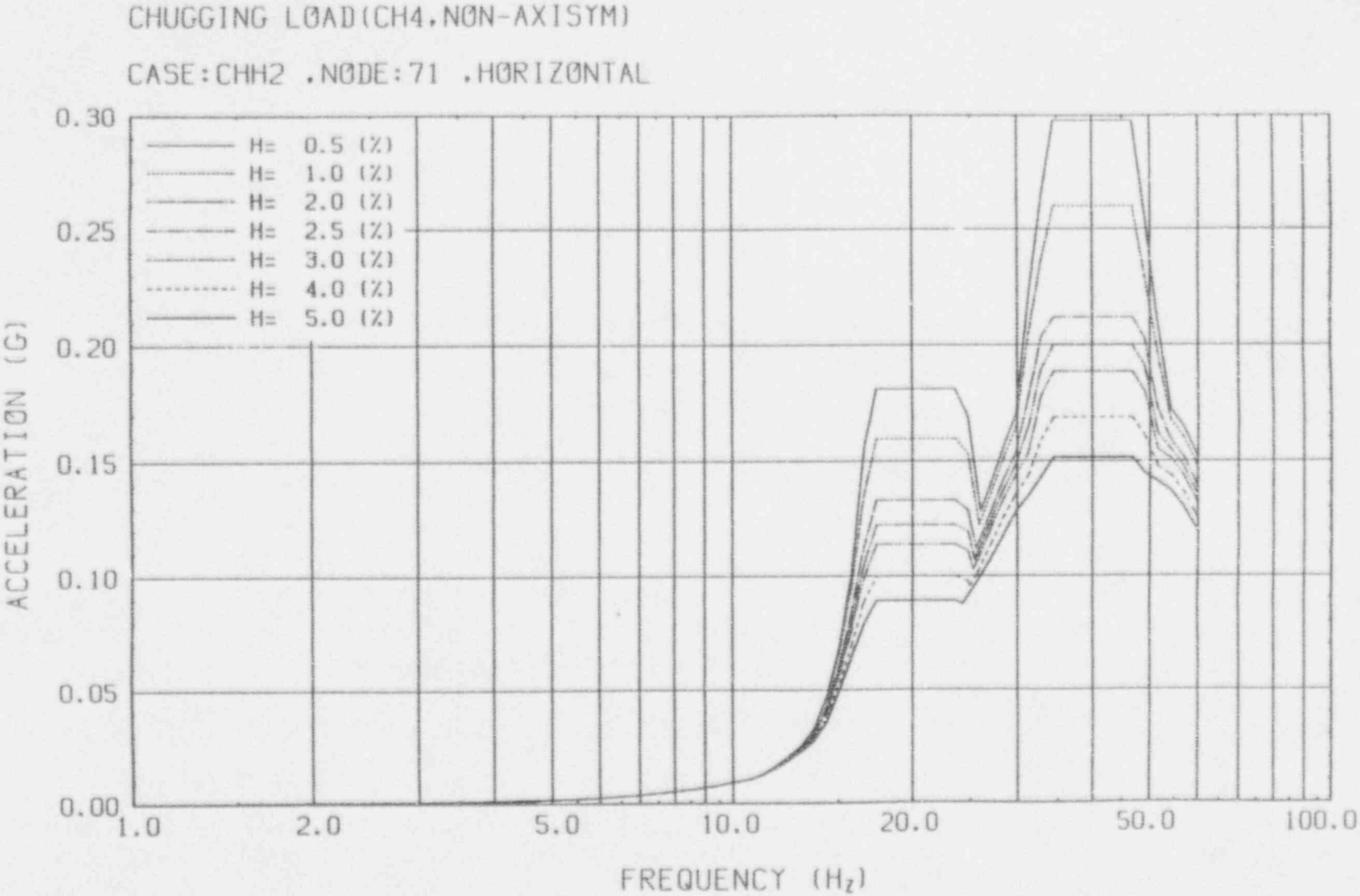


FIG. A-754 FLOOR RESPONSE SPECTRUM

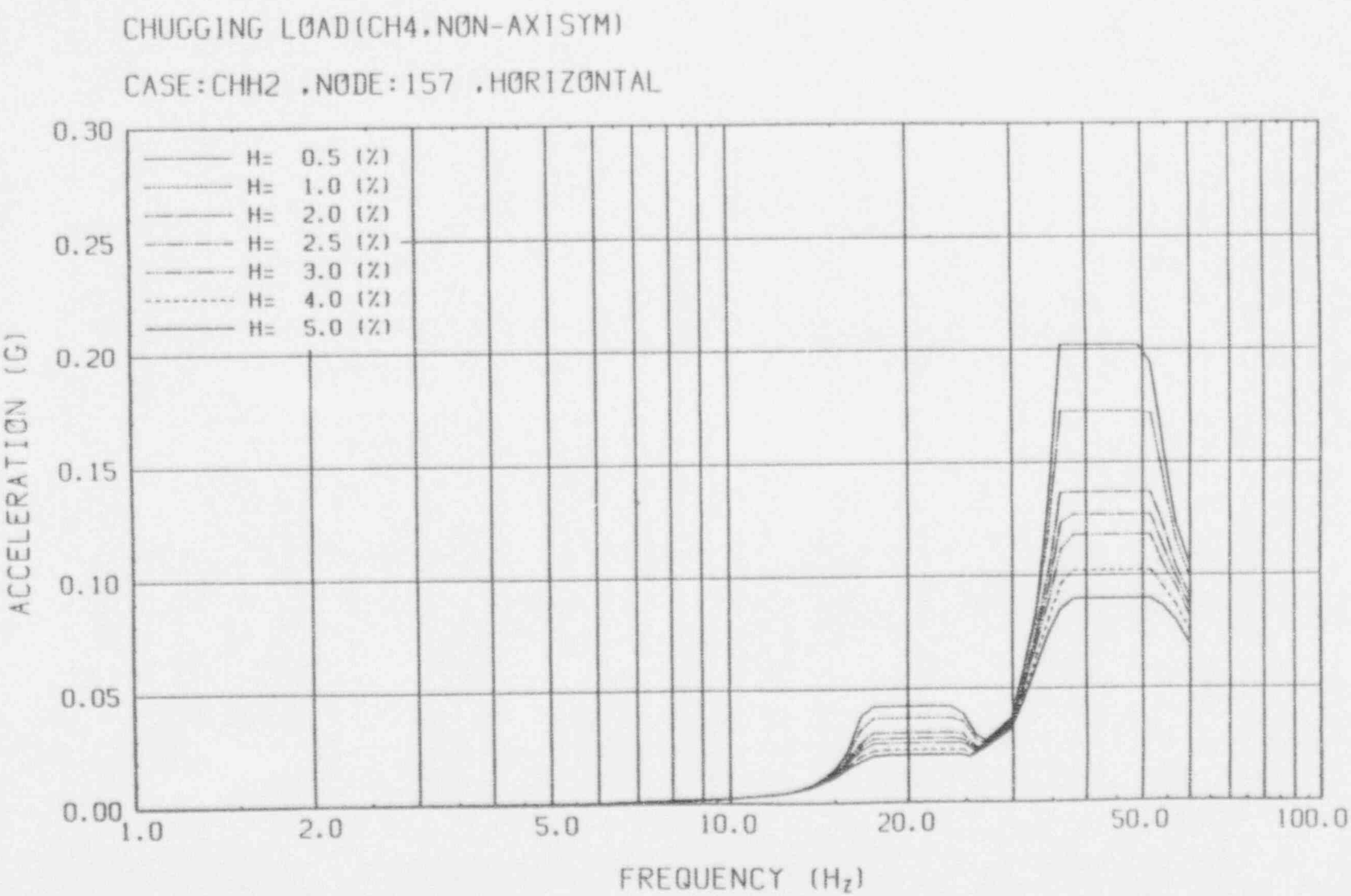


FIG. A-765 FLØØR RESPØNSE SPECTRUM

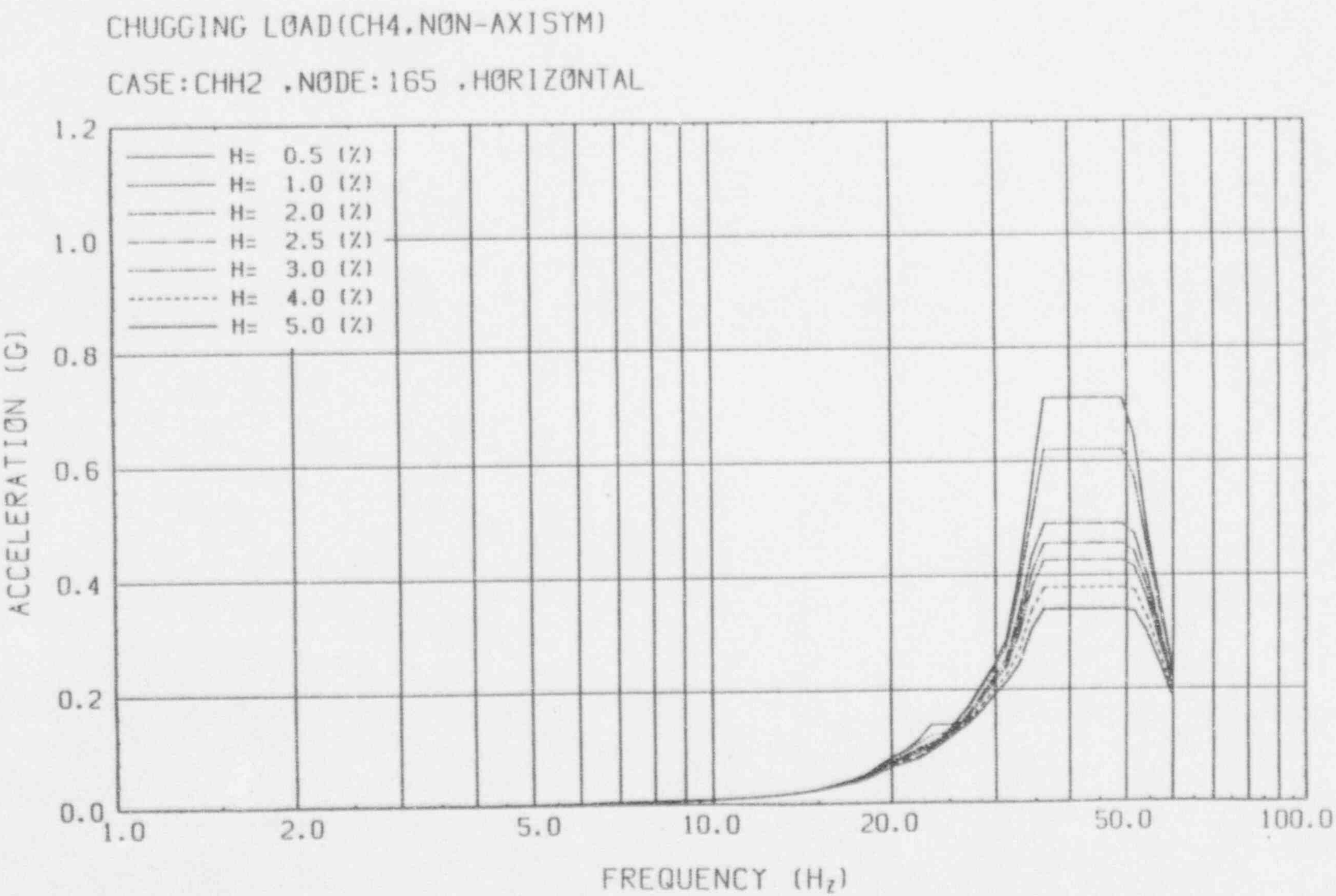


FIG. A-773 FLØØR RESPØNSE SPECTRUM

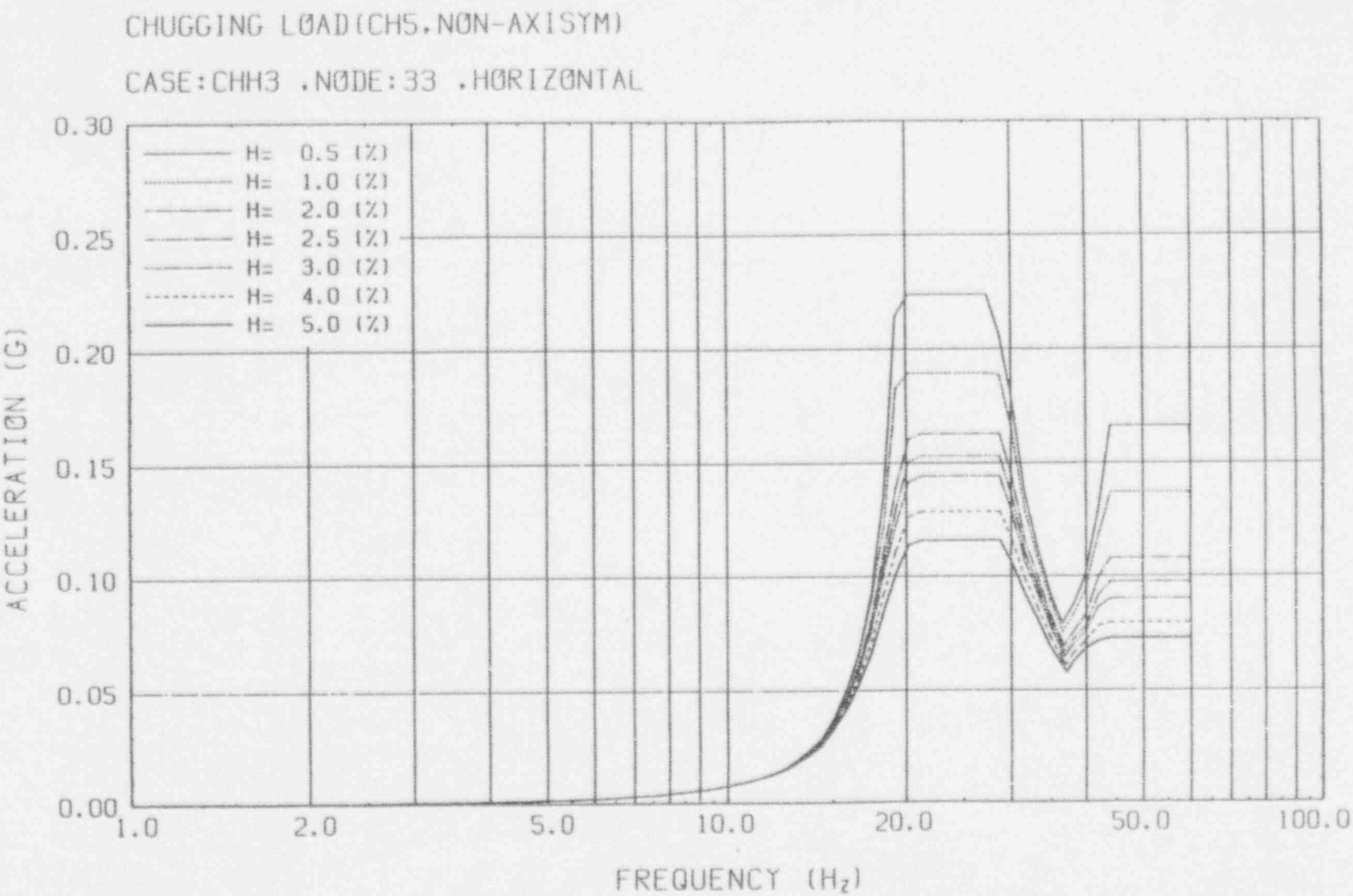


FIG. A-790 FLOOR RESPONSE SPECTRUM

CHUGGING LOAD(CH5.NON-AXISYM)

CASE:CHH3 ,NODE:71 ,HORIZONTAL

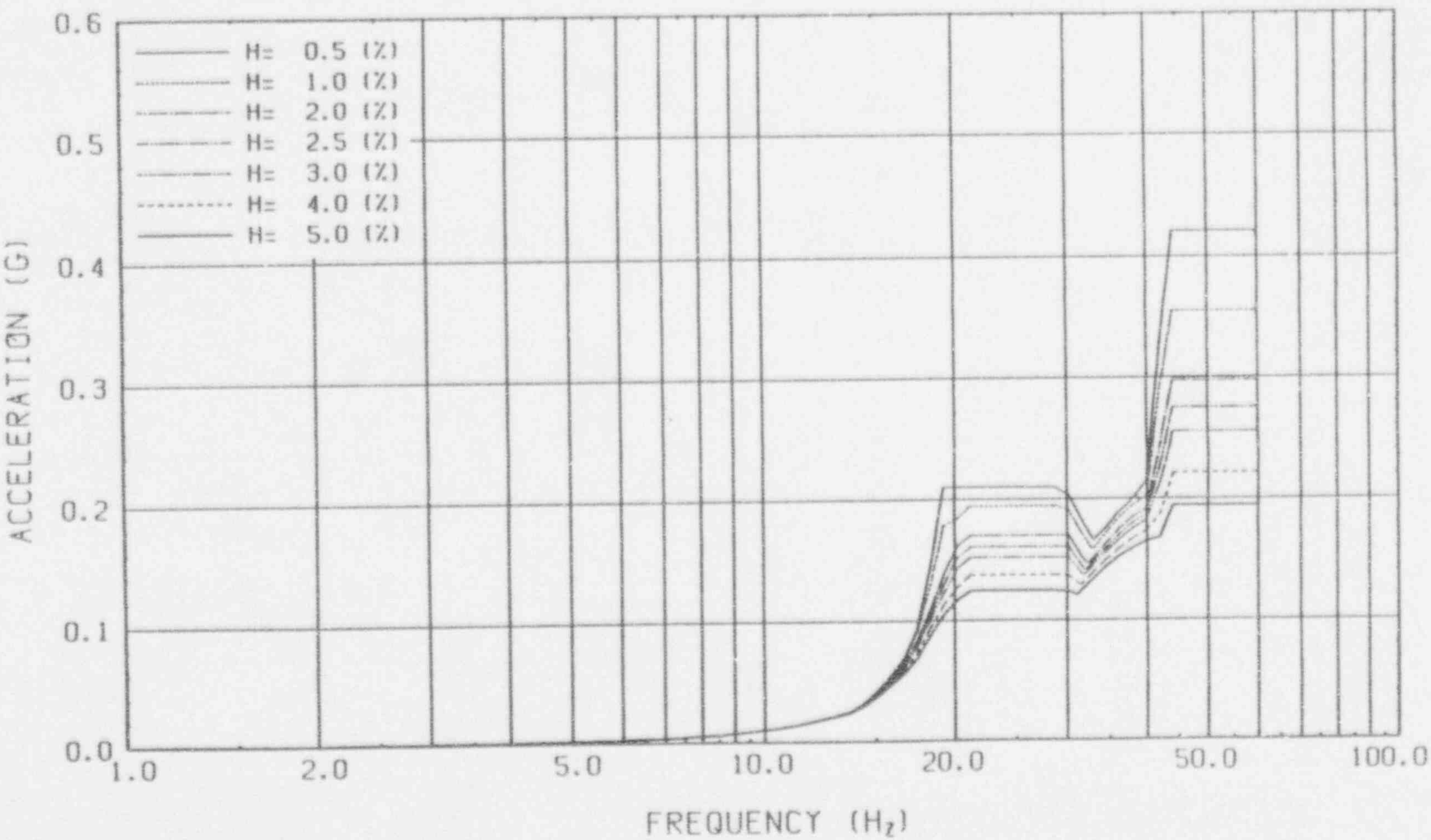


FIG. A-807 FLOOR RESPONSE SPECTRUM

A-807

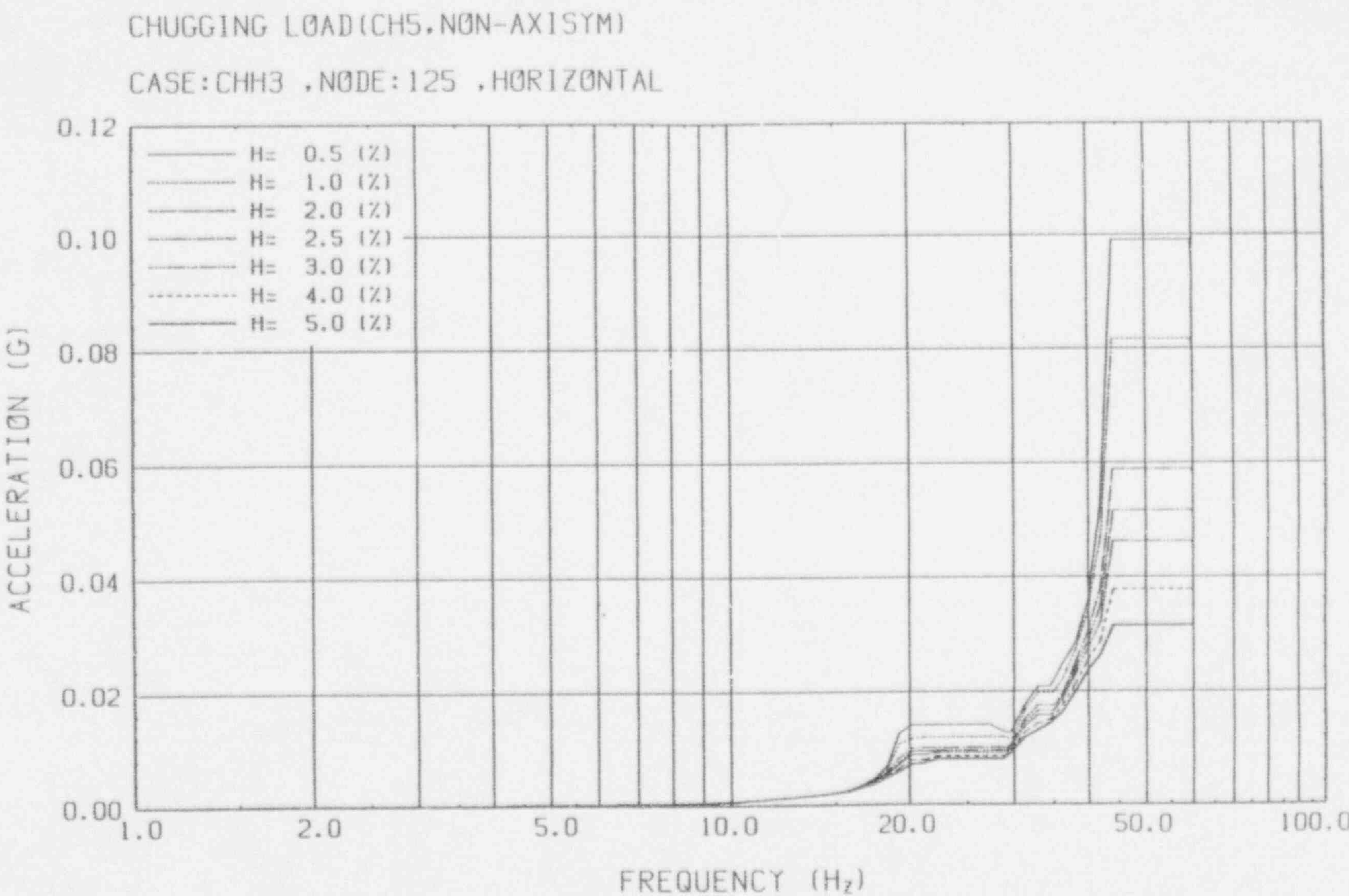


FIG. A-810 FLØØR RESPØNSE SPECTRUM

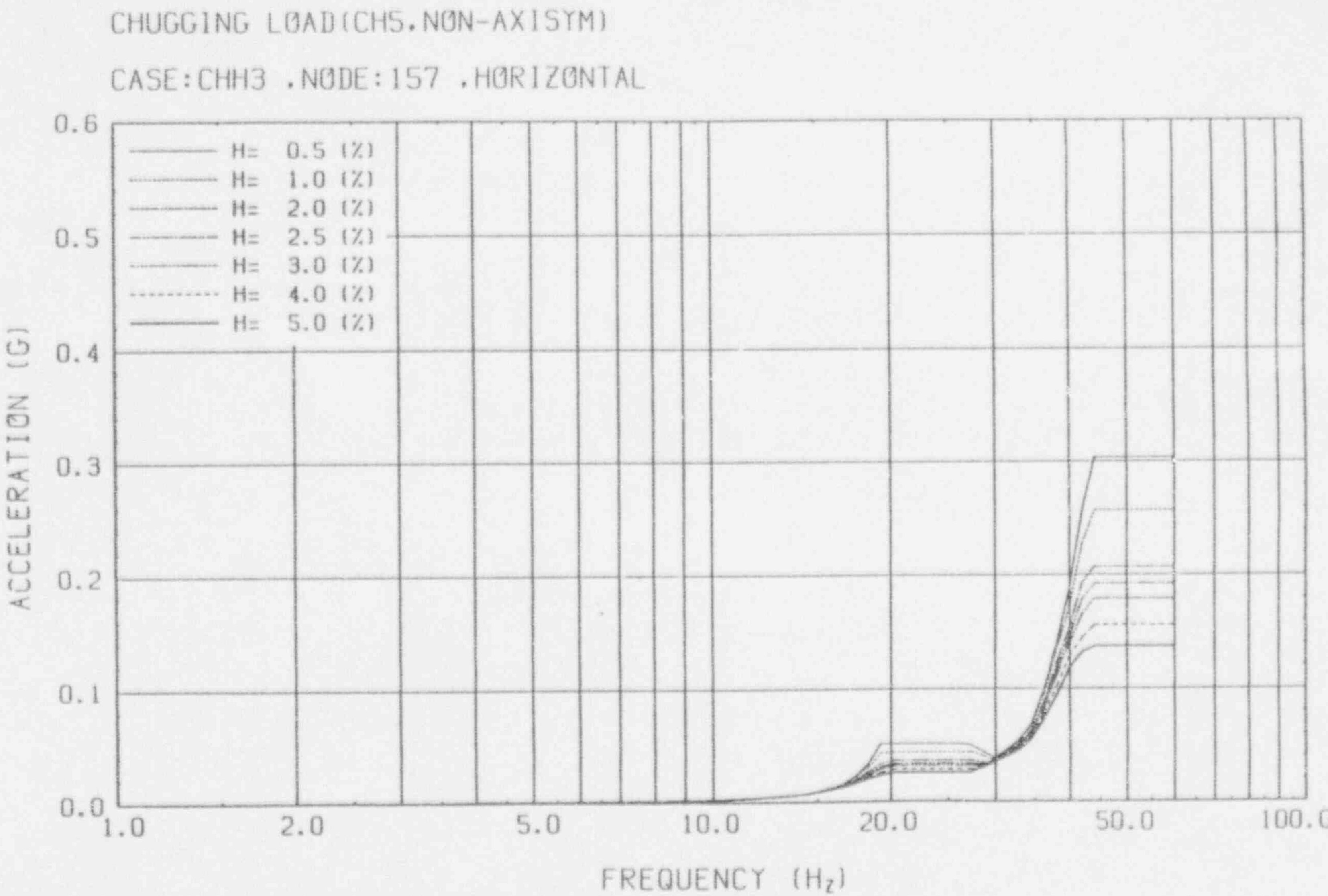


FIG. A-818 FLOOR RESPONSE SPECTRUM

CHUGGING LOAD(CH5,NON-AXISYM)

CASE:CHH3 ,NODE:165 ,HORIZONTAL

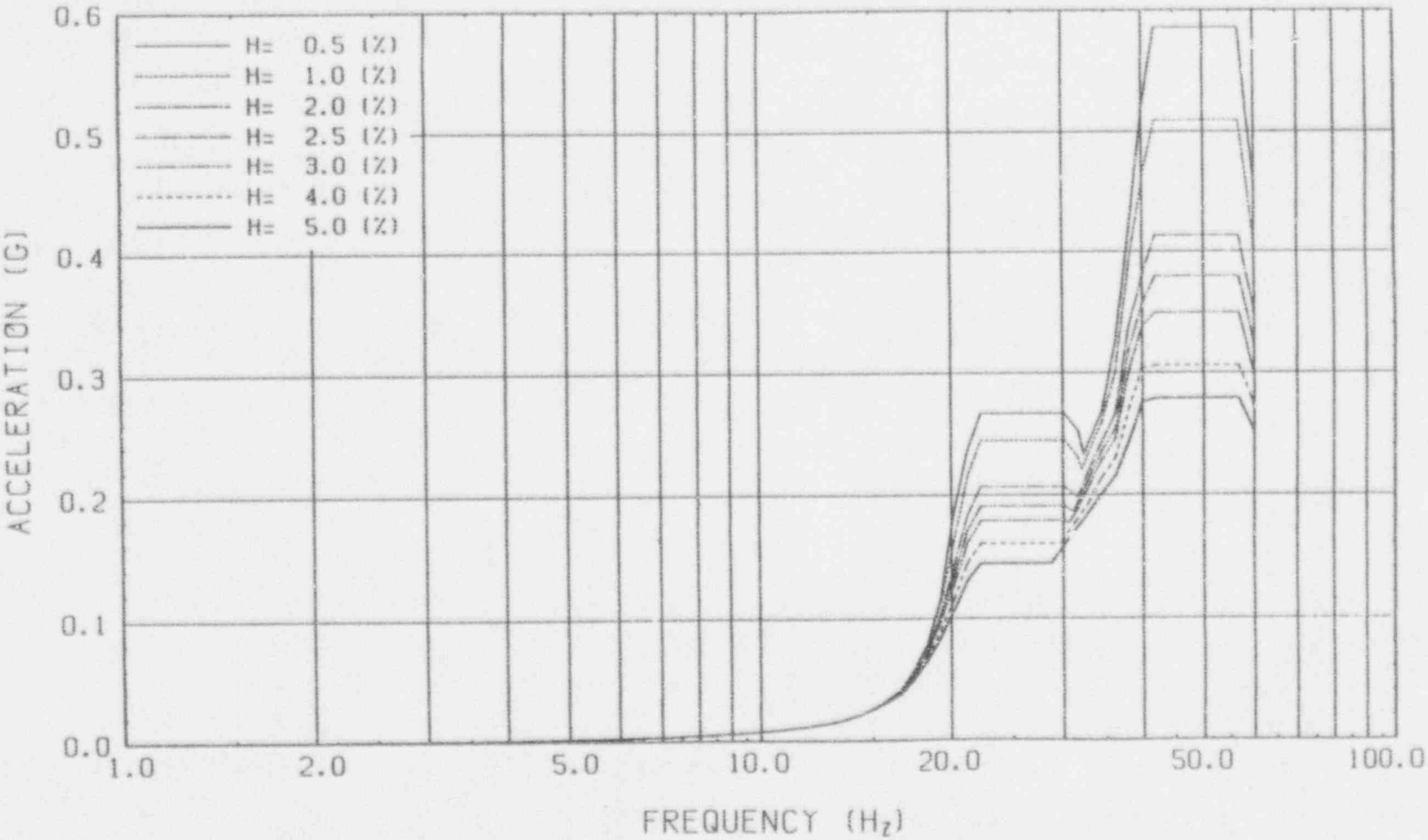


FIG. A-826 FLOOR RESPONSE SPECTRUM

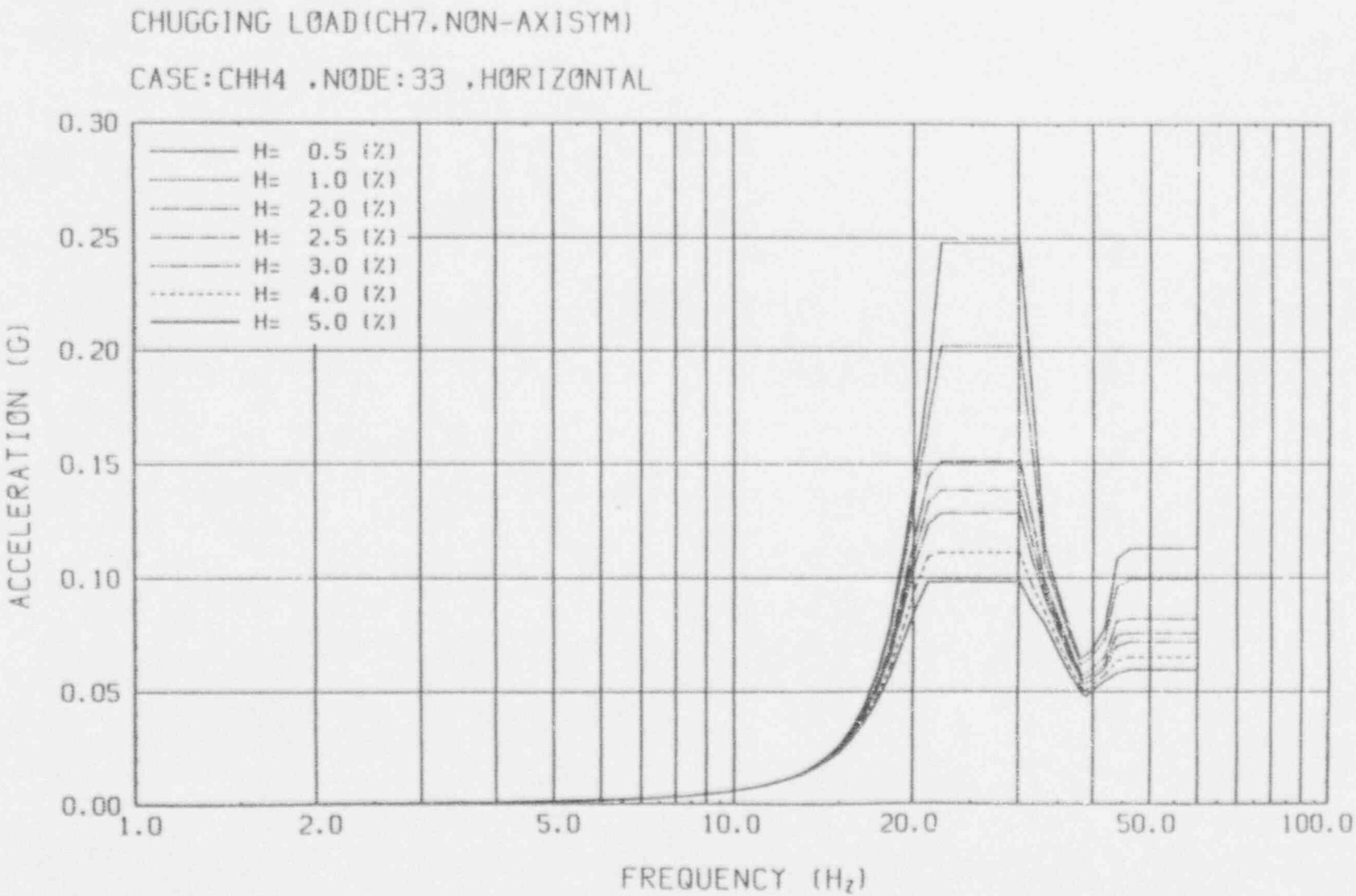


FIG. A-843 FLOOR RESPONSE SPECTRUM

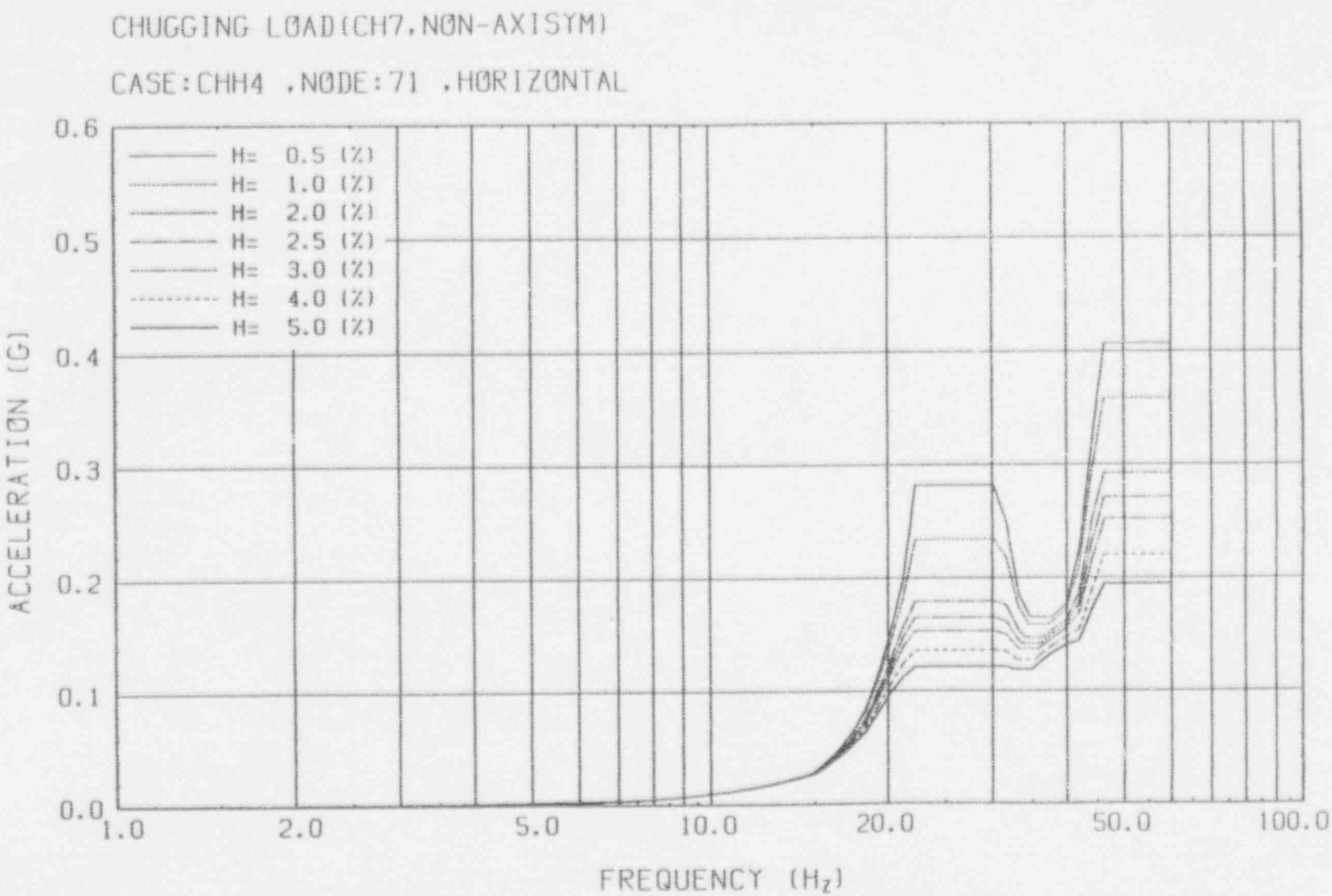
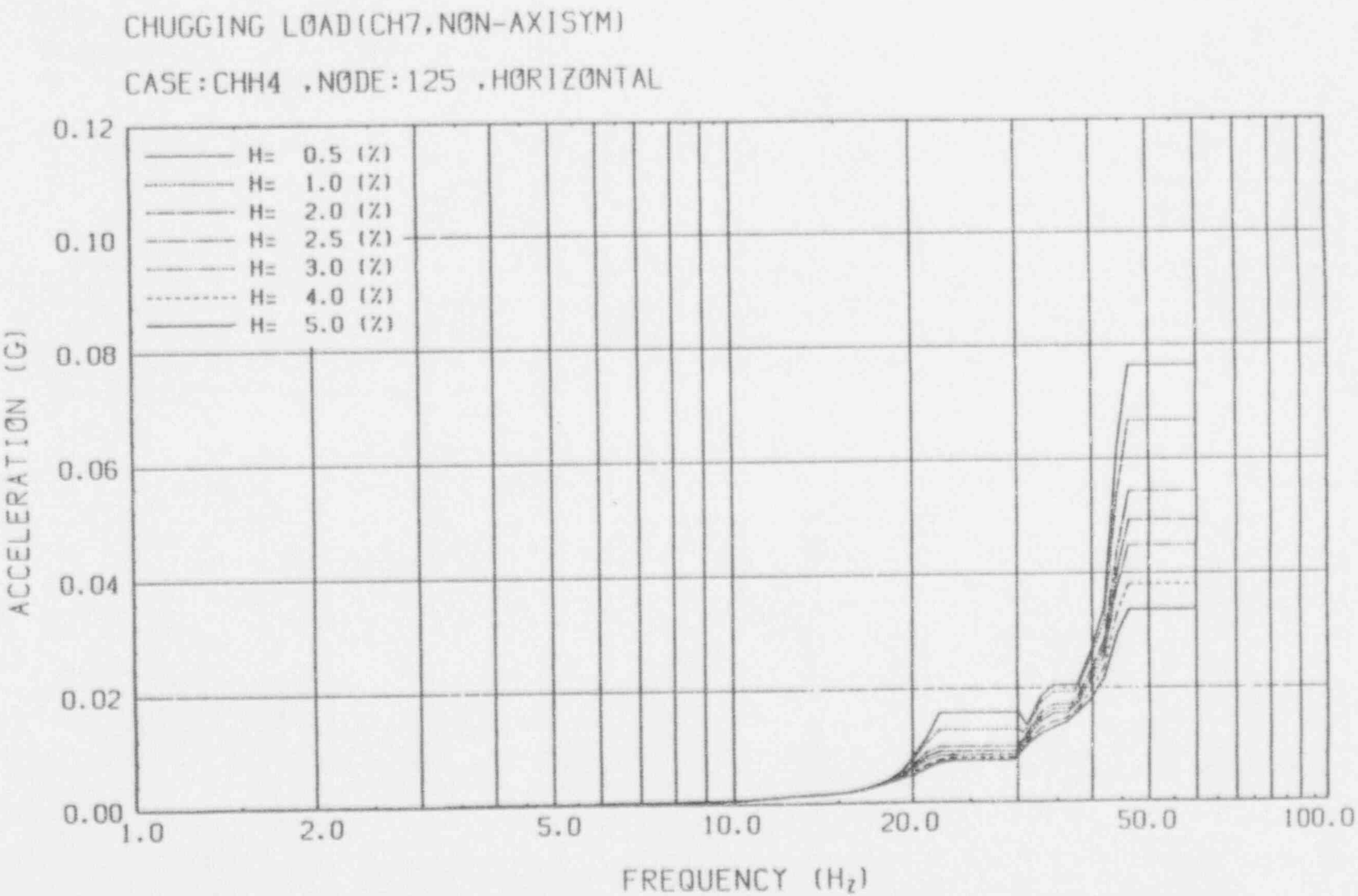


FIG. A-860 FLOOR RESPONSE SPECTRUM



A-863

FIG. A-863 FLOOR RESPONSE SPECTRUM

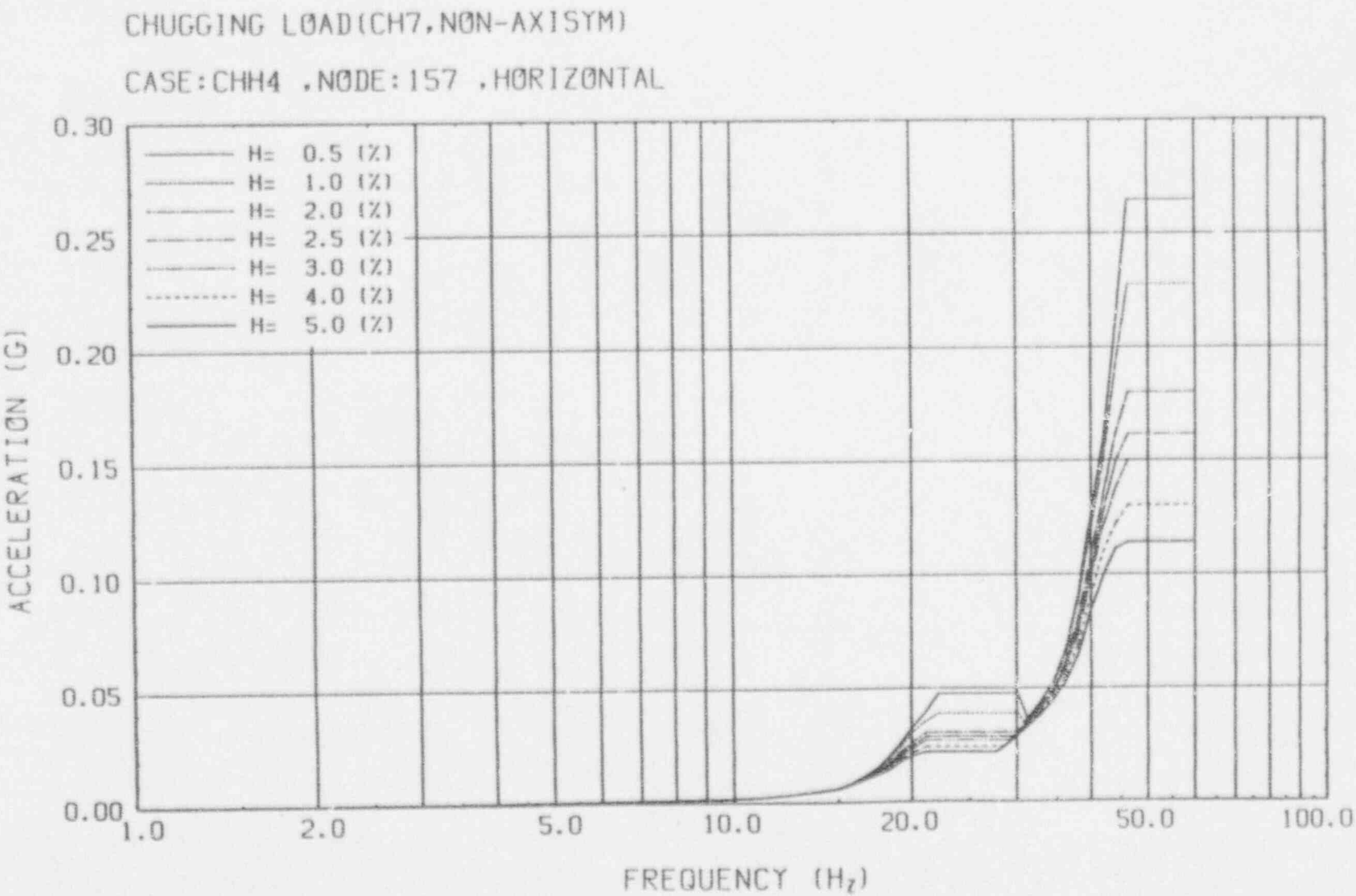


FIG. A-871 FLOOR RESPONSE SPECTRUM

CHUGGING LOAD(CH7.NON-AXISYM)

CASE:CHH4 .NODE:165 .HORIZONTAL

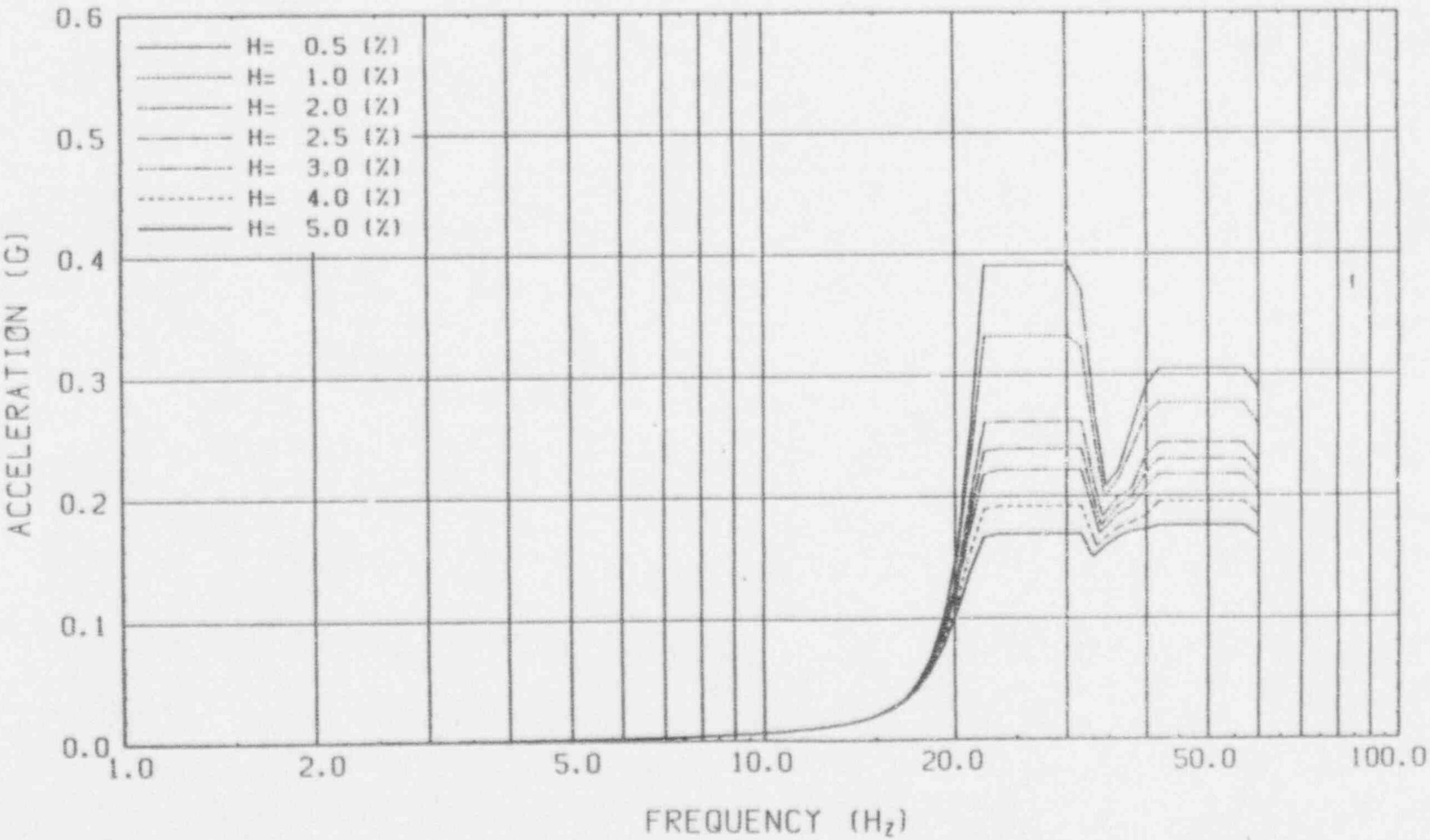


FIG. A-879 FLOOR RESPONSE SPECTRUM

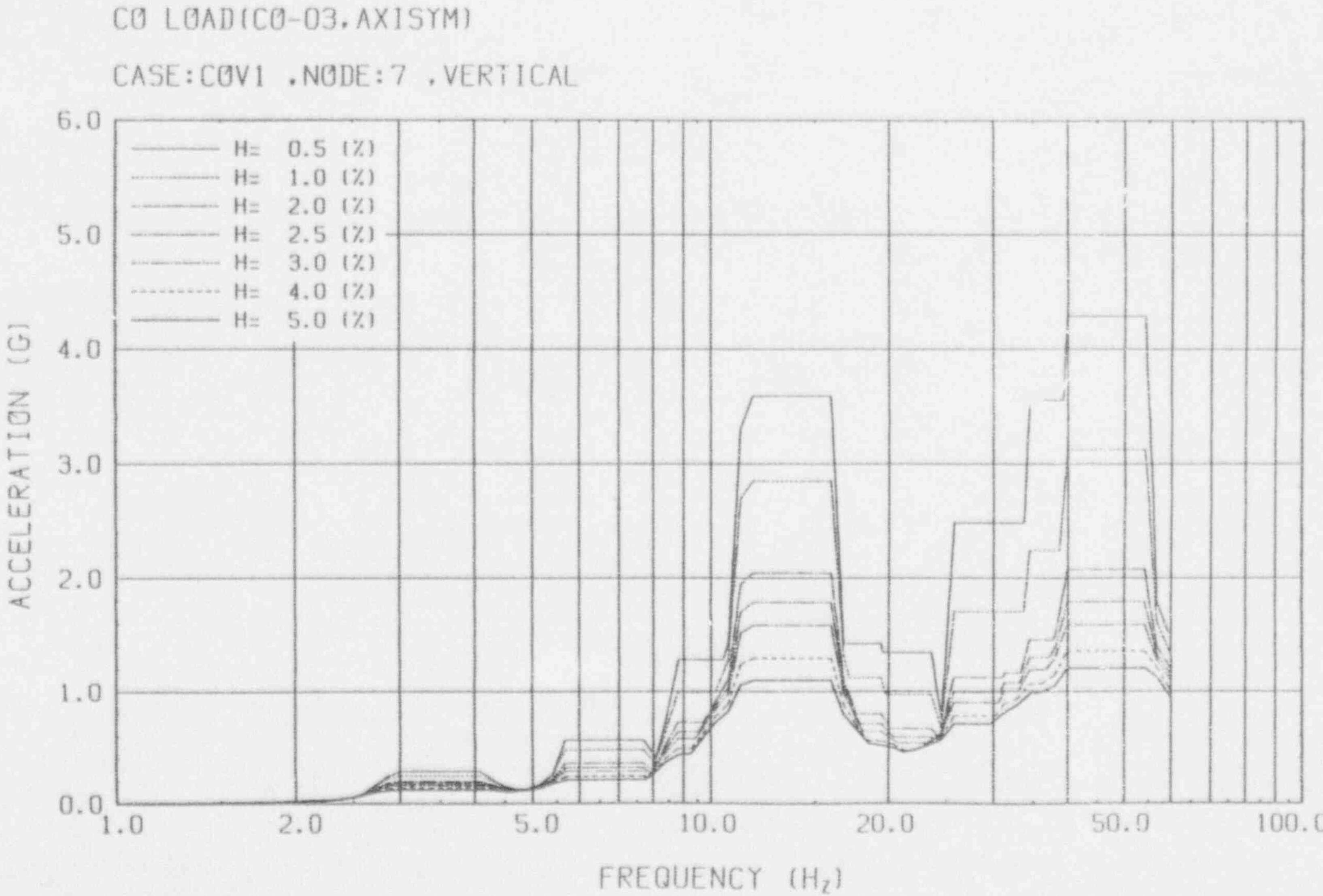


FIG. A-889 FLOOR RESPONSE SPECTRUM

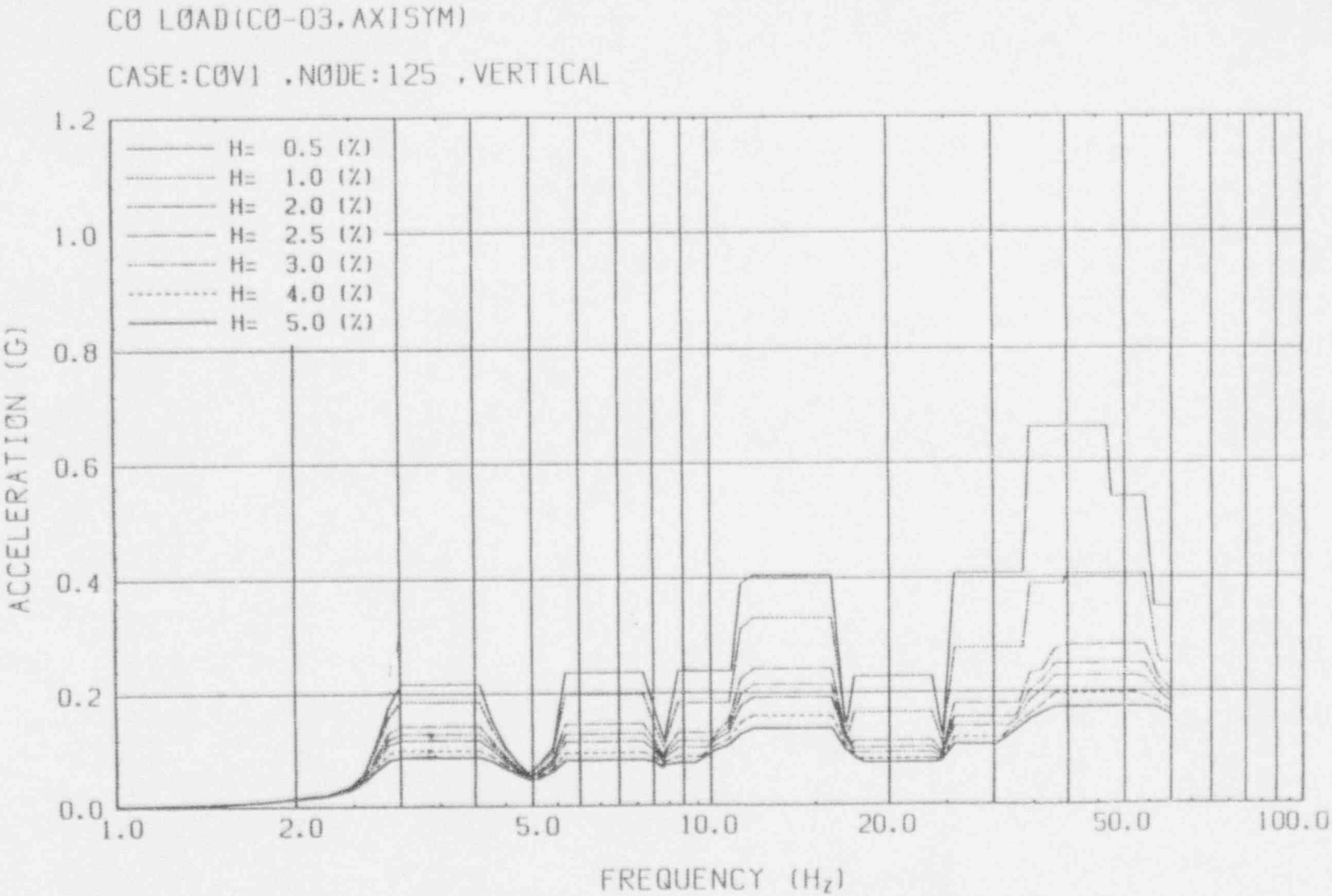


FIG. A-902 FLØØR RESPØNSE SPECTRUM

A-902

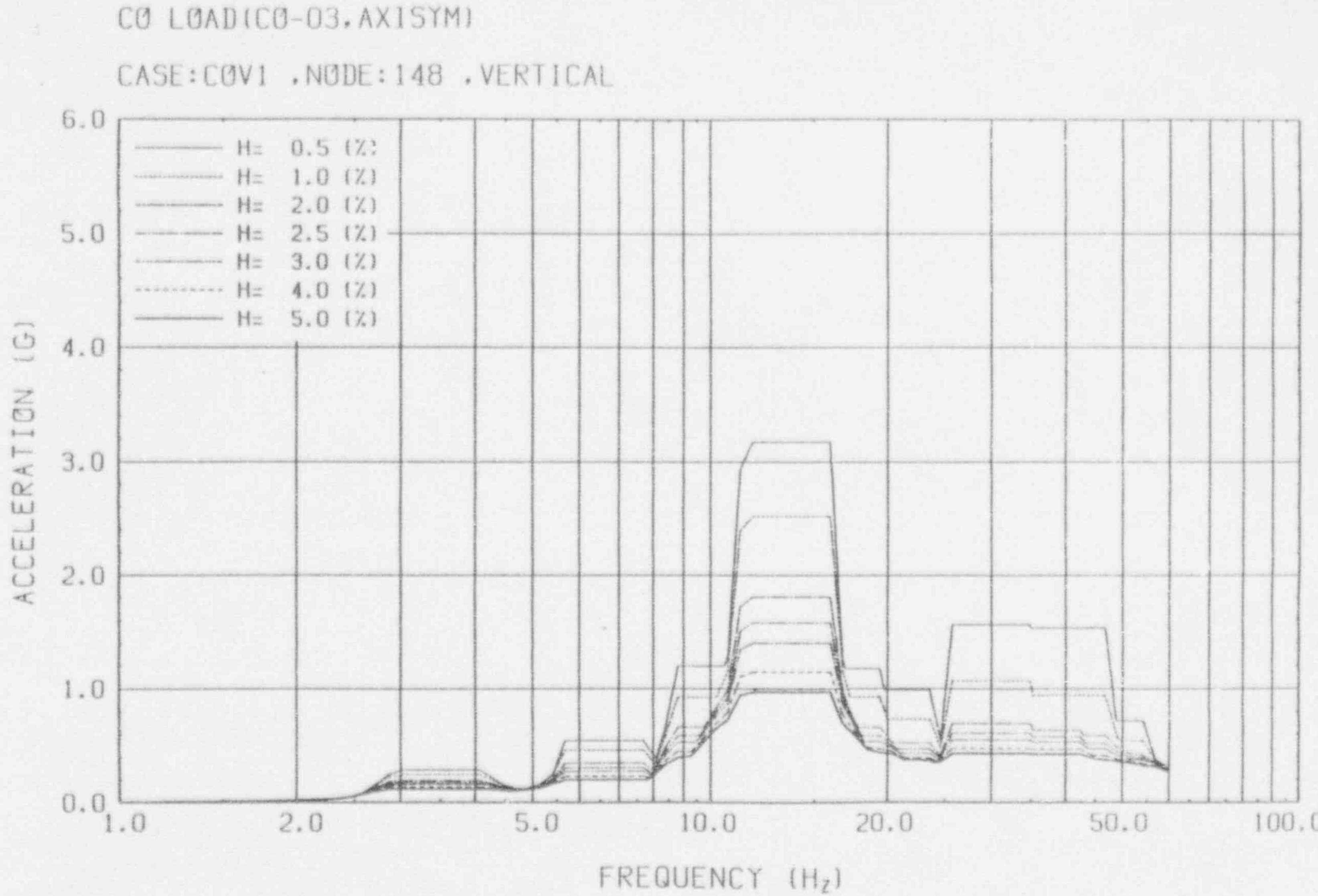


FIG. A-908 FLØØR RESPØNSE SPECTRUM

CO LOAD(CO-03.AXISYM)

CASE:COV1 .NODE:157 .VERTICAL

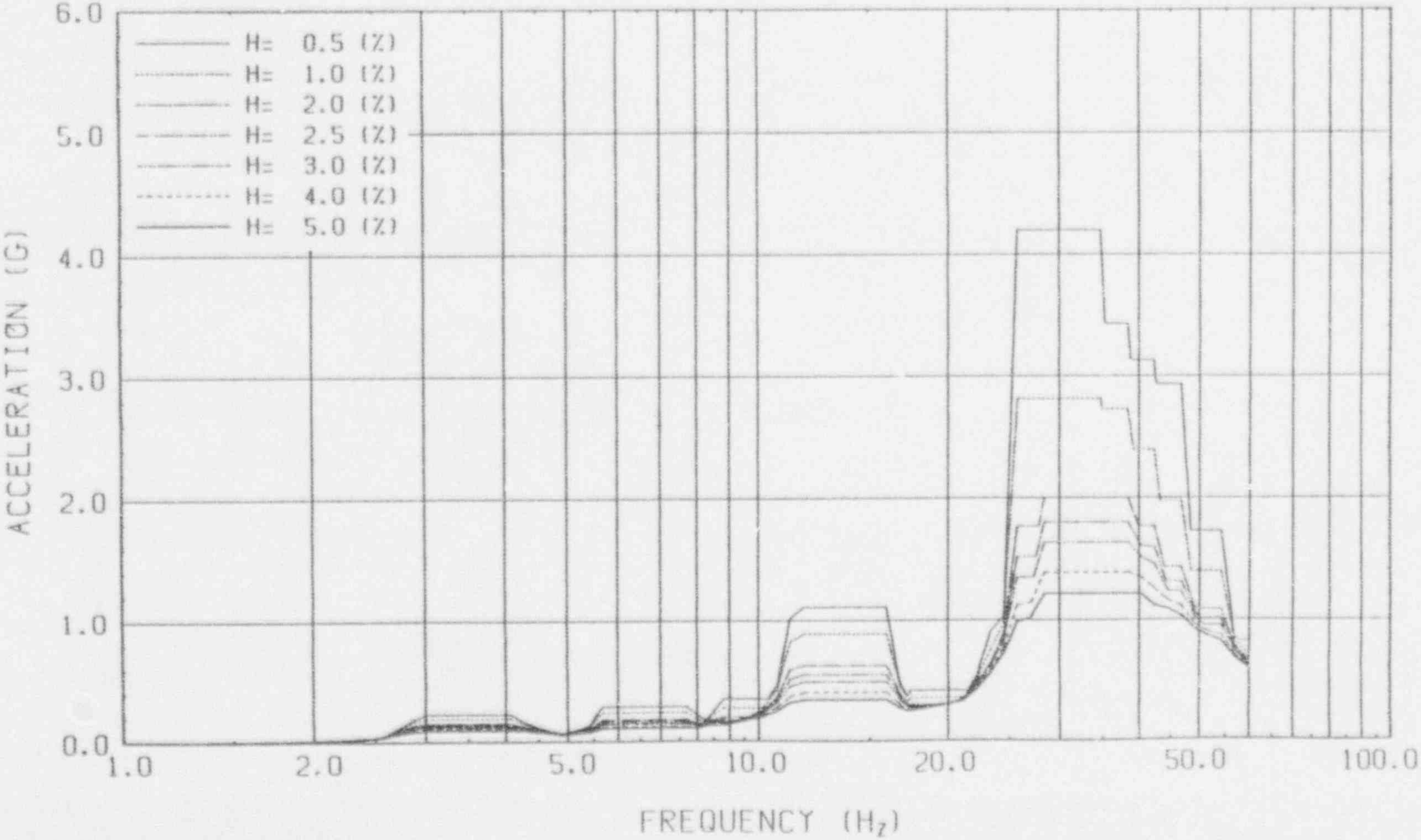


FIG. A-911 FLOOR RESPONSE SPECTRUM

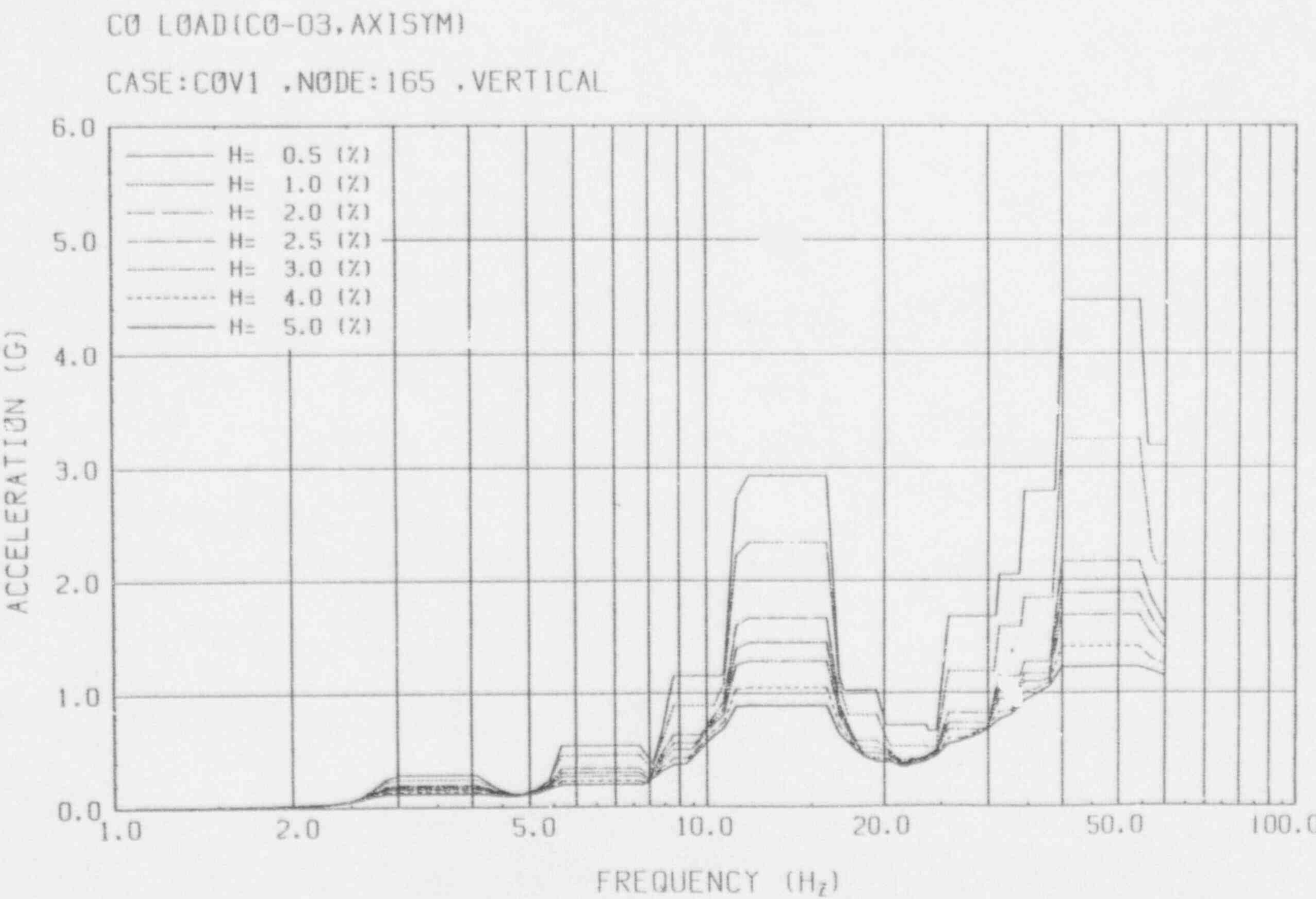


FIG. A-919 FLØØR RESPØNSE SPECTRUM

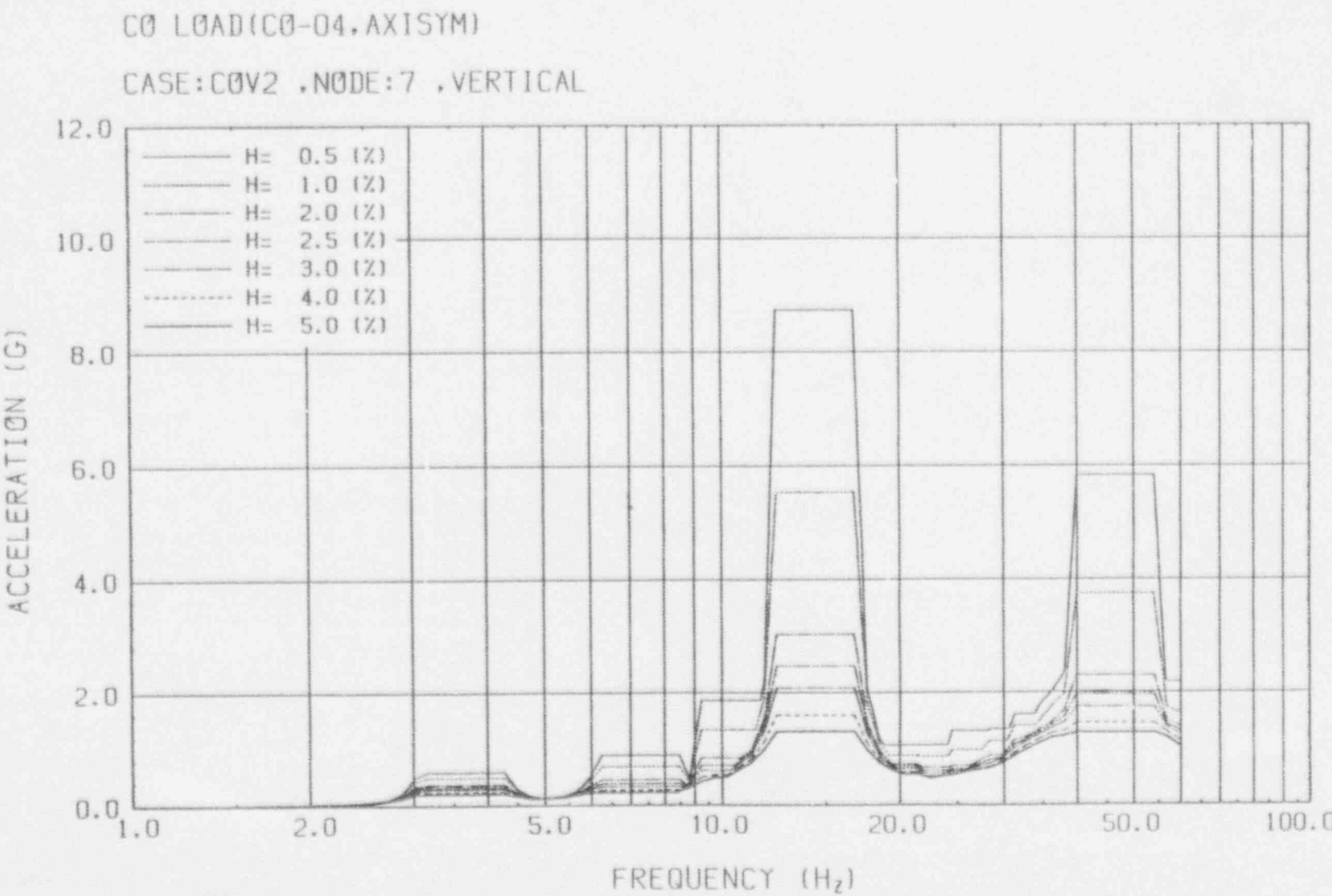


FIG. A-929 FLOOR RESPONSE SPECTRUM

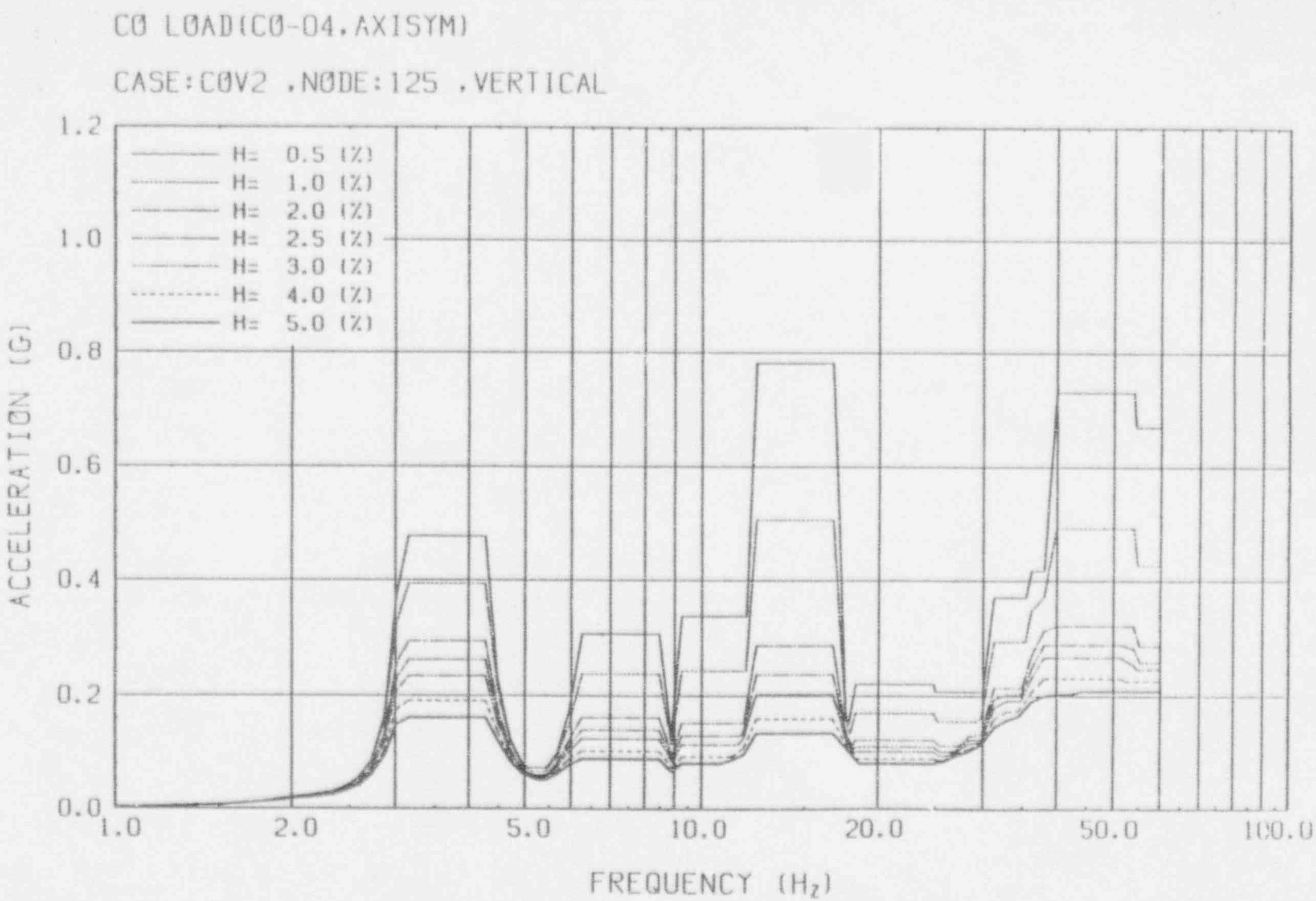


FIG. A-942 FLOOR RESPONSE SPECTRUM

CO LOAD(CO-04.AXISYM)

CASE:COV2 .NODE:148 .VERTICAL

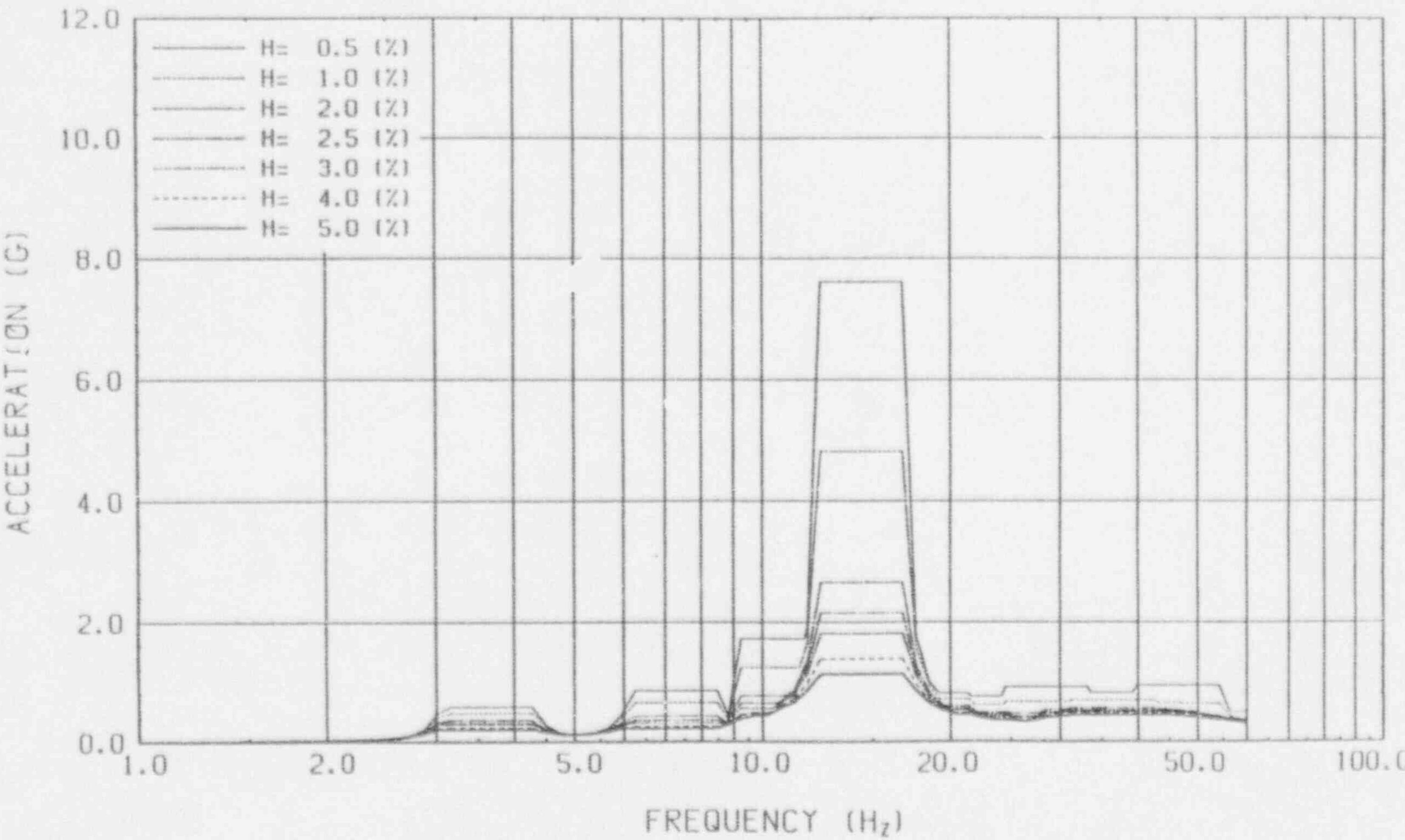


FIG. A-948 FLOOR RESPONSE SPECTRUM

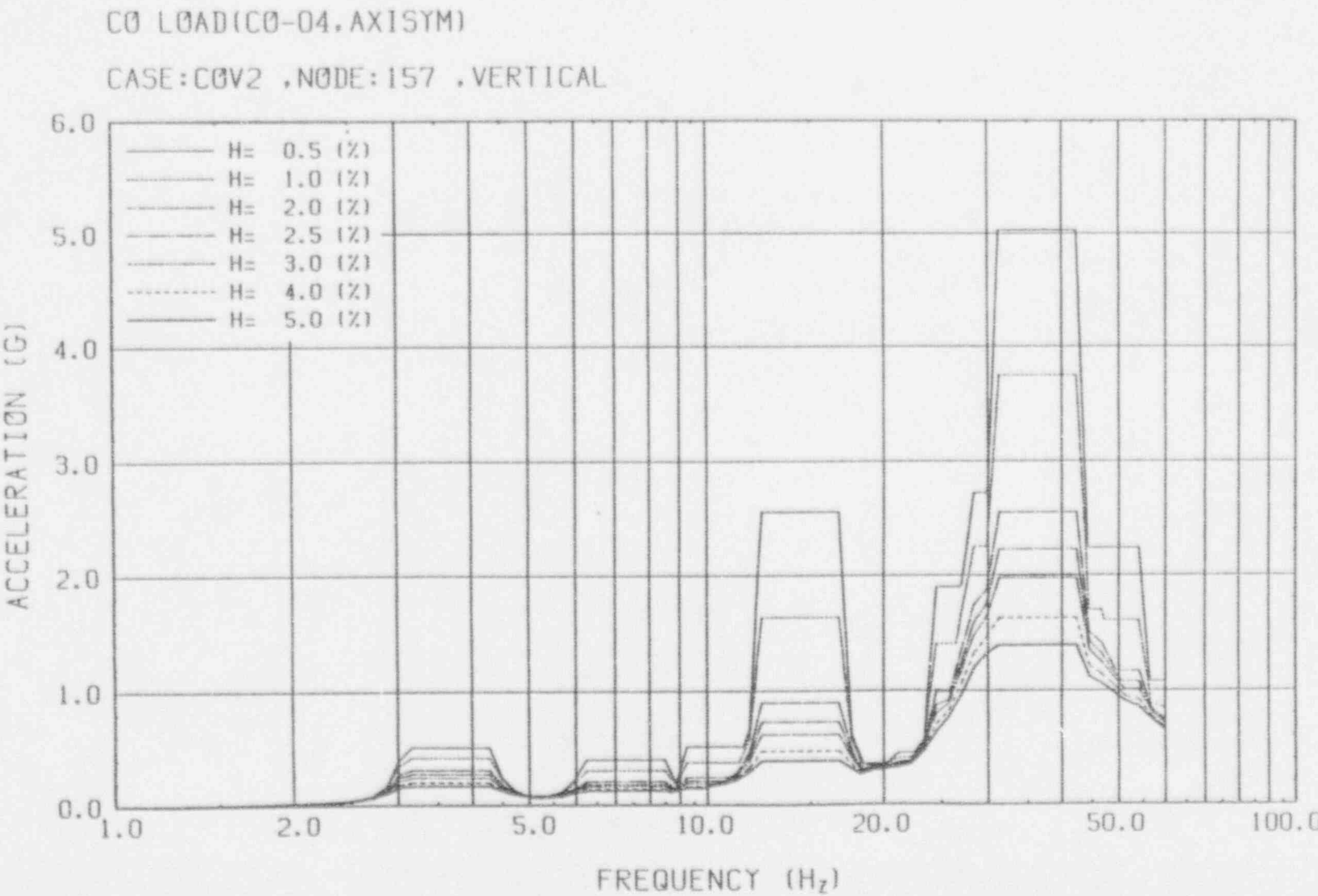


FIG. A-951 FLØØR RESPØNSE SPECTRUM

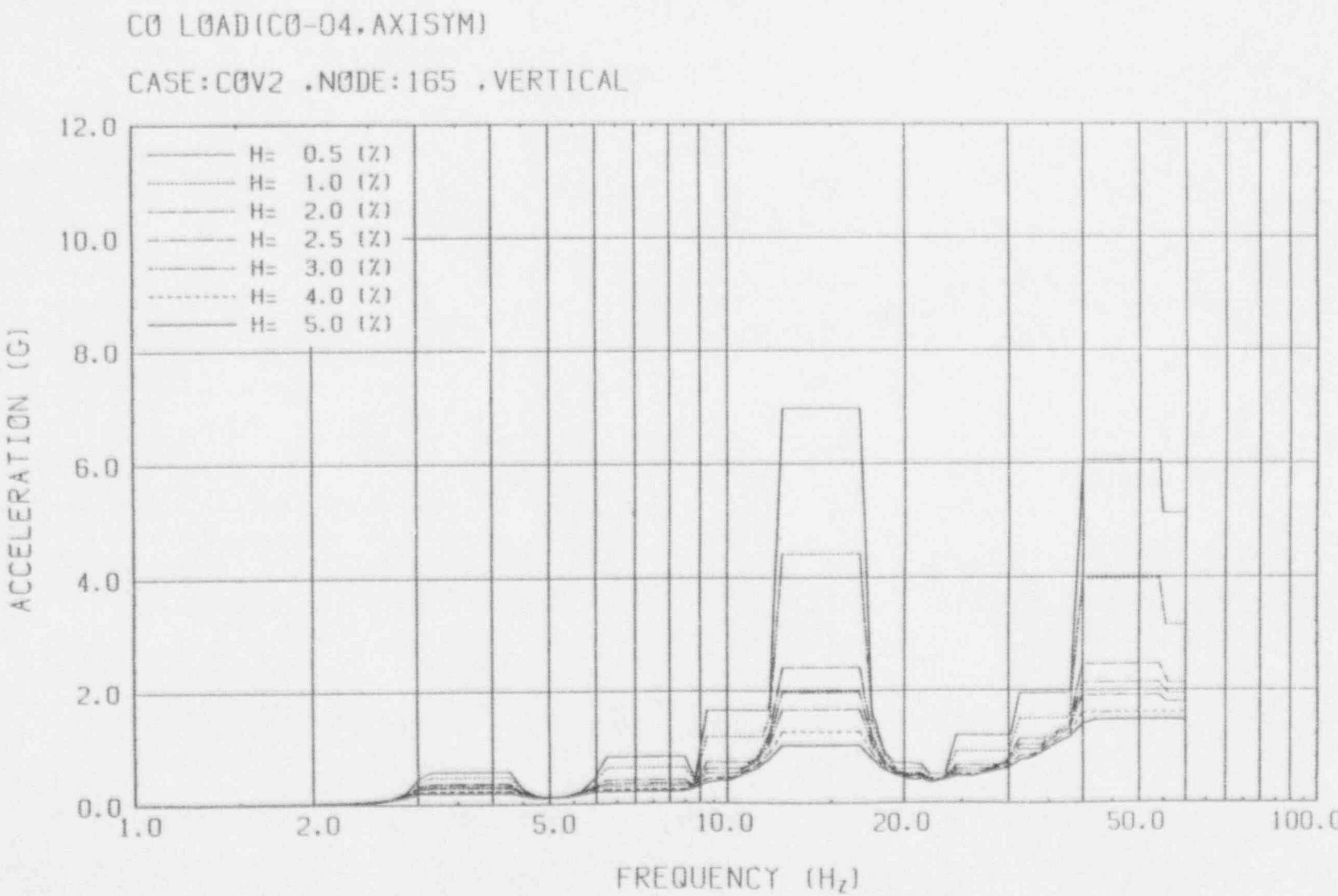


FIG. A-959 FLOOR RESPONSE SPECTRUM

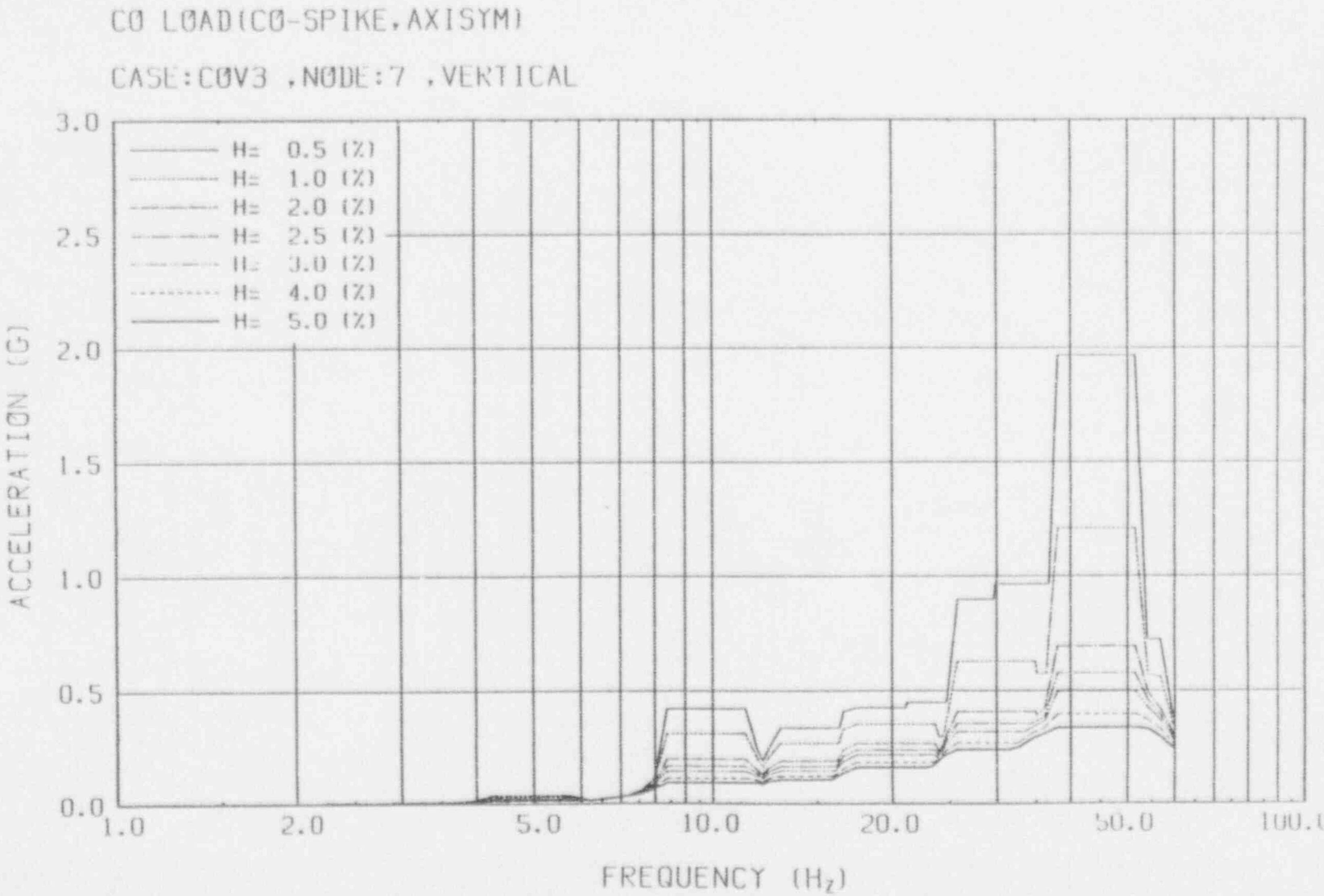


FIG. A-969 FLOOR RESPONSE SPECTRUM

A-969

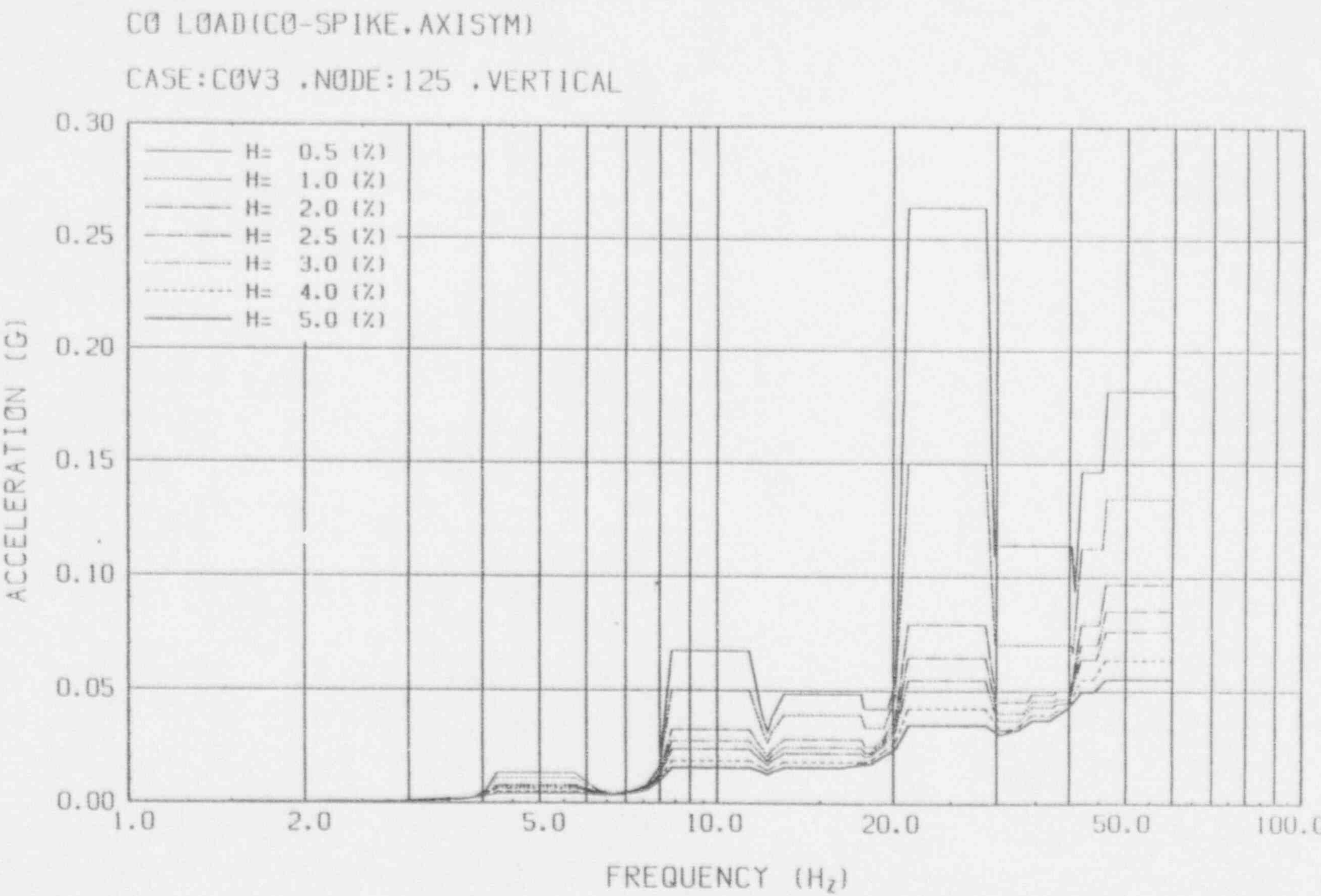


FIG. A-982 FLØØR RESPØNSE SPECTRUM

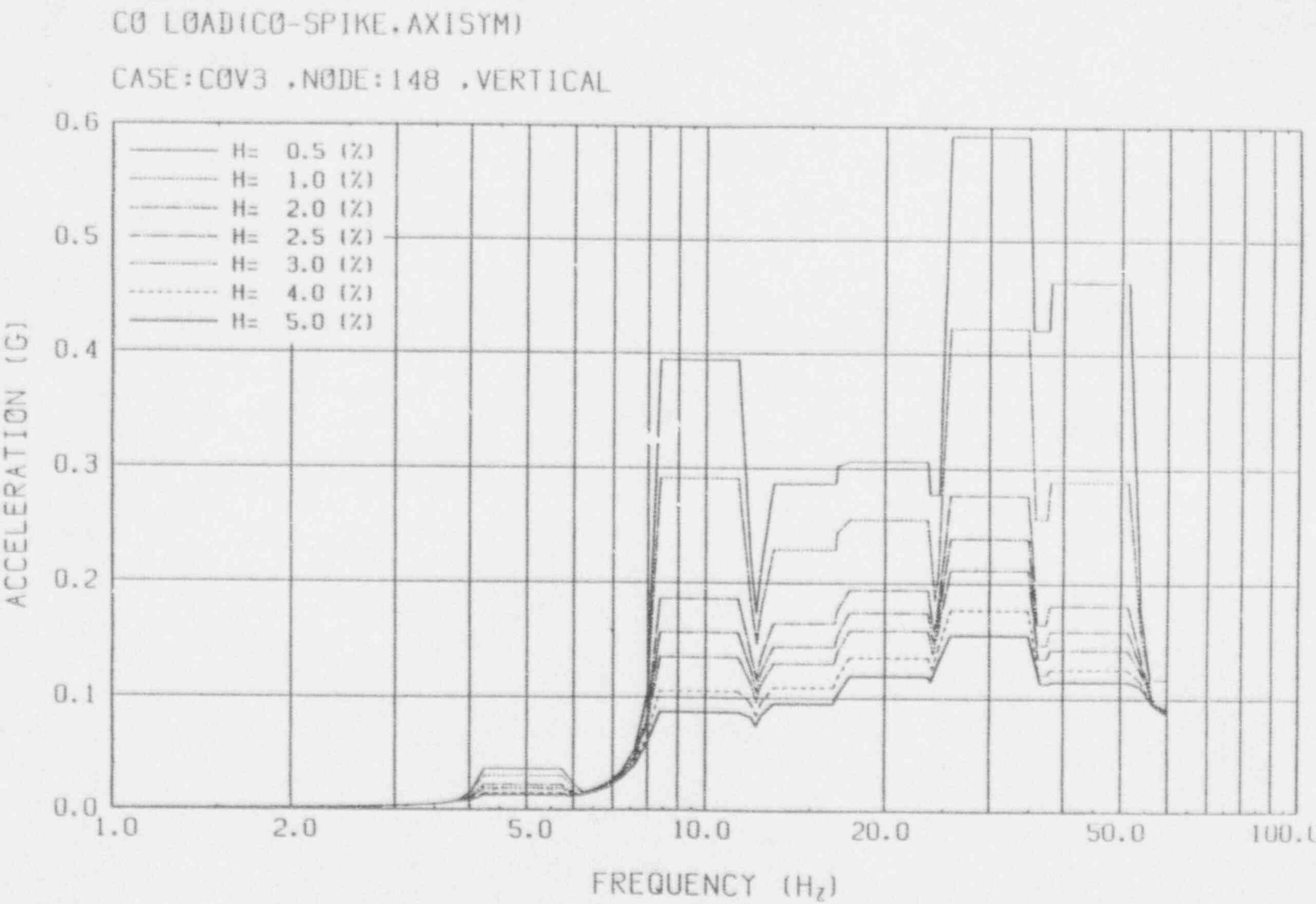


FIG. A-988 FLØØR RESPØNSE SPECTRUM

A-988

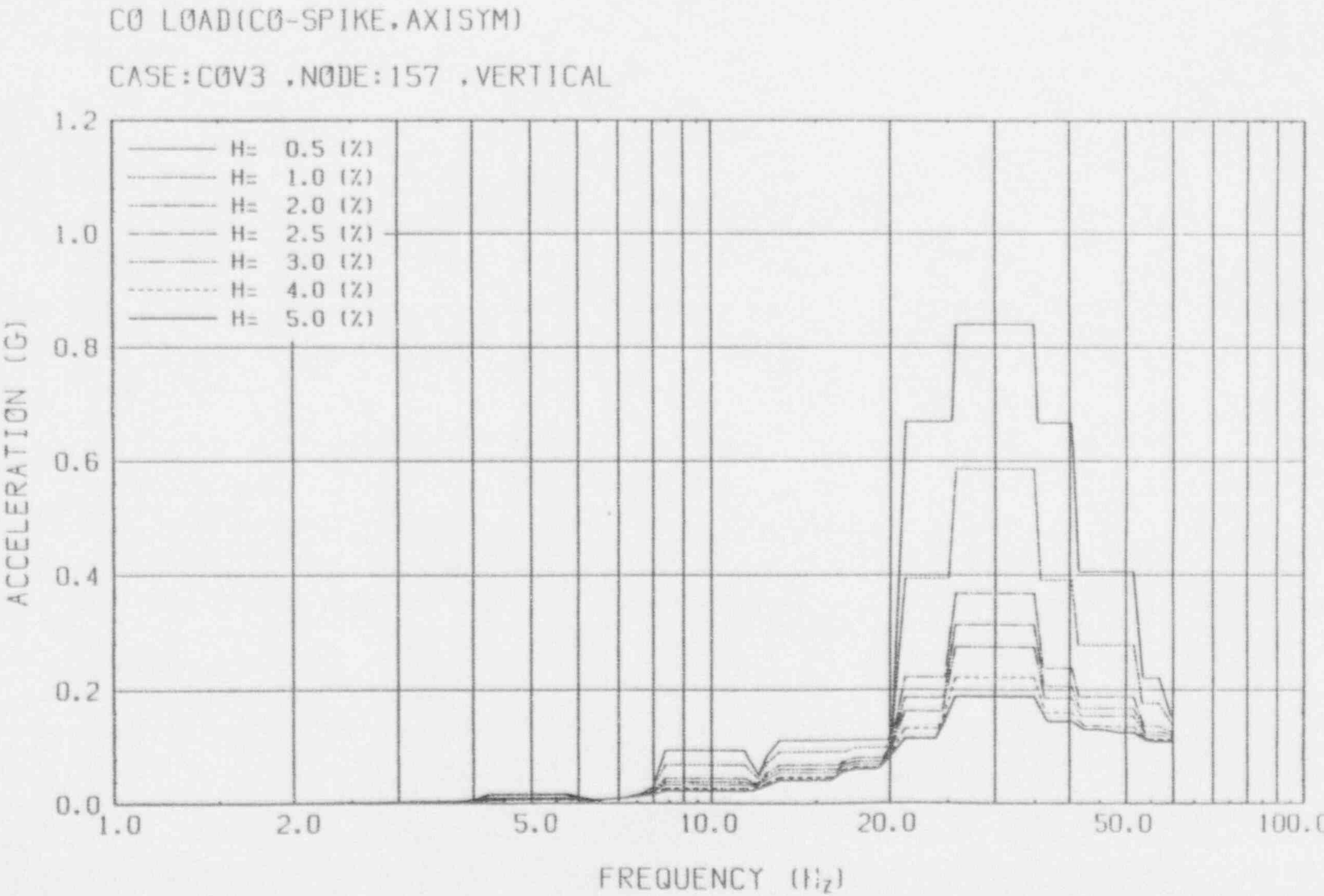


FIG. A-991 FLØØR RESPØNSE SPECTRUM

CØ LØAD(CØ-SPIKE.AXISYM)

CASE:CØV3 ,NØDE:165 ,VERTICAL

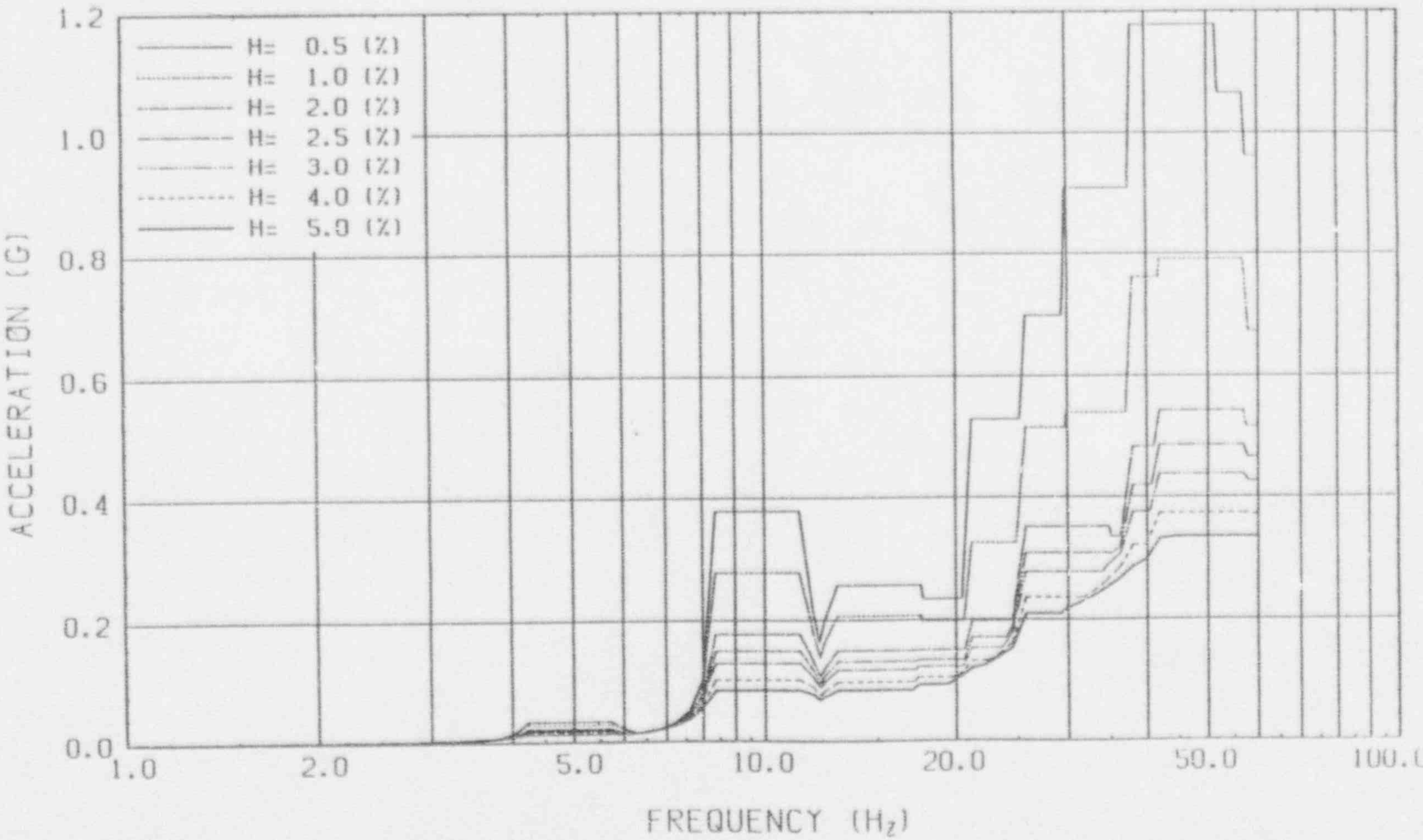


FIG. A-999 FLØØR RESPØNSE SPECTRUM