Entergy
Operations

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September 18, 1992

0CAN099201

U. S. Nuclear Regulatory Commission
Document Control Desk
Mail Station P1-137
Washington, DC 20555

Subject: Arkansas Nuclear One - Units 1 and 2
Docket Nos. 50-313 & 50-368
License Nos. DPR-51 & NPF-6
Response to Generic Letter 87-02, Supplement No. 1 -
SSER No. 2 on SQUG Generic Implementation Procedure,
Revision 2 and Generic Letter 88-20, Supplement No. 4 -
IPEEE for Severe Accident Vulnerabilities
(TAC Nos. M69426, M69427, M83588, and M83589)

Gentlemen:

By NRC letter dated May 22, 1992 (0CNA059214), licensees were requested to provide a schedule for implementing the Generic Implementation Procedure, Revision 2 (GIP-2) within 120 days of the issuance of Supplement 1 to Generic Letter 87-02 which transmitted the associated Supplemental Safety Evaluation Report No. 2 (SSER-2). In order to address Unresolved Safety Issue (USI) A-46, GIP-2 was developed by the Seismic Qualification Utility Group (SQUG) for seismic verification of nuclear plant equipment.

By letter dated December 19, 1991 (0CAN129101), Entergy Operations at Arkansas Nuclear One (ANO) committed to submit a schedule to complete our Individual Plant Examination of External Events (IPEEE) per Supplement 4 to Generic Letter 88-20 for both ANO units within 120 days following issuance of the GIP-2 SSER-2. Also, by NRC letter dated June 18, 1992 (0CNA069212), the Staff found our selected IPEEE methods acceptable and requested that we provide our projected milestones and schedule with our response to Supplement 1 to Generic Letter 87-02.

As a member of SQUG, Entergy Operations at ANO commits to apply the SQUG commitments in GIP-2 as supplemented by the clarifications, interpretations, and exceptions identified in SSER-2 and as clarified by the August 21, 1992, SQUG letter responding to SSER-2 for the resolution of USI A-46 at ANO-1 and ANO-2. Also, Entergy Operations at ANO will be guided by the GIP-2 implementation guidance which comprises suggested methods for implementing the applicable commitments. Any significant or programmatic deviations from the guidance portions of GIP-2 will be reported to the NRC as soon as practicable, but no later than the final USI A-46 summary report. Justifications for such deviations, as well as for other minor deviations, will be retained on site for NRC review.

A035 1 1

ADD: AEOD/DSP/TPAB 1 1
NRR/DREP/PRAB 1 1

ANO-2 is designated as a post-1976 operating license plant with non-Housner-type ground response spectra (Category 1 plant without double asterisks) in Table A of SSER-2. The in-structure response spectra included in the Safety Analysis Report (SAR) will be used for USI A-46 as the conservative, design in-structure response spectra for ANO-2.

ANO-1 is designated as a pre-1976 operating license plant (Category 3 plant) in Table A of SSER-2. The ANO-1 licensing-basis in-structure response spectra described in SAR section 3.1.6 as supplemented by Attachment 1 of this letter will be used as the conservative, design in-structure response spectra for USI A-46. Attachment 1 provides the information on which procedures and criteria were used to generate the in-structure response spectra for ANO-1.

Also, Entergy Operations at ANO intends to change its licensing basis methodology for verifying the seismic adequacy of new, replacement, and existing electrical and mechanical equipment prior to receipt of a final plant-specific SER resolving USI A-46. Changes will be conducted under 10CFR50.59 and will be consistent with the guidance in section 2.3.3 of Part I of GIP-2 and with the clarifications, interpretations, and exceptions identified in SSER-2 as clarified by the August 21, 1992, SQUG letter responding to SSER-2. Any necessary changes to our Safety Analysis Reports will be performed in accordance with 10CFR50.71(e).

As mentioned in our December 19, 1991 letter, the next realistic opportunity to perform the IPEEE/A-46 walkdowns is during the eleventh refueling outage for ANO-1 (1R11) and the tenth refueling outage for ANO-2 (2R10). These 1R11 and 2R10 milestone refueling outages are currently scheduled to begin in September of 1993 and February of 1994, respectively. Completion of 1R11 will occur approximately three months prior to the commencement of 2R10. Many of the same resources will be utilized for the IPEEE/A-46 effort for both ANO units, so development of the ANO-1 summary report will not be able to begin until subsequent to the ANO-2 refueling outage. Also, we plan to develop the summary reports simultaneously in order to incorporate lessons learned between the two ANO units, so both the ANO-1 and ANO-2 summary reports are expected to be submitted at approximately the same time frame. This schedule should allow implementation of GIP-2 and completion of the IPEEE/A-46 efforts for both ANO units in a time frame that supports submittal of summary reports by May of 1995.

The summary report submittal schedule is consistent with that requested for Supplement 1 to GL 87-02 on resolution of USI A-46 and is considered to be justified for Supplement 4 to GL 88-20 for IPEEE based on the outage milestone schedules discussed above. This schedule assumes prompt notification of the acceptability of the in-structure response spectra for ANO-1 as described in SSER-2. Should future proposed response spectra changes result within the 60 days following this submittal based on NRC's review of the ANO-1 in-structure response spectra, the IPEEE/A-46 completion date of May of 1995 may need to be rescheduled to permit coordination with future planned refueling outages.

This information is being provided under affirmation pursuant to 10CFR50.54(f). If you have any further questions, please contact me or my staff.

Very truly yours,

James J. Fisicaro

James J. Fisicaro
Director, Licensing

JJF/NBM/sjf
Attachments

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STATE OF ARKANSAS)
) SS
COUNTY OF LOGAN)

Affidavit

I, James J. Fisicaro, being duly sworn, subscribe to and say that I am Director, Licensing at ANO for Entergy Operations, that I have full authority to execute this affidavit; that I have read the document numbered 0CAN099201 and know the contents thereof; and that to the best of my knowledge, information and belief the statements in it are true.

James J. Fisicaro
James J. Fisicaro

SUBSCRIBED AND SWORN TO before me, a Notary Public in and for the County and State above named, this 18th day of September, 1992.

Sandy Siebenmorgen
Notary Public

My Commission Expires:

May 11, 2000

ATTACHMENT 1

Description of Licensing-Basis

In-structure Response Spectra

For Use in Resolving USI A-46

For ANO-1

The procedures and criteria used to generate the licensing basis in-structure response spectra to be used by Entergy Operations to resolve USI A-46 at Arkansas Nuclear One (ANO) Unit 1 are described below:

The Seismic Class I Structures at ANO-1 are founded on bedrock.

The "Design Earthquake" (OBE) for ANO-1 consists of a .1g horizontal ground acceleration and .067g vertical ground acceleration, acting simultaneously. The "Maximum Earthquake" (DBE) consists of .2g horizontal ground acceleration and .133g vertical acceleration, acting simultaneously. Copies of SAR Figures 5-10 (Design Earthquake) and 5-11 (Maximum Earthquake), which are the ANO-1 design spectrum response curves, are attached.

The earthquake analyses of the Seismic Class I structures at ANO-1 were accomplished using the spectrum response or time history approaches which utilized the natural period, mode shapes and appropriate damping values of the particular system. Copies of SAR Figures 5-12 (Mathematical Model of the Reactor Building), 5-13 (Mathematical Model of the Intake Structure) and 5-14 (Mathematical Model of the Auxiliary Building) are attached.

The details of the procedure used to incorporate soil-structure interaction are discussed in the SAR Section 5.1.4.1. In general, soil properties were simulated by introducing springs into the mathematical model. The soil spring constants were developed using the material properties of the soil based on laboratory test results of samples. Rocking, vertical, translational and torsional damping effects due to soil-structure interaction were conservatively neglected. Separate springs were developed for the Reactor Building (circular base) and for the Intake Structure and Auxiliary Building (rectangular base). In both cases, an infinitely rigid structure was assumed in the vertical direction.

After the spring constants were determined, the springs were modeled by axial members and incorporated into the mathematical models, the results of which are shown on attached SAR Figures 5-12, 5-13 and 5-14.

Attached are copies of ANO-1 Floor Response Spectra Curves (and calculated peak accelerations at 5% critical damping) for its Class I Structures at important floor elevations (See Figures on pages 8-26):

Reactor Building:	Peak Accel:
Elevation 336'-6" (Base Mat-Horiz)	.38g
Elevation 357'-6" (Internal Structure-Horiz)	.56g
Elevation 374'-6" (Internal Structure-Horiz)	.74g
Elevation 401'-6" (Internal Structure-Horiz)	1.18g
Elevation 355'-0" (Cylindrical Outer shell-Horiz)	.45g
Elevation 397'-0" (Cylindrical Outer shell-Horiz)	.63g
Elevation 439'-0" (Cylindrical Outer shell-Horiz)	1.09g
Vertical Acceleration Response Spectra - All Elev.	.22g

Auxiliary Building:	
Elevation 335'-0" & 317'-0" (Horiz)	.45g
Elevation 354'-0" (Horiz)	.79g
Elevation 372'-0" (Horiz)	1.03g
Elevation 386'-0" (Horiz)	1.22g
Elevation 404'-0" (Horiz)	1.24g
Vertical Acceleration Response Spectra - All Elev.	.22g

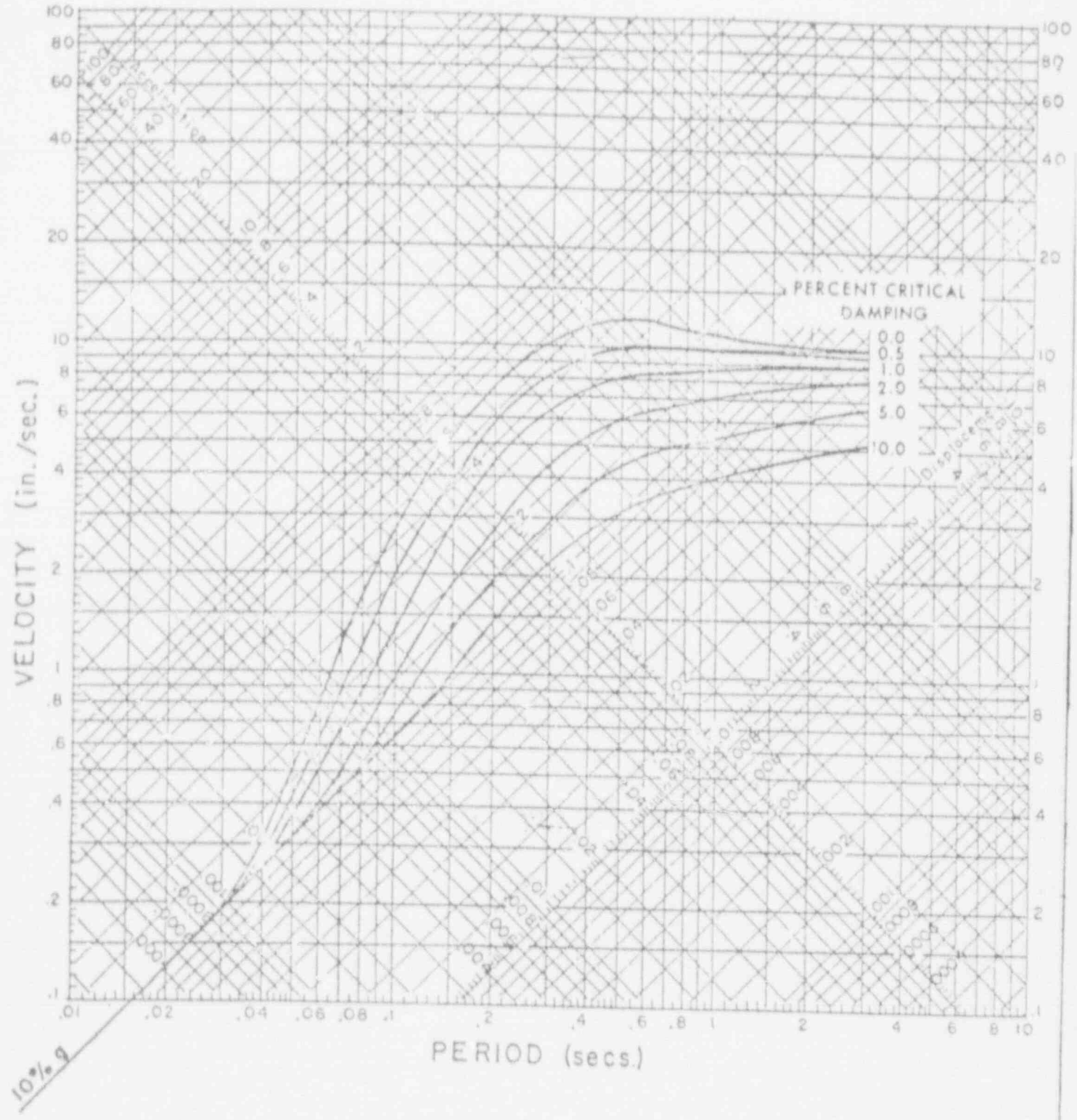
Intake Structure:	
Elevation 315'-0" & 322'-6" (Horiz)	.29g
Elevation 354'-0" (Horiz)	1.26g
Elevation 366'-0" (Horiz)	1.32g
Elevation 378'-0" (Horiz)	1.65g
Vertical Acceleration Response Spectra - All Elev.	.22g

NOTE: Horizontal peak acceleration values are for two directions.

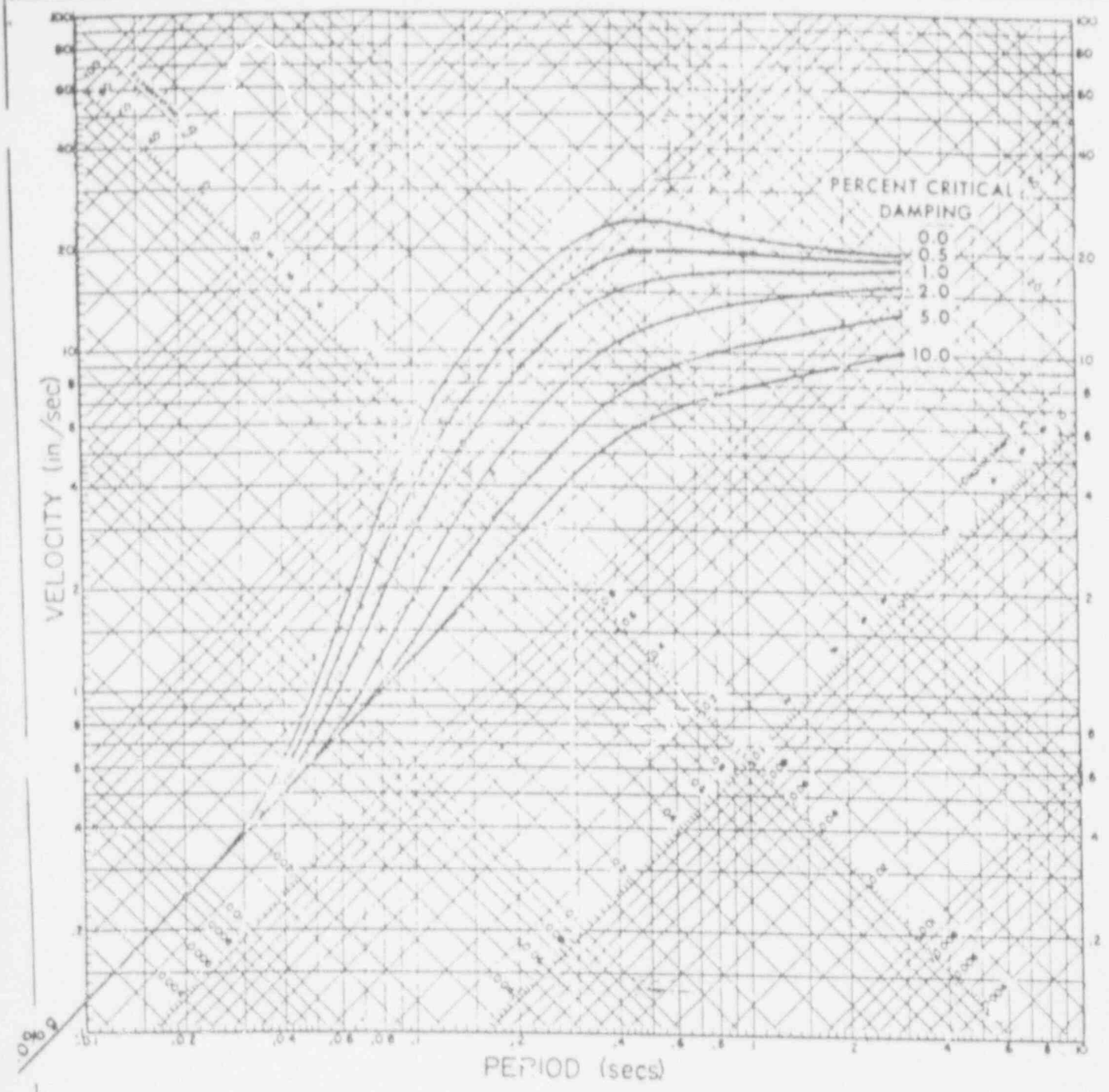
Fundamental Natural Frequencies for each of the ANO-1 Class I Structures are as follows:

	1st Mode	2nd Mode
Reactor Building:	3.25 Hz (Horiz.)	9.30 Hz (Horiz.)
Auxiliary Building:	3.40 Hz (Horiz.)	10.50 Hz (Horiz.)
Intake Structure:	2.00 Hz (Horiz.)	11.50 Hz (Horiz.)

NOTE: As previously discussed, the original seismic analysis for ANO-1 assumed an infinitely rigid structure in the vertical direction.



ARKANSAS POWER & LIGHT CO. ARKANSAS NUCLEAR ONE-UNIT 1	SPECTRUM RESPONSE CURVE DESIGN EARTHQUAKE	FIGURE NO. 5-10

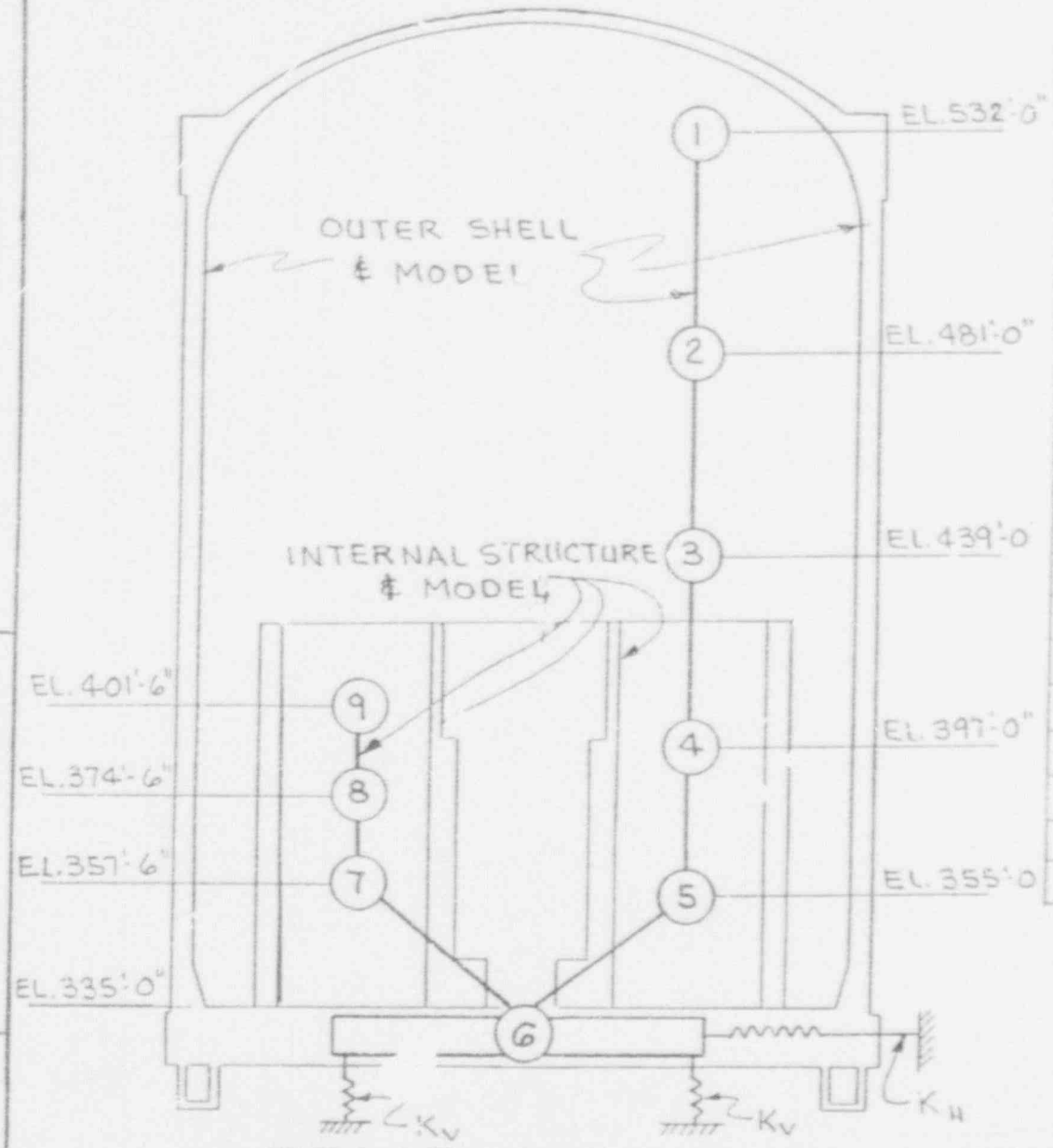


ARKANSAS POWER & LIGHT CO. ARKANSAS NUCLEAR ONE-UNIT 1	SPECTRUM RESPONSE CURVE- MAXIMUM EARTHQUAKE	FIGURE NO. 5-11

ARKANSAS POWER & LIGHT COMPANY
ARKANSAS NUCLEAR ONE-UNIT 1

MATHEMATICAL MODEL OF THE REACTOR BUILDING

FIG. NO. 5-12



REACTOR BUILDING

MASS POINT	WEIGHT (KIPS)	MOMENT OF INERTIA (FT^4)	CROSS SECTION AREA (FT^2)	SHEAR AREA (FT^4)
1	16918			
		2530000	1410	946
2	8914			
		2530000	1410	946
3	8914			
		2530000	1410	946
4	8914			
		2530000	1410	946
5	8914			
		2530000	1410	946
6	20194			
		927000	1730	843
7	7075			
		915000	1790	742
8	7808			
		841000	1690	1040
9	9588			

$K_H = 11.82 \times 10^6 K/FT.$

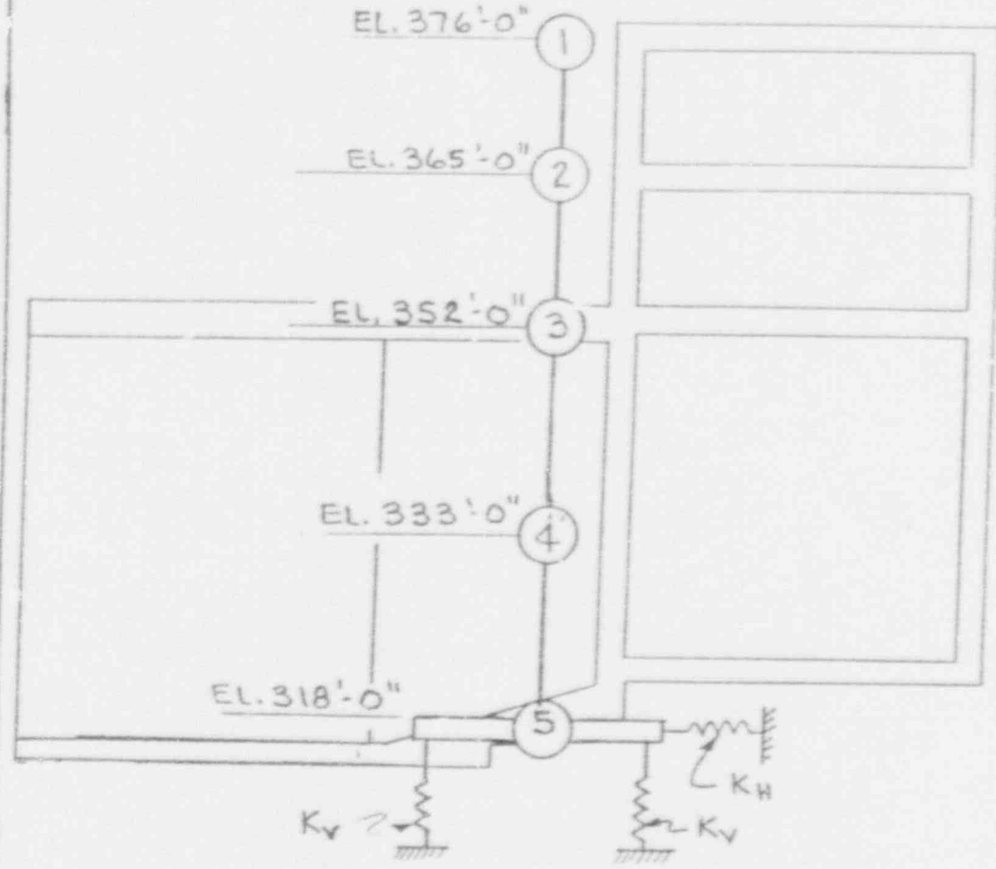
$K_V = 4.10 \times 10^6 K/FT.$

SPRINGS SIMULATE SOIL RESPONSE

ARKANSAS POWER & LIGHT COMPANY
ARKANSAS NUCLEAR ONE-UNIT 1

MATHEMATICAL MODEL OF THE INTAKE STRUCTURE

FIGURE NO. 5-13



INTAKE STRUCTURE

MASS POINT	WEIGHT (KIPS)	MOMENT OF INERTIA (FT^4)	CROSS SECTION AREA (FT^2)	SHEAR AREA (FT^2)
1	1106			
		81800	492	268
2	1310			
		81800	492	268
3	5850			
		680000	1354	370
4	2850			
		680000	1354	370
5	5060			

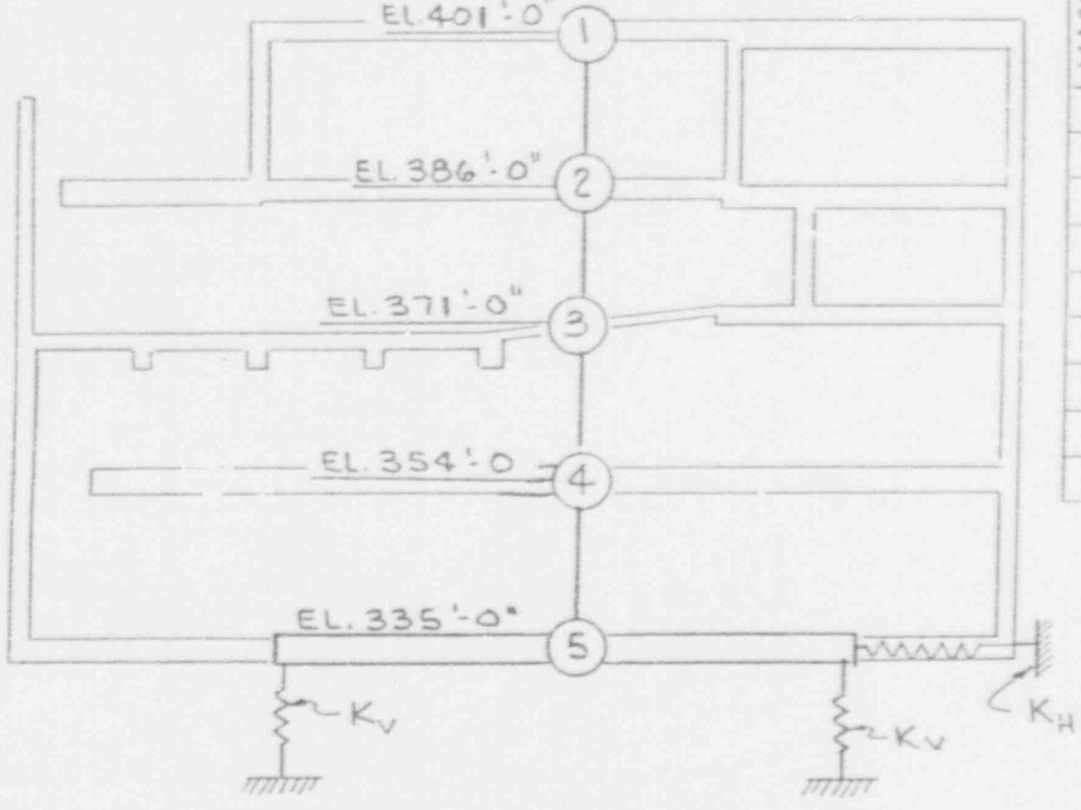
$K_H = 8.3 \times 10^6 K/FT$
$K_V = 3.84 \times 10^6 K/FT$
SPRINGS SIMULATE SOIL RESPONSE

AMENDMENT NO. 6

ARKANSAS POWER & LIGHT CO.
ARKANSAS NUCLEAR ONE-UNIT 1

MATHEMATICAL MODEL OF THE AUXILIARY BUILDING

FIG. NO. 5-14



AUXILIARY BUILDING

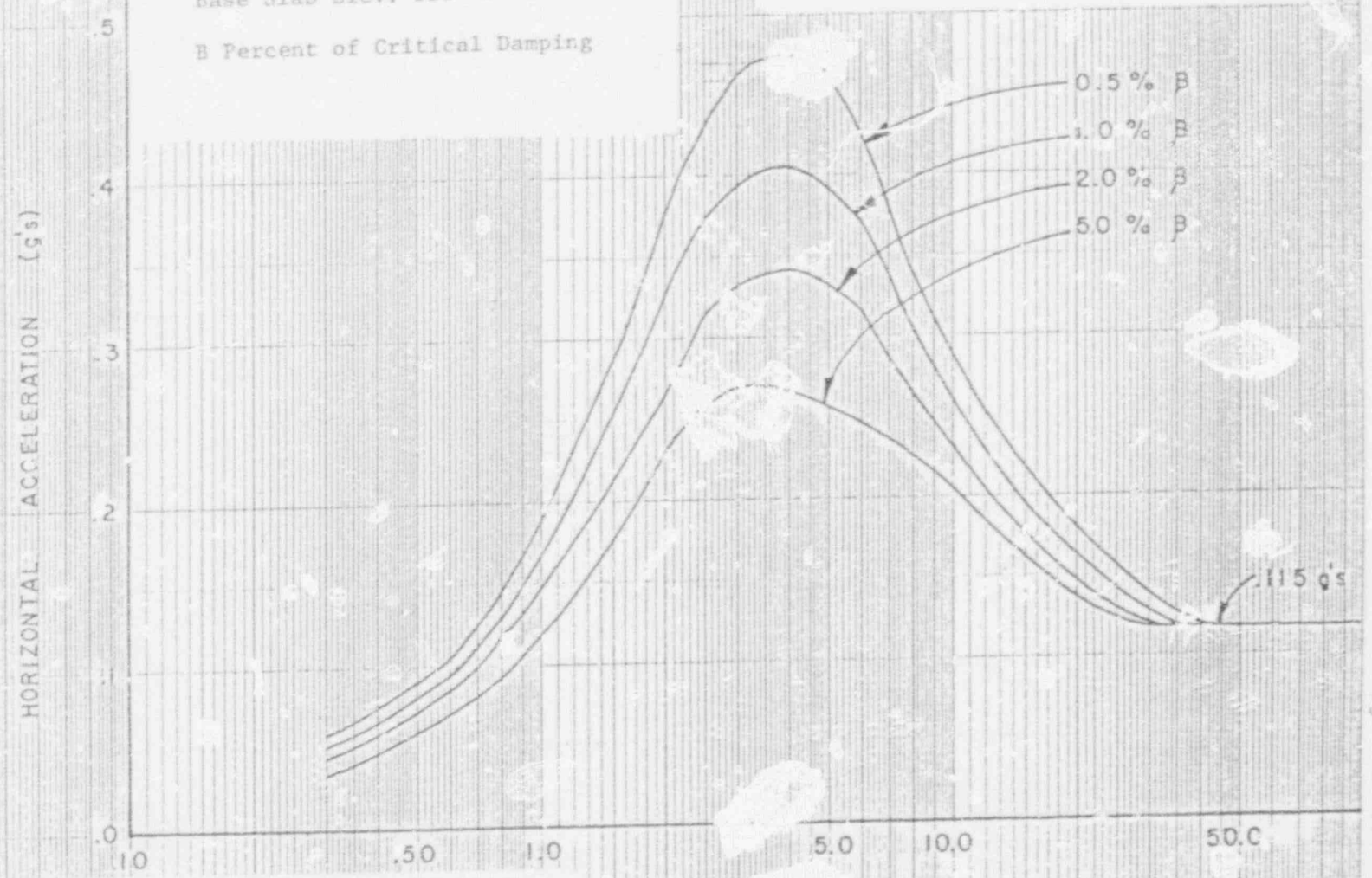
MASS POINT	WEIGHT (KIPS)	MOMENT OF INERTIA (FT^4)	CROSS SECTION AREA (FT^2)	SHEAR AREA (FT^2)
1	5790			
		1799000	2233	1049
2	9700			
		3281000	2924	1432
3	10340			
		2952000	2533	1072
4	15930			
		3691000	2362	948
5	7900			

$K_H = 13.7 \times 10^6 K/FT$
$K_V = 9.0 \times 10^6 K/FT$
SPRINGS SIMULATE SOIL RESPONSE
NOTE: MASS POINT (5) INCLUDES AREA @ EL. 317'-0"

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Reactor Building-Internal Structure
Elev. 336'-6" (Base Mat)

Reactor Building
Acceleration Response
Spectrum For
Base Slab Elev. 336'-6"

B Percent of Critical Damping



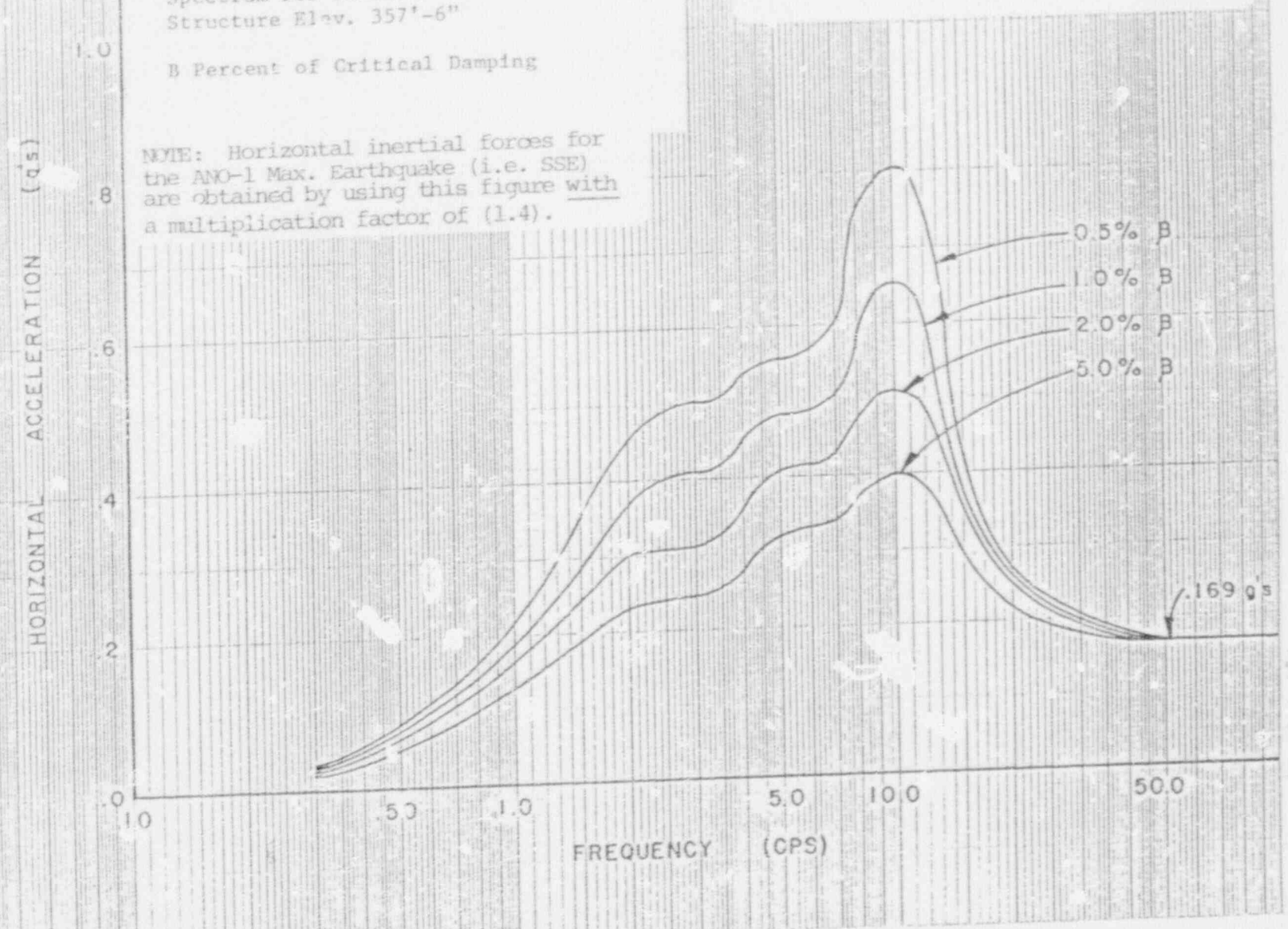
NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE, are obtained by using this figure with a multiplication factor of (1.4).

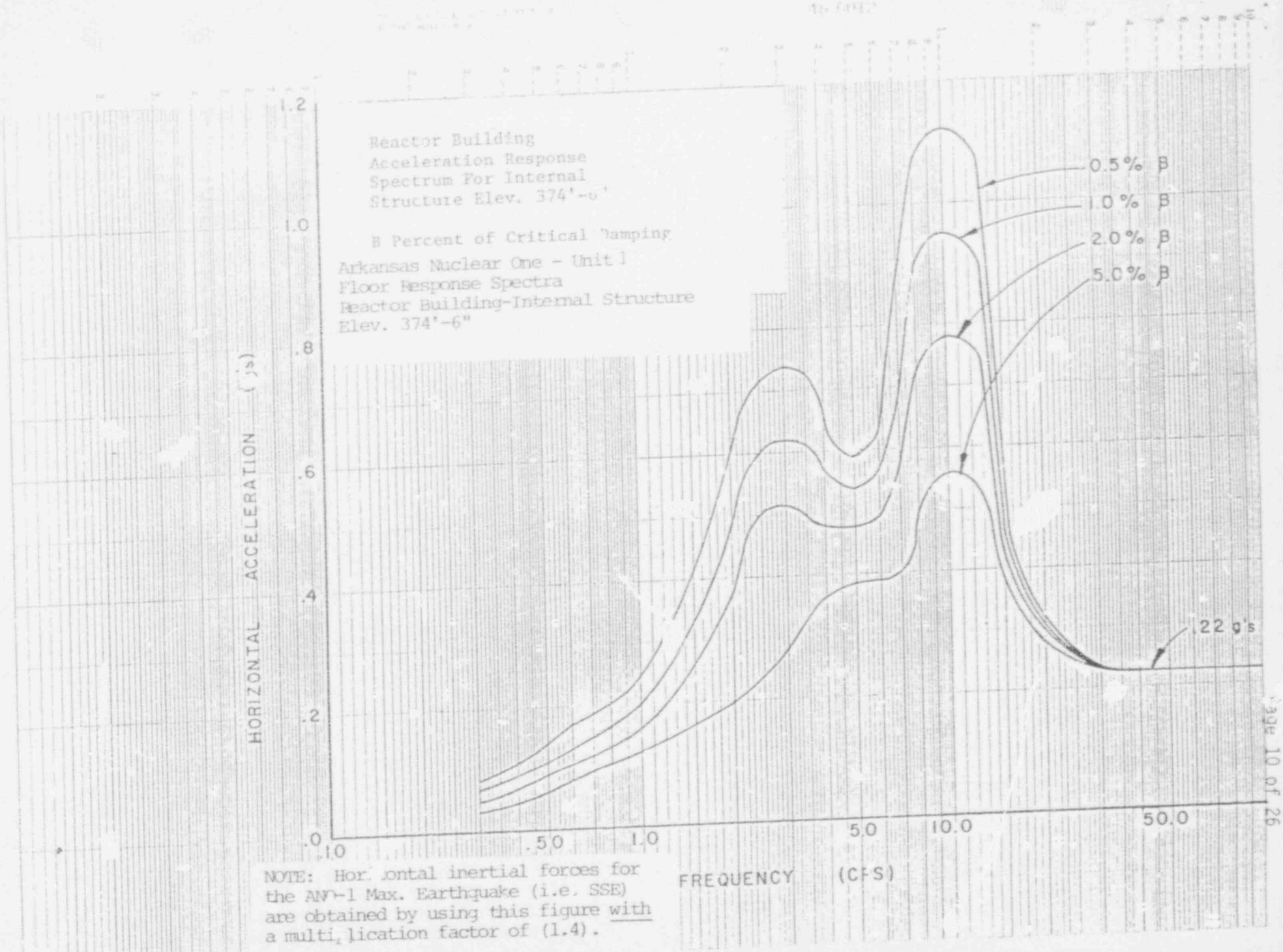
Arkansas Nuclear One - Unit 1
Floor Response Spectra
Reactor Building-Internal Structure
Elev. 357'-6"

Reactor Building
Acceleration Response
Spectrum For Internal
Structure Elev. 357'-6"

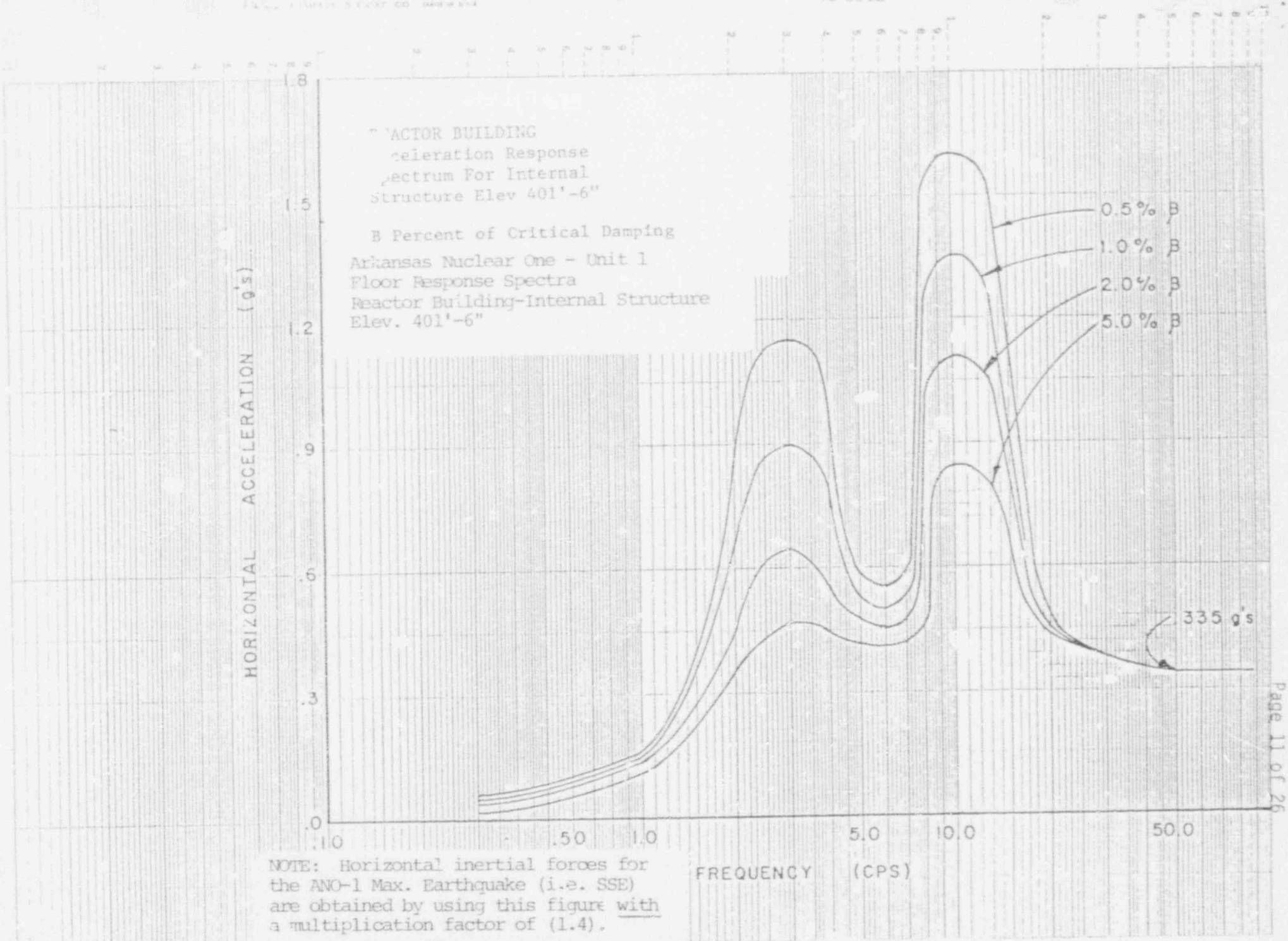
β Percent of Critical Damping

NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.4).





NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.4).

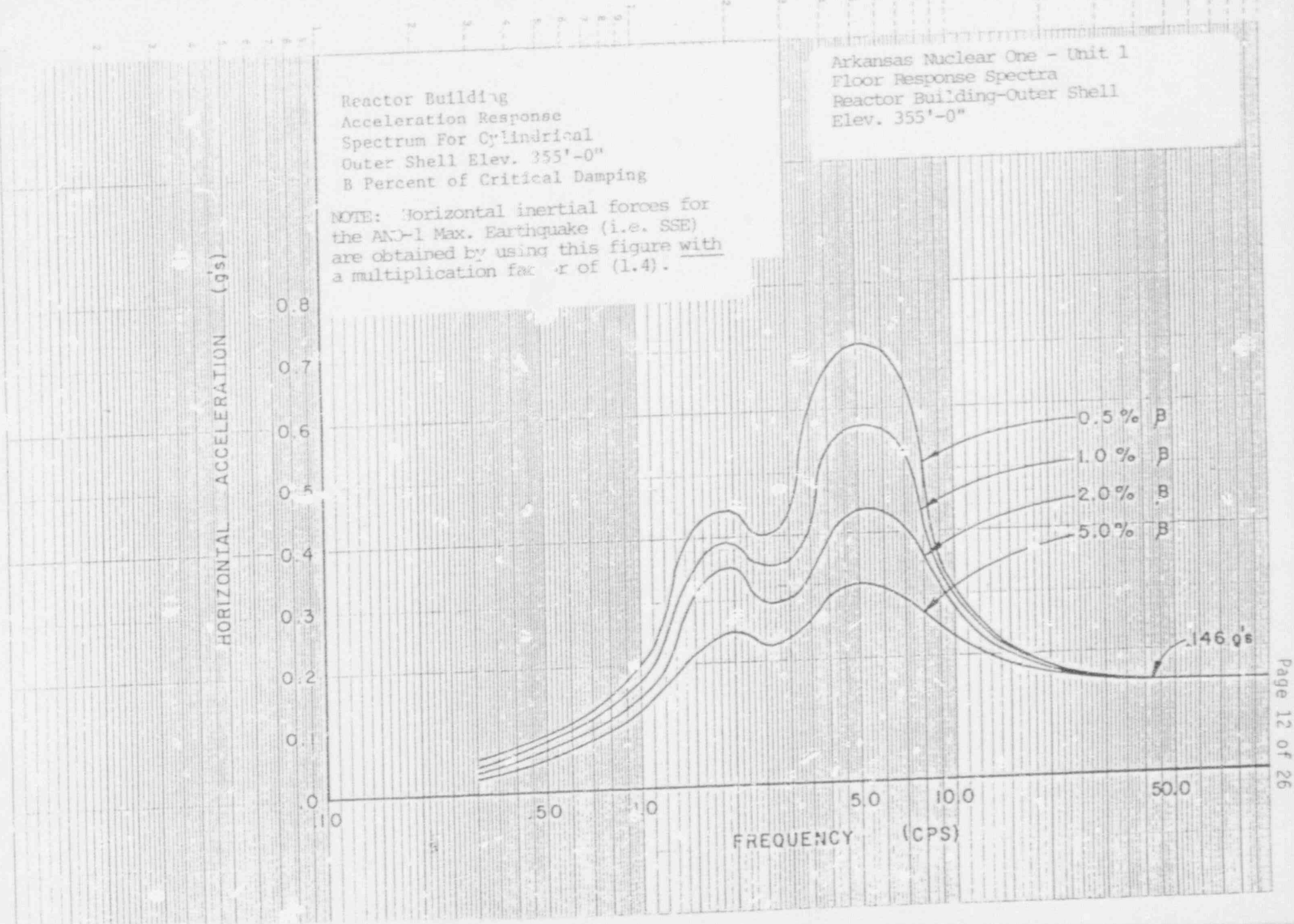


NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.4).

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Reactor Building-Outer Shell
Elev. 355'-0"

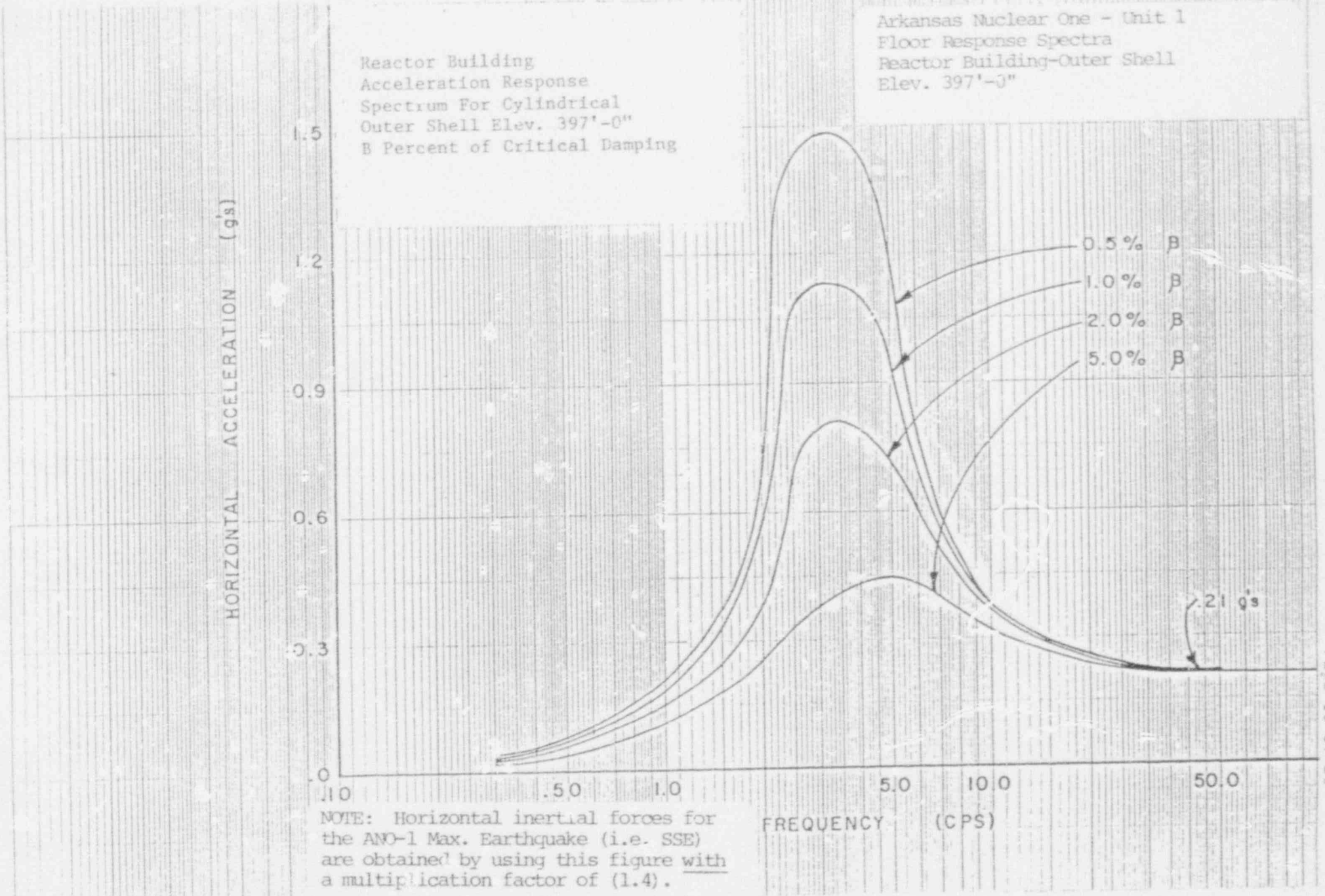
Reactor Building
Acceleration Response
Spectrum For Cylindrical
Outer Shell Elev. 355'-0"
B Percent of Critical Damping

NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.4).



Arkansas Nuclear One - Unit 1
Floor Response Spectra
Reactor Building-Outer Shell
Elev. 397'-0"

Reactor Building
Acceleration Response
Spectrum For Cylindrical
Outer Shell Elev. 397'-0"
β Percent of Critical Damping

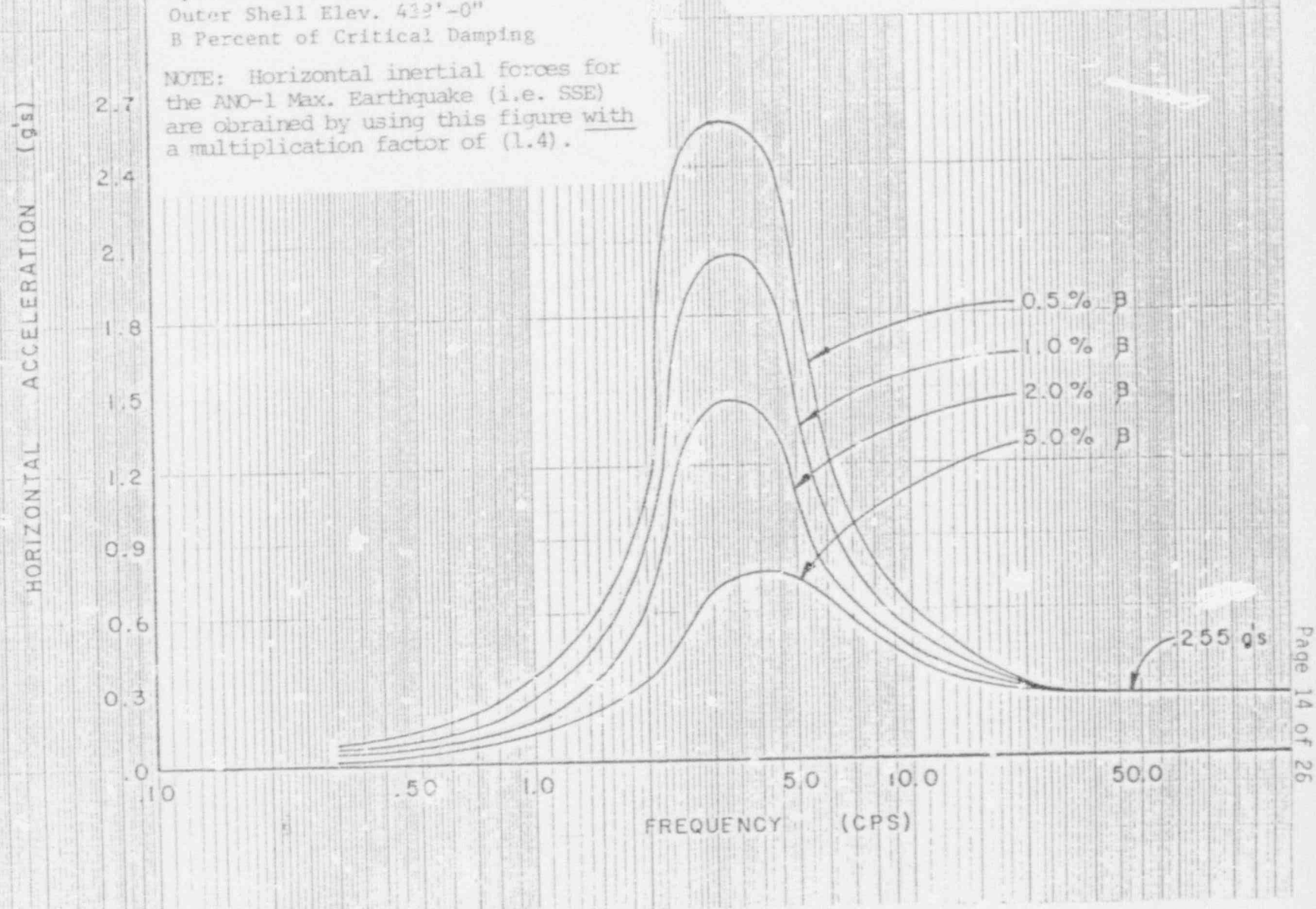


NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.4).

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Reactor Building-Outer Shell
Elev. 439'-0"

Reactor Building
Acceleration Response
Spectrum For Cylindrical
Outer Shell Elev. 439'-0"
B Percent of Critical Damping

NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obrained by using this figure with a multiplication factor of (1.4).



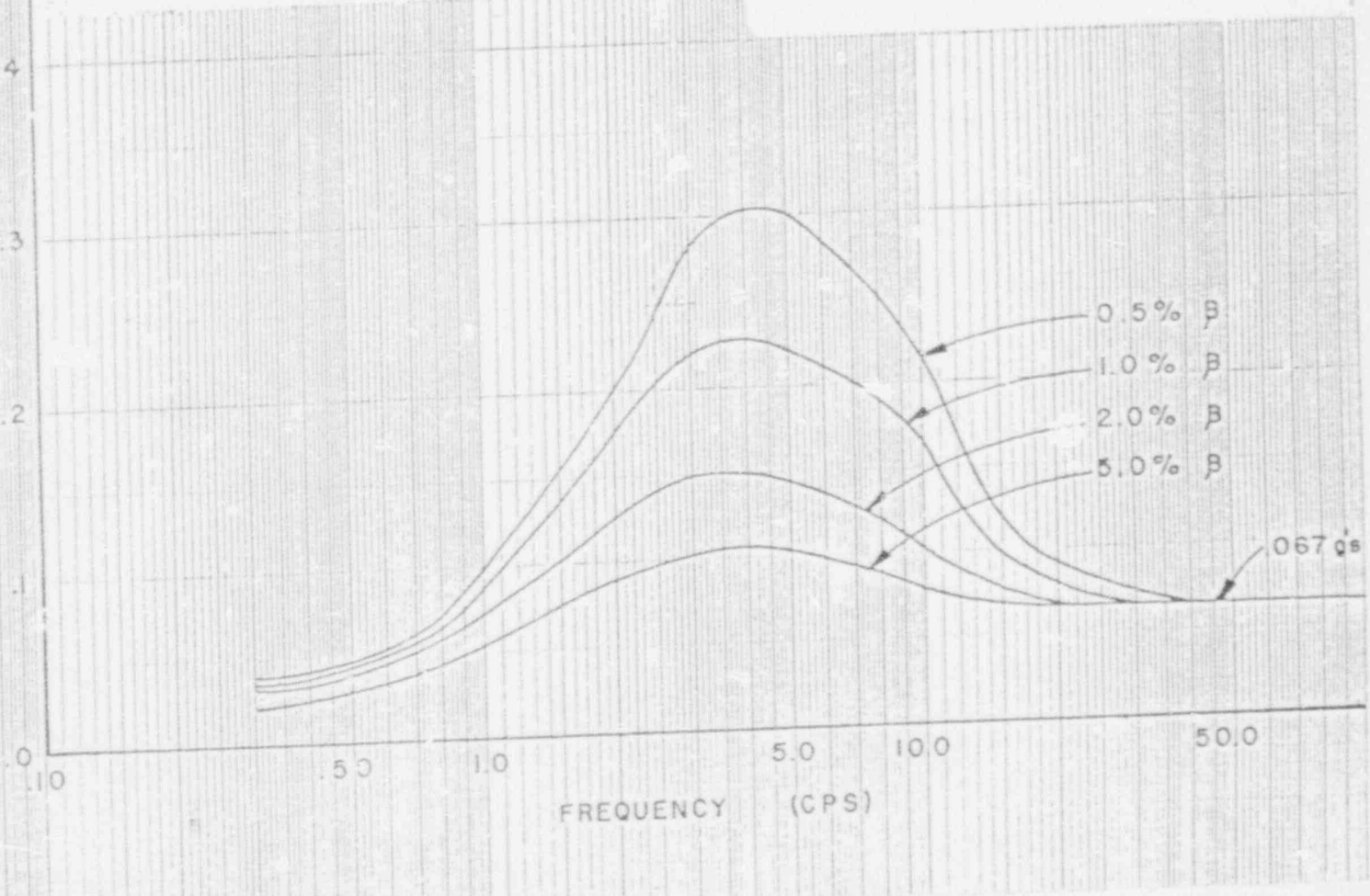
46 6012

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Reactor Building-All Elevations
Vertical Acceleration

Reactor Building
Acceleration Response
Spectrum For
All Elevations

B Percent of Critical Damping

NOTE: Vertical inertial forces for ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (2.0).

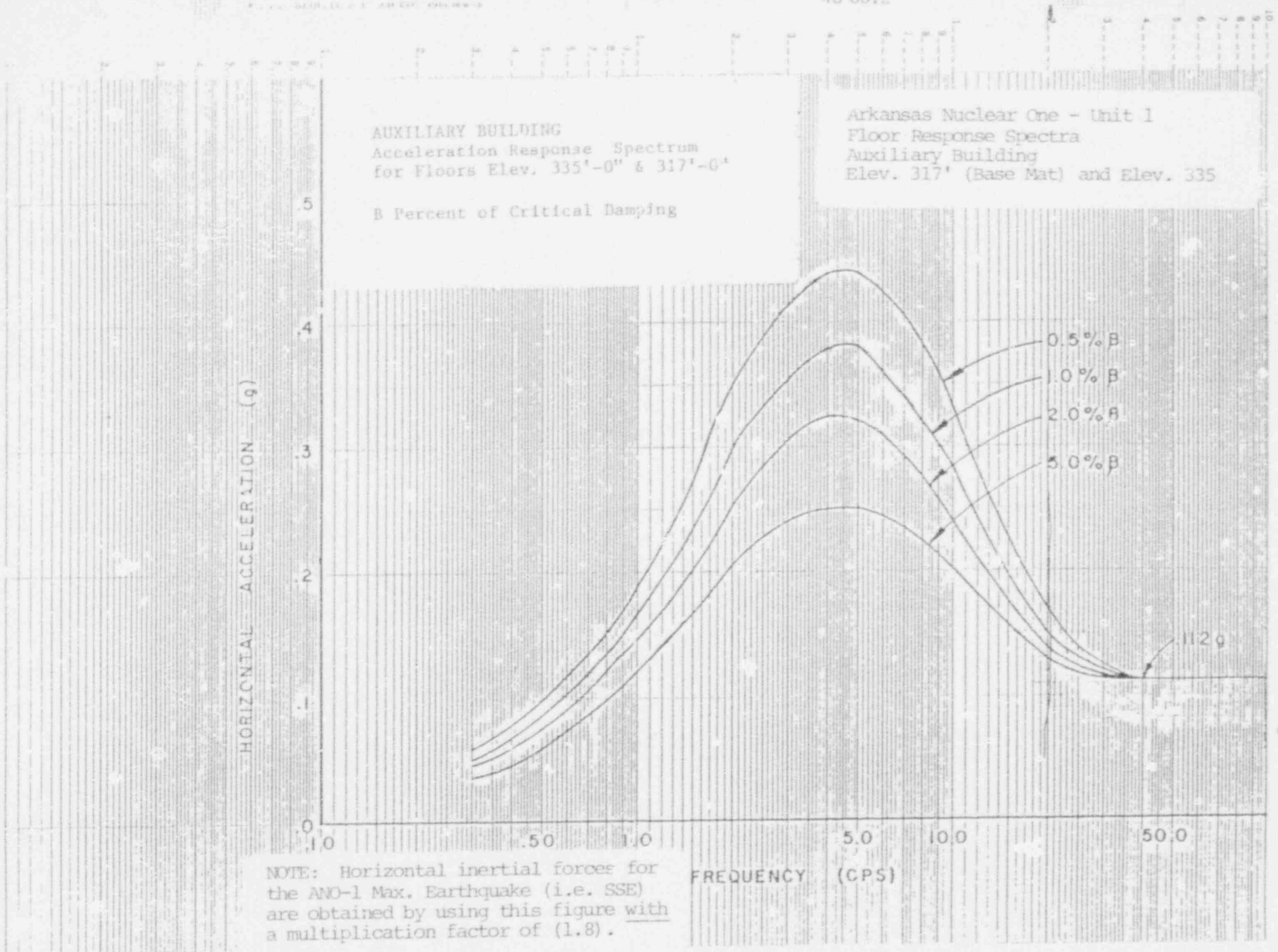


46 6012

AUXILIARY BUILDING
Acceleration Response Spectrum
for Floors Elev. 335'-0" & 317'-0"

B Percent of Critical Damping

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Auxiliary Building
Elev. 317' (Base Mat) and Elev. 335



NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.8).

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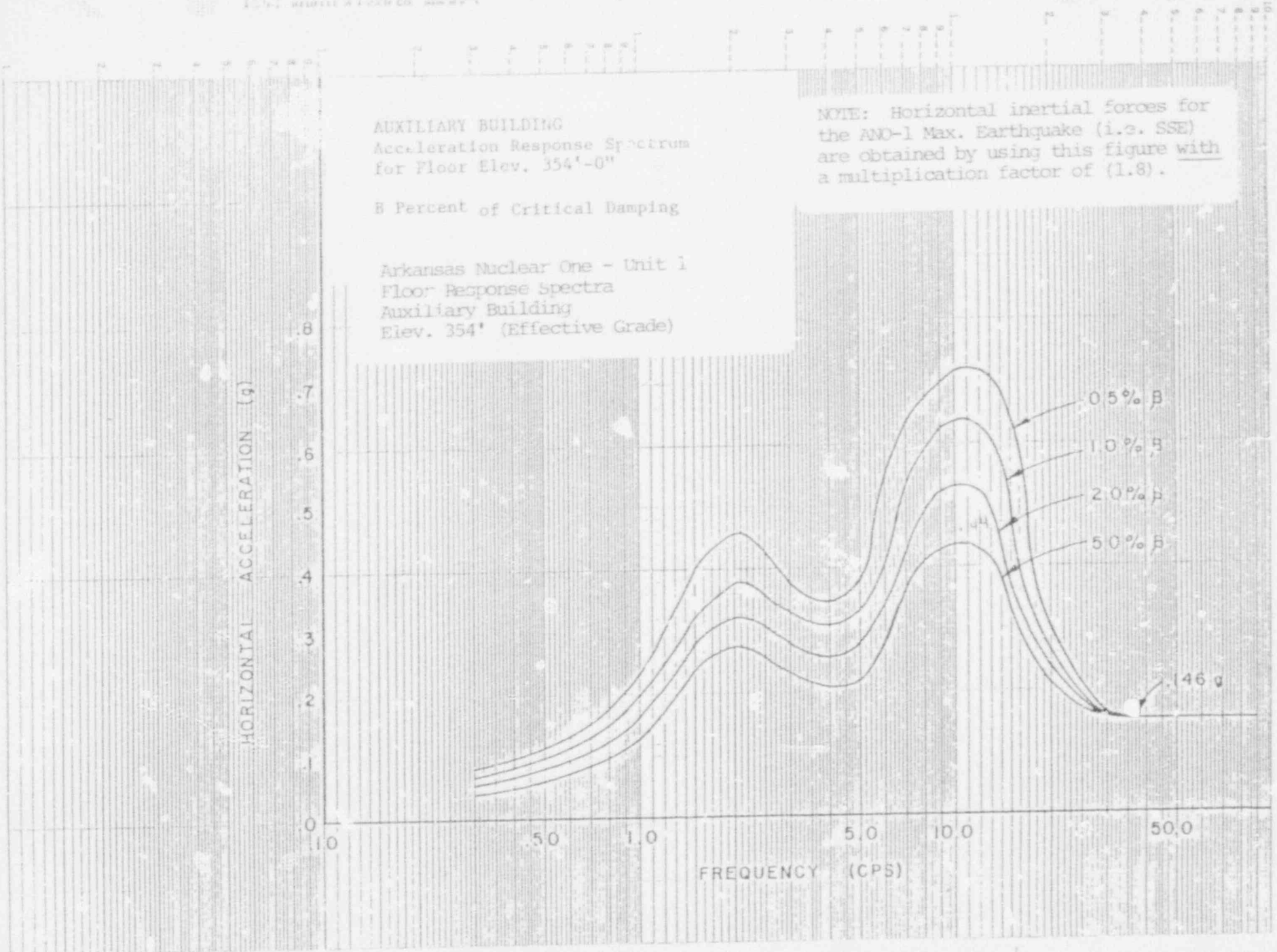
AUXILIARY BUILDING
Acceleration Response Spectrum
for Floor Elev. 354'-0"

B Percent of Critical Damping

NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.8).

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Auxiliary Building
Elev. 354' (Effective Grade)

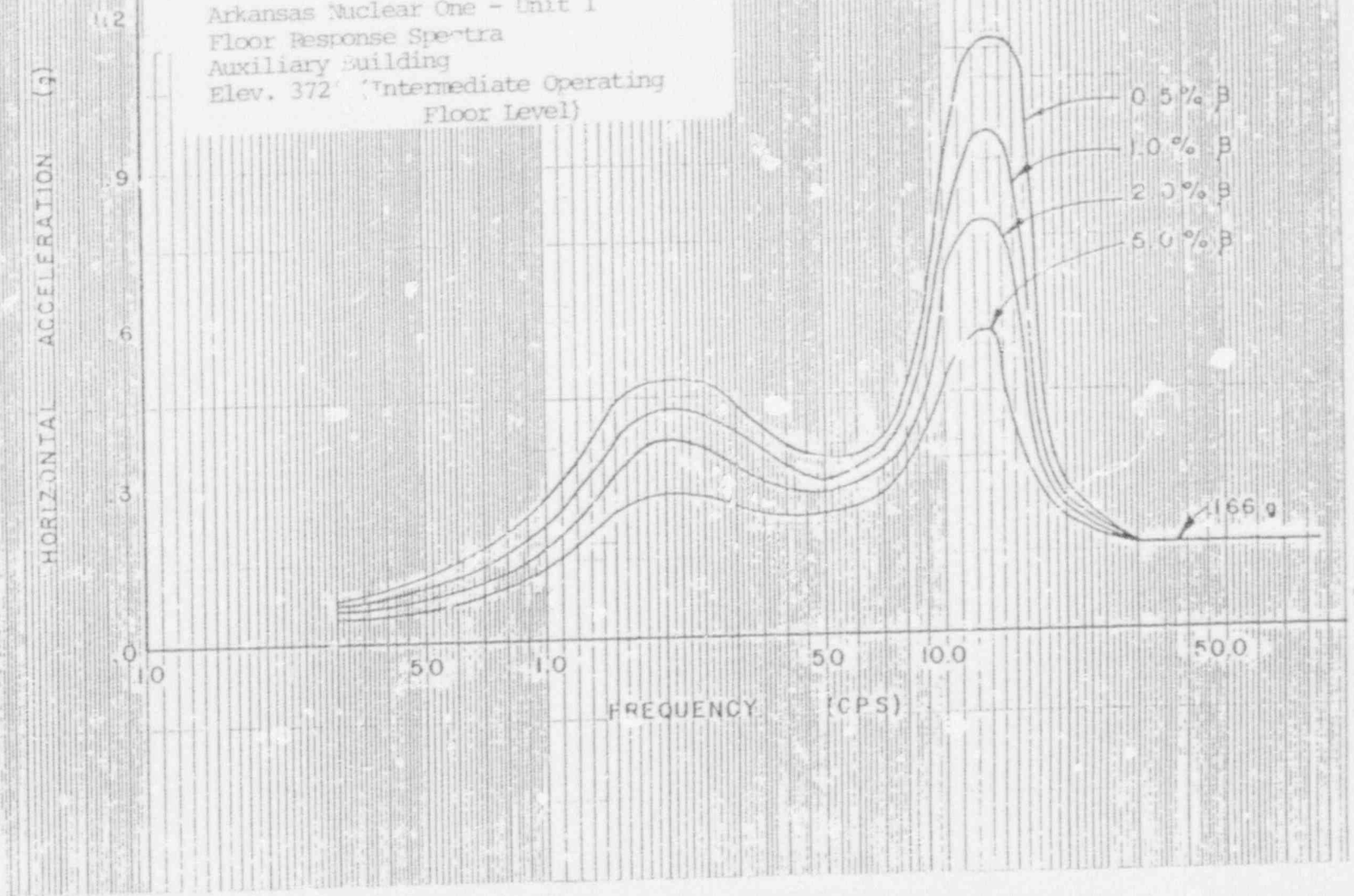


AUXILIARY BUILDING
Acceleration Response Spectrum
for Floor Elev. 372'-0"

β Percent of Critical Damping

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Auxiliary Building
Elev. 372' (Intermediate Operating Floor Level)

NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.3).

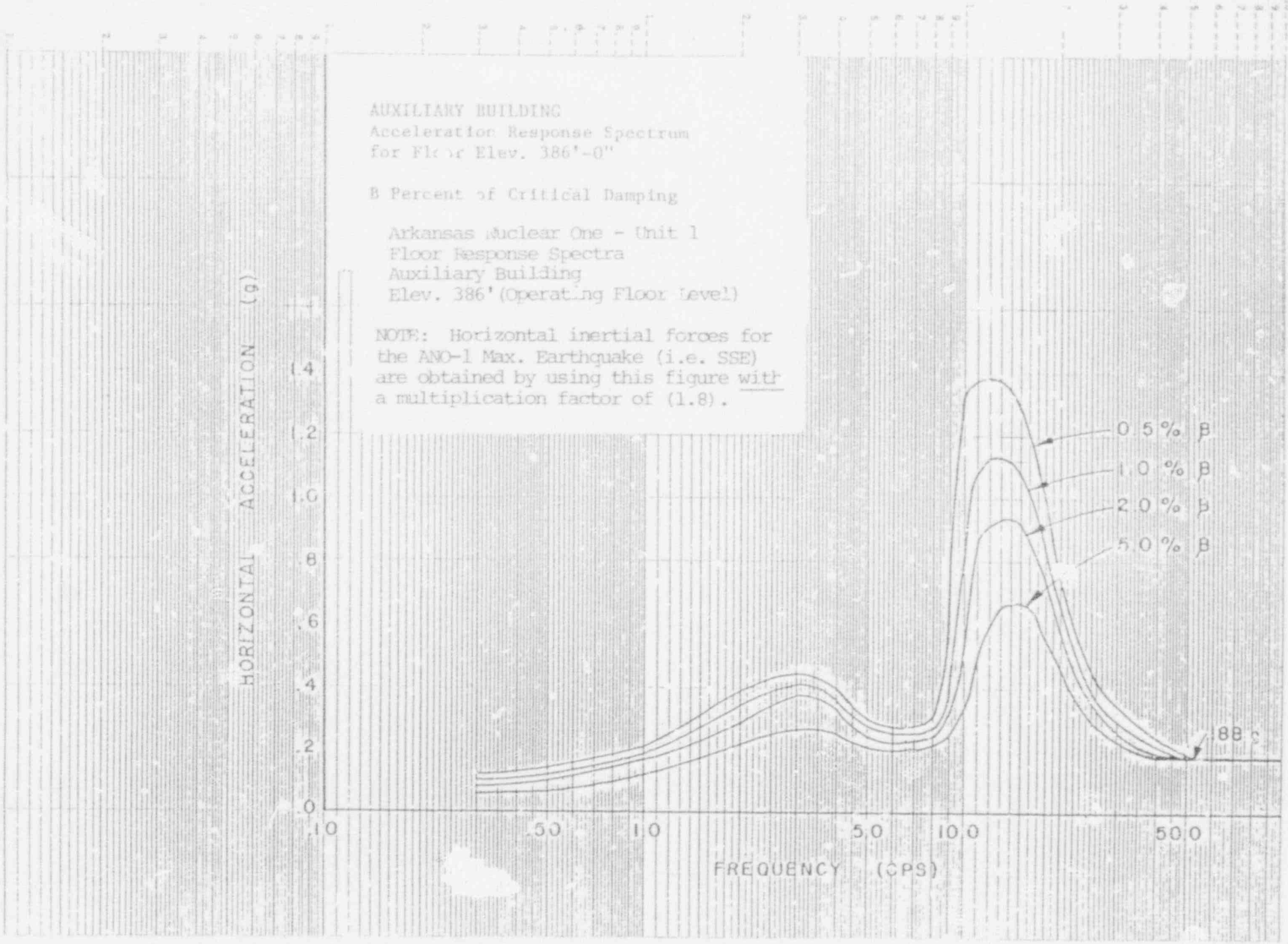


AUXILIARY BUILDING
Acceleration Response Spectrum
for Floor Elev. 386'-0"

B Percent of Critical Damping

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Auxiliary Building
Elev. 386' (Operating Floor Level)

NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.8).

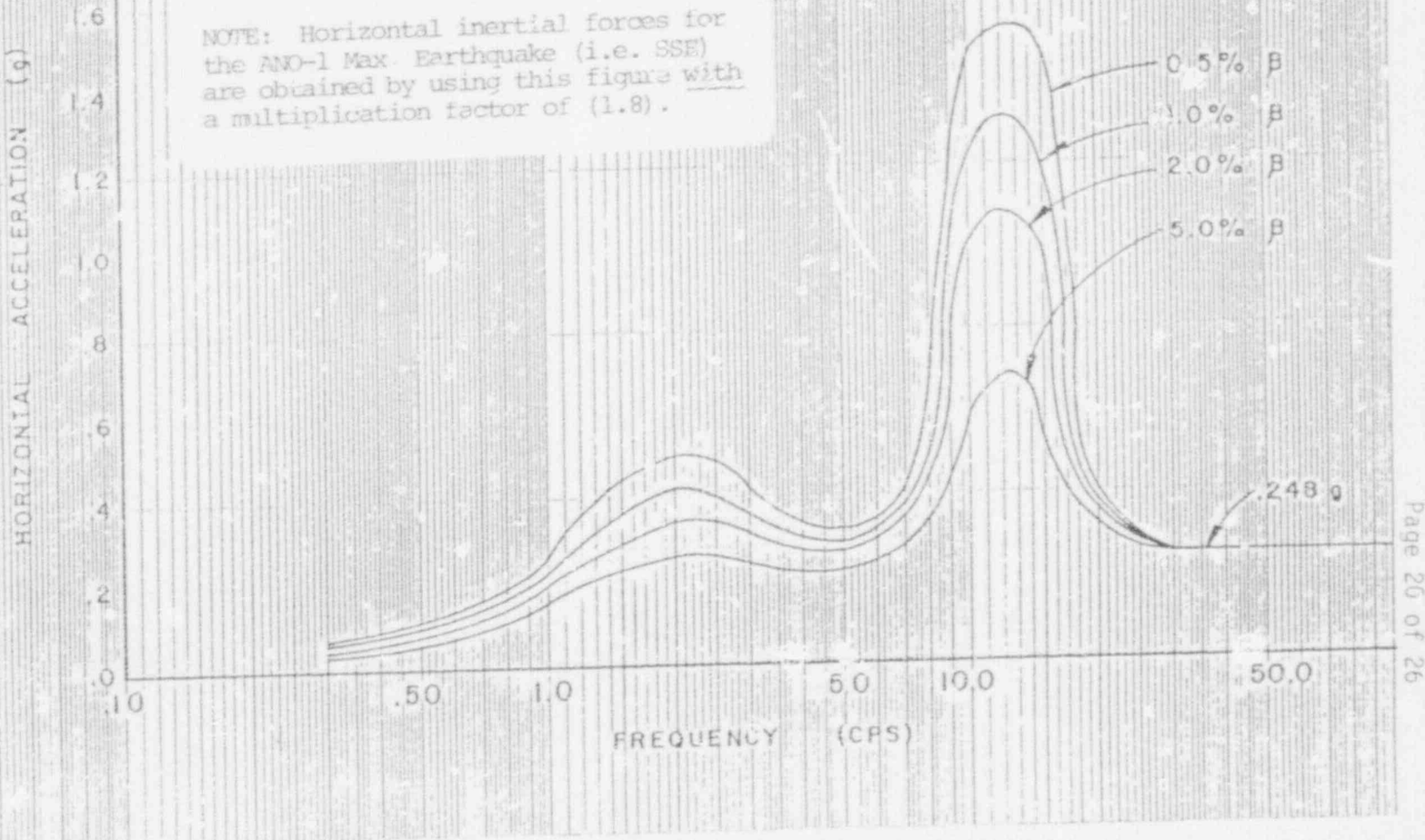


AUXILIARY BUILDING
Acceleration Response Spectrum
for Floor Elev. 404'-0"

β Percent of Critical Damping

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Auxiliary Building
Elev. 404'

NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.8).

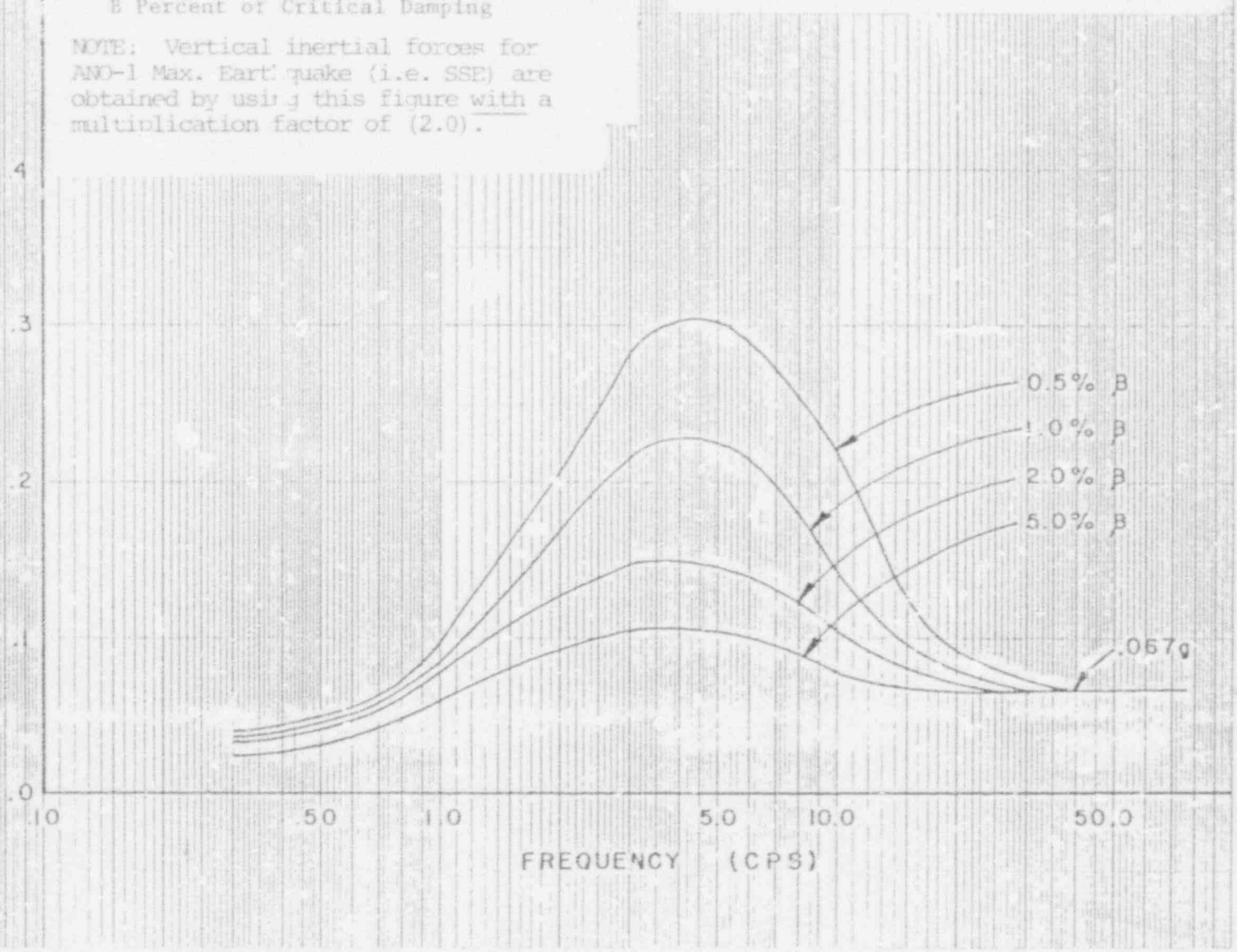


AUXILIARY BUILDING
Acceleration Response Spectrum
for All Elevations

B Percent of Critical Damping

NOTE: Vertical inertial forces for ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (2.0).

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Auxiliary Building - All Elevations
Vertical Accelerat ion

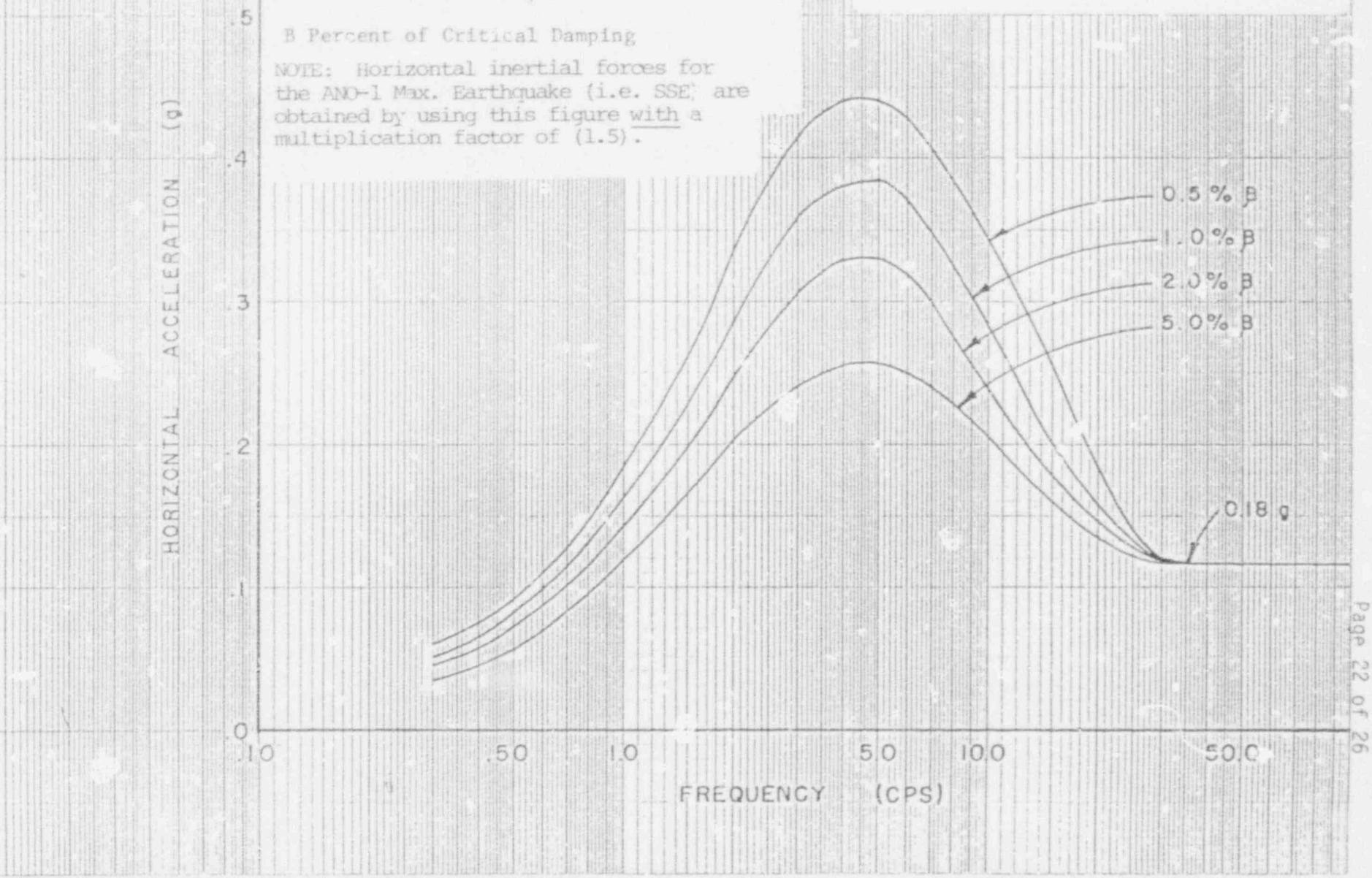


Arkansas Nuclear One - Unit 1
Floor Response Spectra
Intake Structure
Elev. 315'-0" & 322'-6"

INTAKE STRUCTURE
Acceleration Response Spectrum for
Floors Elev. 315'0" & 322'-6"

B Percent of Critical Damping

NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.5).



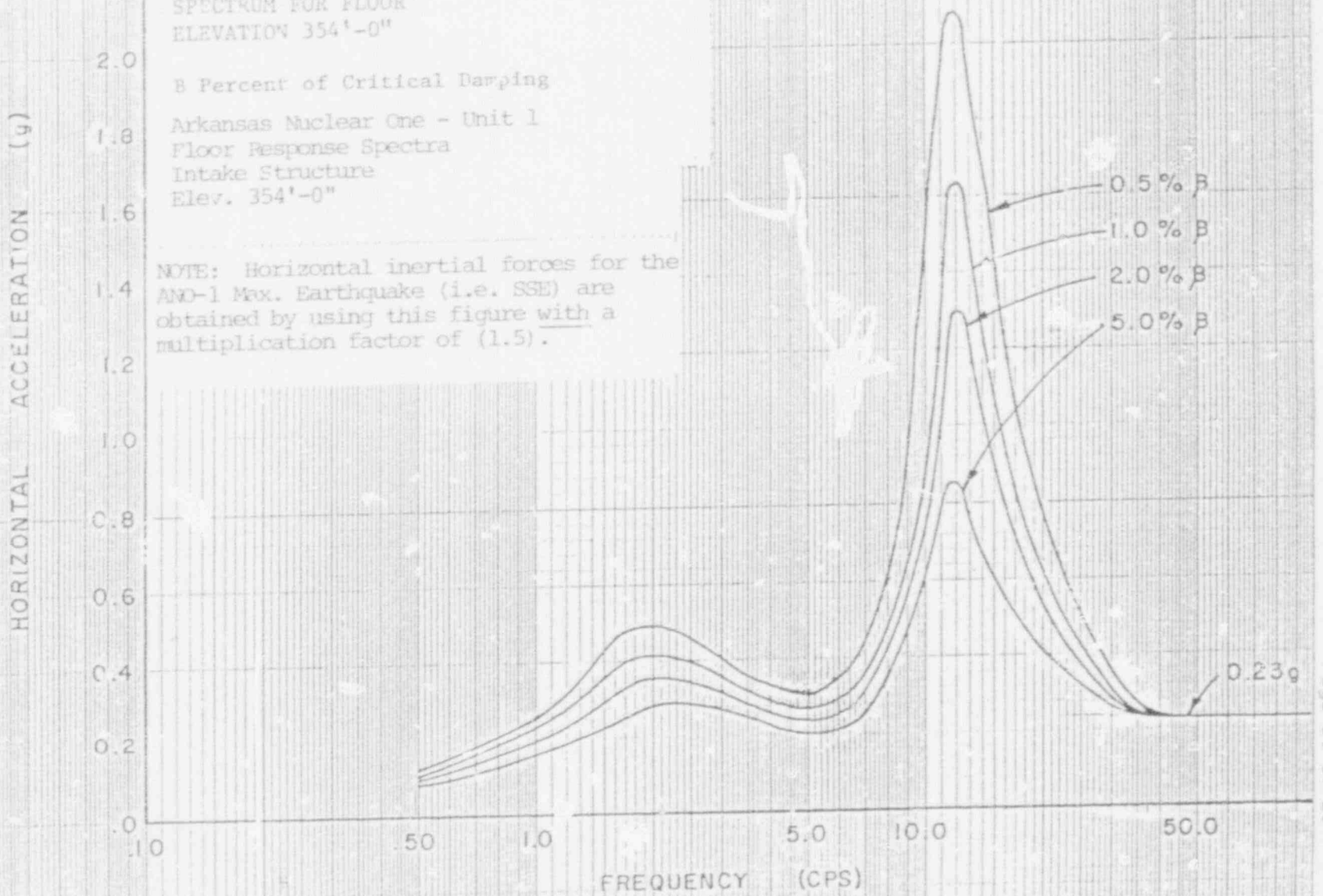
SEMI-LOGARITHMIC 4 CYCLES X 10 DIVISIONS
KEUFFEL & ESSER CO. 46 6012

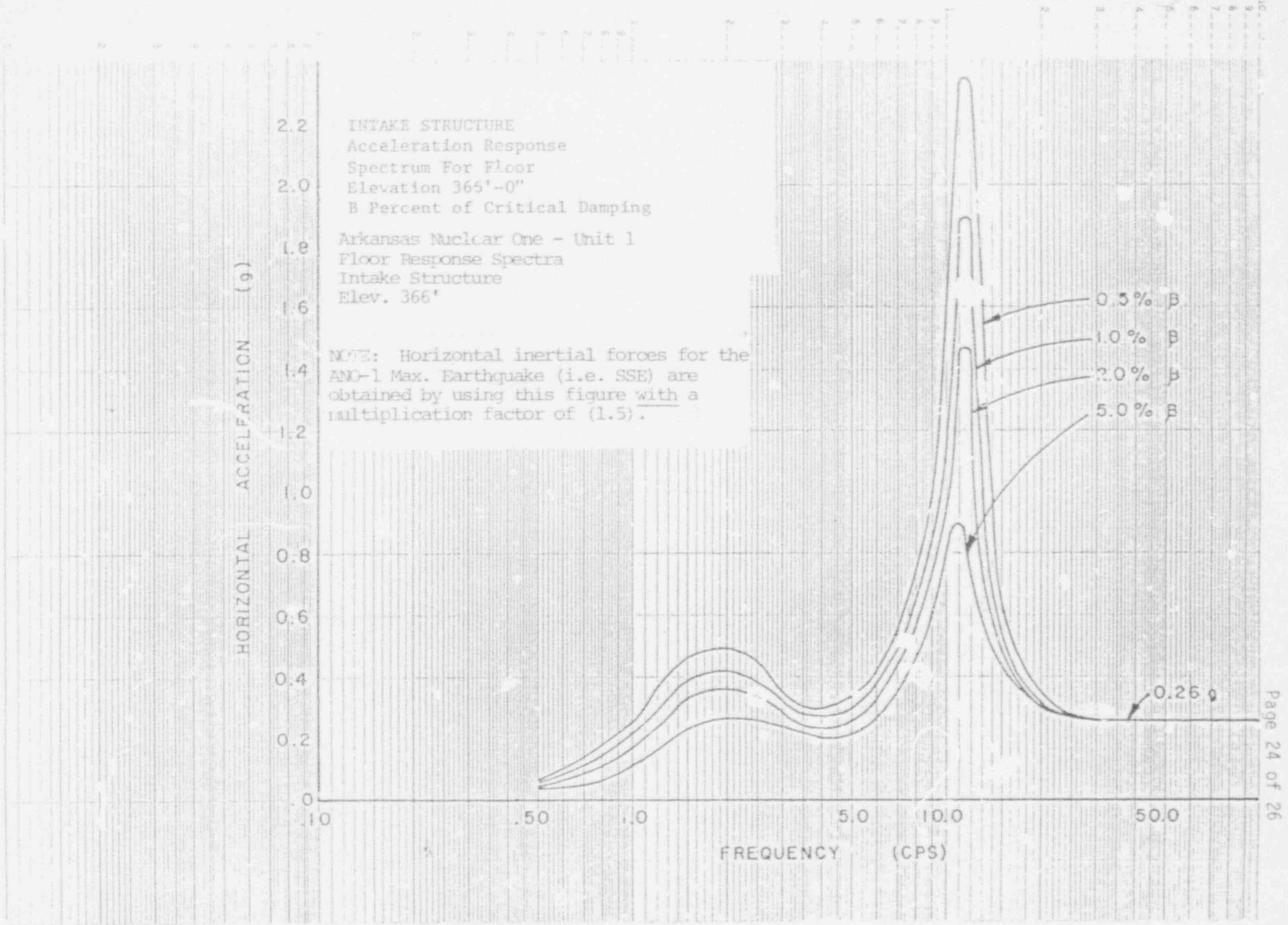
INTAKE STRUCTURE
ACCELERATION RESPONSE
SPECTRUM FOR FLOOR
ELEVATION 354'-0"

B Percent of Critical Damping

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Intake Structure
Elev. 354'-0"

NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.5).

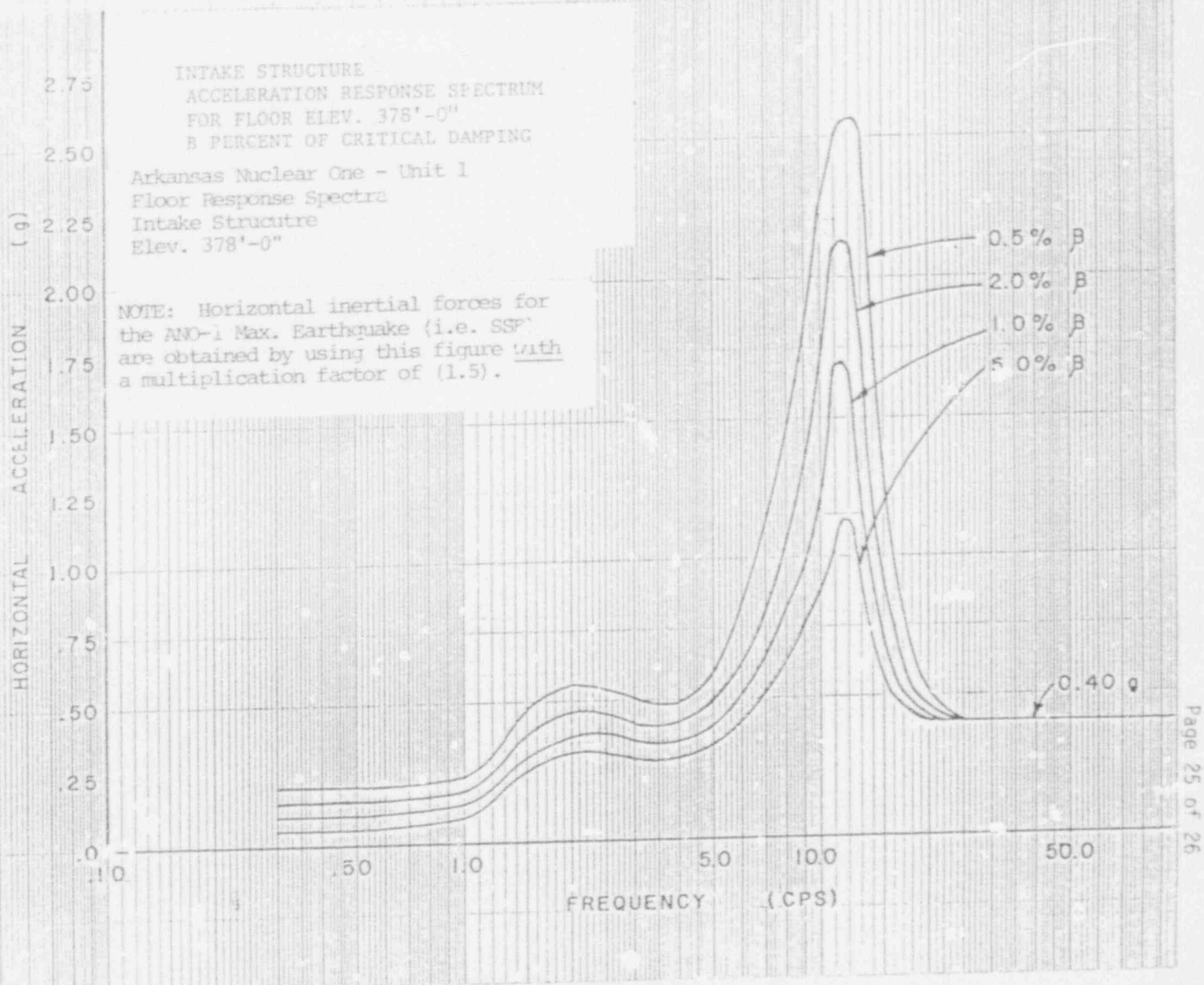



INTAKE STRUCTURE
Acceleration Response
Spectrum For Floor
Elevation 365'-0"
B Percent of Critical Damping
Arkansas Nuclear One - Unit 1
Floor Response Spectra
Intake Structure
Elev. 366'
NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.5).
0.5% β
1.0% β
2.0% β
5.0% β
0.26 g
HORIZONTAL ACCELERATION (g)
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
.10
.50
1.0
5.0
10.0
50.0
FREQUENCY (CPS)

INTAKE STRUCTURE
ACCELERATION RESPONSE SPECTRUM
FOR FLOOR ELEV. 378'-0"
B PERCENT OF CRITICAL DAMPING

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Intake Strucutre
Elev. 378'-0"

NOTE: Horizontal inertial forces for the ANO-1 Max. Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (1.5).



AG 6012

Arkansas Nuclear One - Unit 1
Floor Response Spectra
Intake Structure-All Elevations
Vertical Acceleration

INTAKE STRUCTURE
Acceleration Response
Spectrum For All Elevations
B Percent of Critical Damping

NOTE: Vertical inertial forces for ANO-1 Max Earthquake (i.e. SSE) are obtained by using this figure with a multiplication factor of (2.0).