Detroit Edison
2000 Second Avenue
Detroit, Michigan 48226
(313) 237-8000

September 4, 1981
EF2 - 54,625

Mr. L. L. Kintner
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Licensing
Washington, DC 20555

Reference: Enrico Fermi Atomic Power Plant - Unit 2
NRC Docket No. 50-341

Subject: Seismic Qualification Review Team (SQRT) Audit Response to Open Items

Dear Mr. Kintner:

As stated in our letter (EF2-54,390) of August 31, 1981, we attach herewith, additional information in connection with Open Item #3a.

We have prepared ground response spectra for 5% and 7% structural (site) damping for 5% and 7% (equipment) damping for N-S direction, and E-W direction reproduced from synthetic time histories - Figures 1 to 4. An overlay of ground response spectra for 5% and 7% structural (site) damping shows an excellent match - See Figures 5 & 6.

We have also prepared overlays of floor response spectra for 5% and 7% structural damping. Both sets of spectra have been developed for 5% equipment damping. These are presented as Attachment I.

An inspection of the overlays shows that the 5% structurally damped spectra pretty well match the 7% structurally damped spectra both in shape and in acceleration magnitudes. The 5% structurally damped curves do show a slightly higher response in the high frequency range. Considering the state of the art developments in this field, the comparison shows no significant differences.

Further, an independent analysis was made to project the response due to 5% structural damping from the 7% structurally damped spectra values as the reference data using a rational analytical approach. The spectra development is presented in Attachment II. This method is somewhat more conservative than the use of the actual floor response spectra. It shows that the 5% structural damped spectra are at most 20% larger than the 7% structural damped spectra, with generally no significant increase over most of the frequency range.

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1/60

The results, as presented in Attachment III, show that no additional requalification of equipment is required. Three items: RPV Top Guide, HVAC Dampers and the Plenum for the multizone unit have calculated stresses in the range of up to 20% over yield. This overstress calculation does not consider the positive effects of higher equipment damping and mobilization of ductility that would accompany such stresses.

Yours very truly,

W. F. Colbert
Technical Director
Enrico Fermi 2

WFC/YNA/jlj
Attachments

cc: B. Little
Dr. Morris Reich
Department of Nuclear Energy
Building 129
Brookhaven National Laboratory
Upton, NY 11973

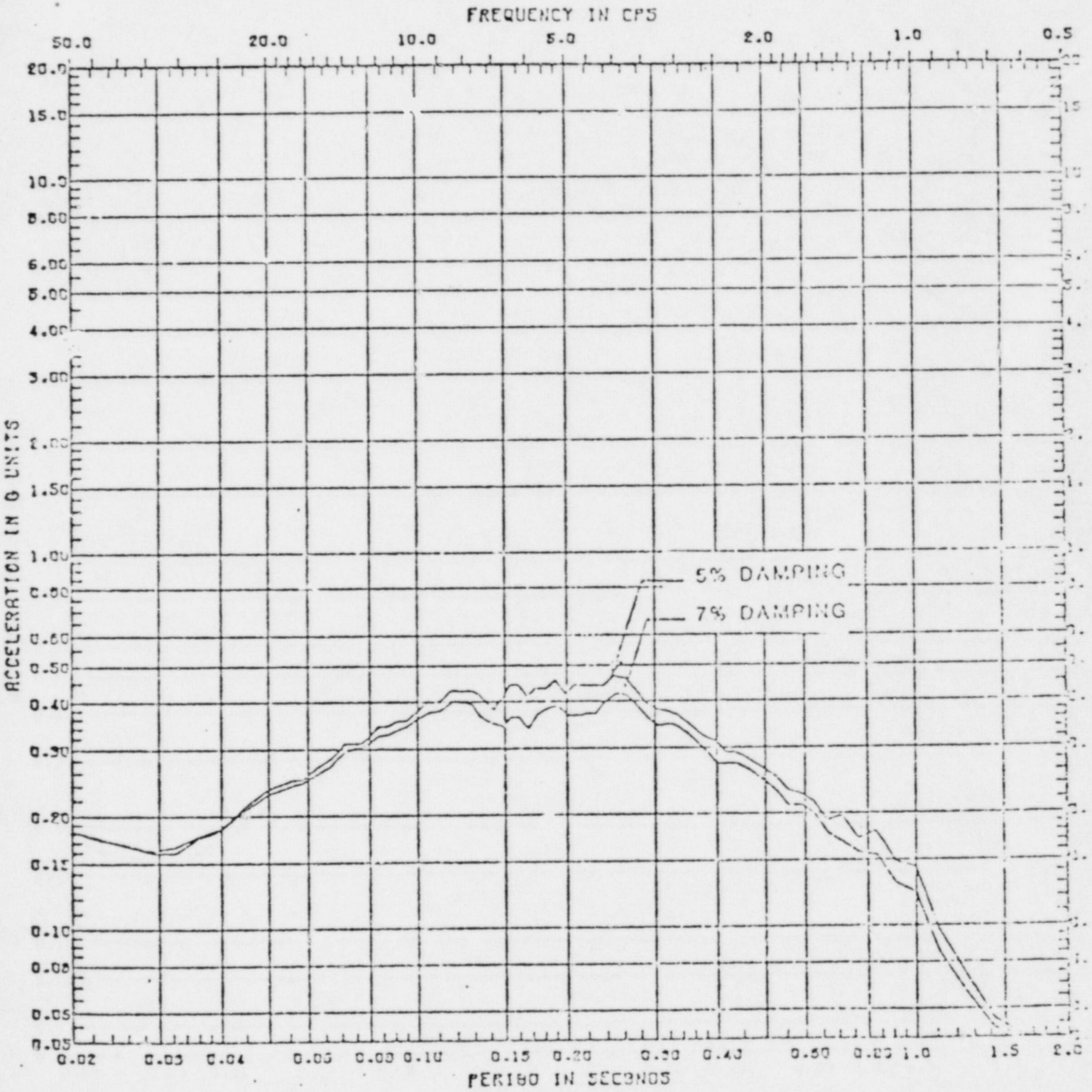
SARGENT & LUNDY ENGINEERS

29 AUG 81
312DL

CALC NO. 300-0EC8-000
PROJECT FERMI-2
PROJECT NO. 6139-38
DAMPING 0.050 0.070
PAGE

REV

EF2-54625
FIGURE 1



DESIGN SITE SPECTRUM

NODE BASE

DIRECTION N3 ANGLE

SPECTRA NO. 5% SITE DBE

ELEVATION 540'-0"

LOCATION REA-RUX BLDG

2

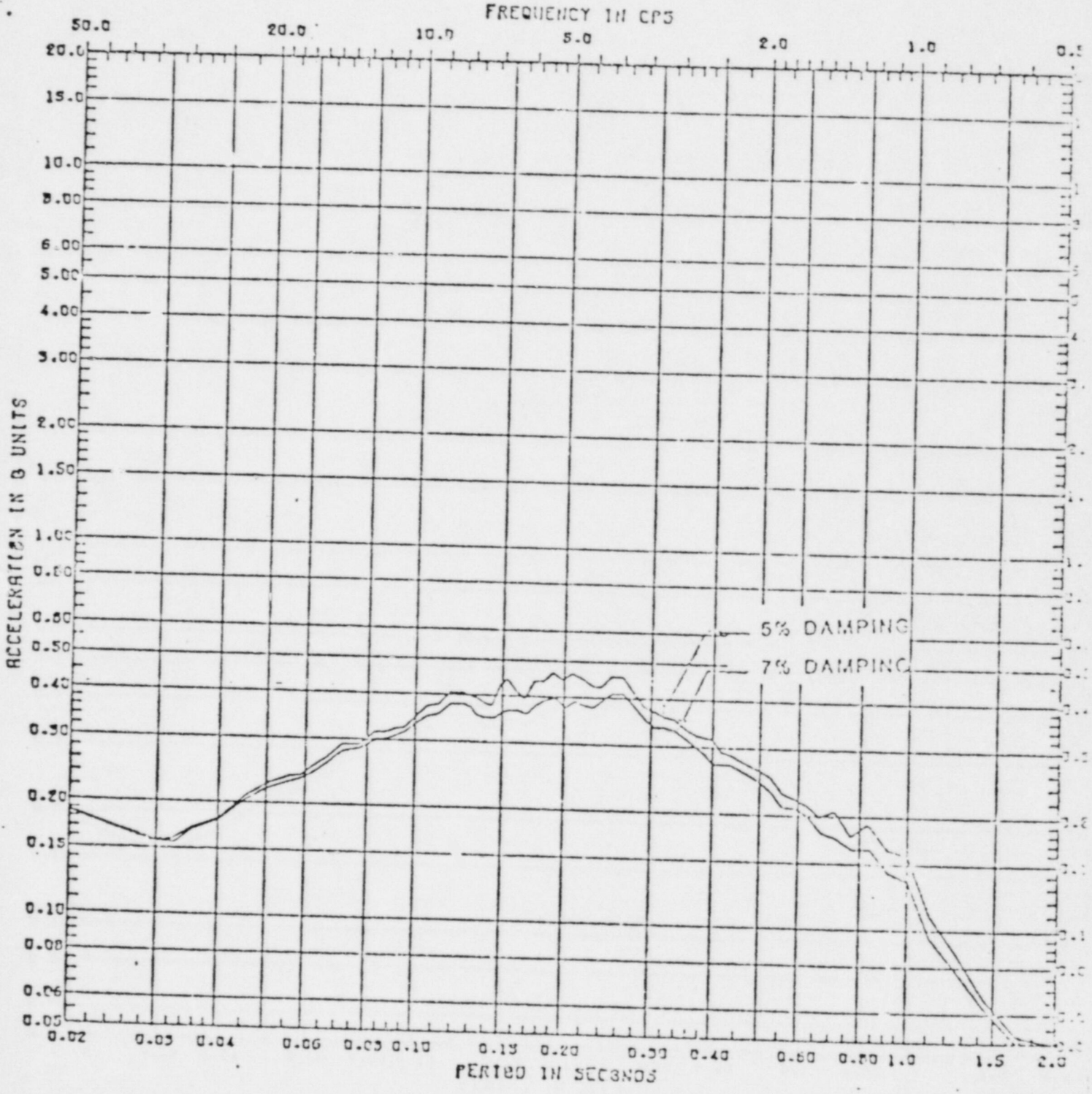
SARGENT & LUNDY ENGINEERS

29 AUG 81
312DL

CALC NO. 300-0000-000
PROJECT FERMI-2
PROJECT NO. 6139-38
DAMPING 0.050 0.070
PAGE

REV

EF2-54525
FIGURE 2



DESIGN SITE SPECTRUM

NODE BASE

DIRECTION N3 ANGLE

SPECTRA NO. 7% SITE DAMP

ELEVATION 540'-0"

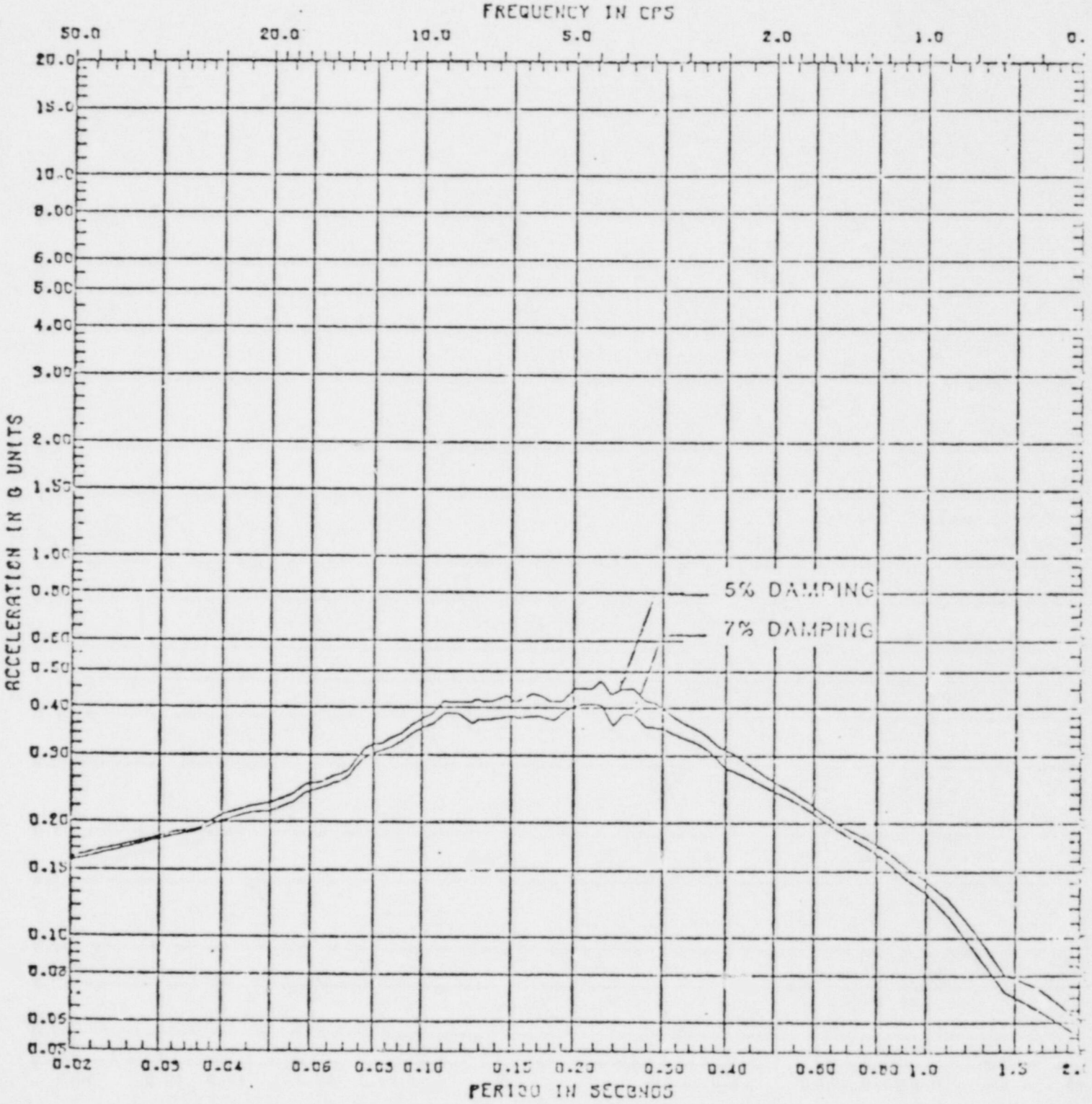
LOCATION REA-AUX BLDG

SARGENT & LUNDY
ENGINEERS

29 AUG 81
3120L

CALC NO. 300-CECS-000
PROJECT FERMI-2 REV
PROJECT NO. 6130-30
DAMPING 0.050 0.070
PROE

EF2-54625
FIGURE 3



DESIGN SITE SPECTRUM
SPECTRA NO. 5% SITE DAMP

NODE BASE
ELEVATION 540'-0"

DIRECTION EW ANGLE
LOCATION REA-AUX BLDG

1

SARGENT & LUNDY ENGINEERS

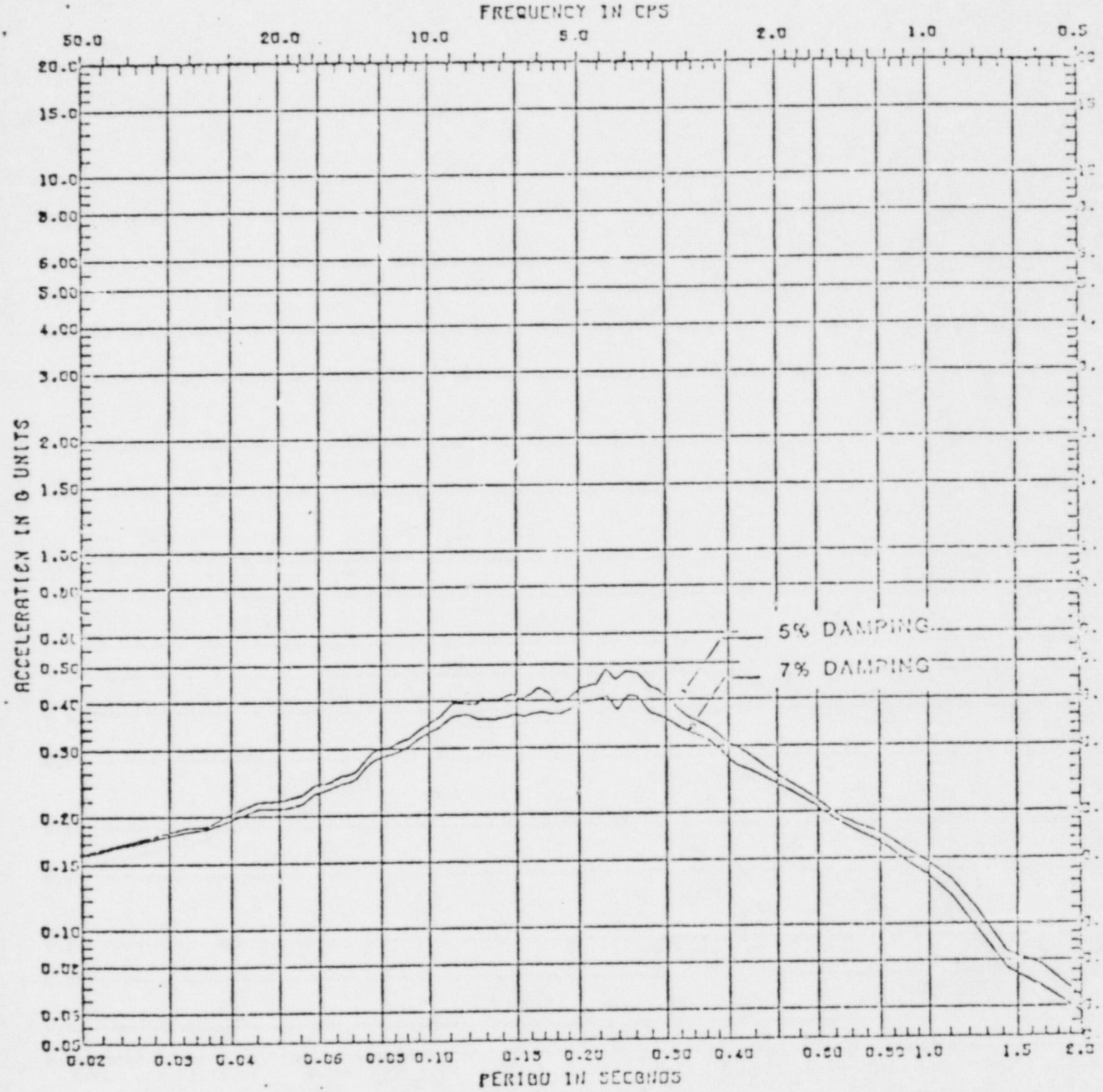
29 AUG 81

312DL

CALC NO. [illegible]
PROJECT FERMI-2 REV
PROJECT NO. 6139-30
DAMPING 0.050 0.070
PAGE

EF2-5+625

FIGURE 4



DESIGN SITE SPECTRUM

NODE BASE

DIRECTION EW ANGLE

SPECTRA NO. 7% SITE DAMP

ELEVATION 540'-0"

LOCATION REA-AUX BLDG

3

SARGENT & LUNDY ENGINEERS

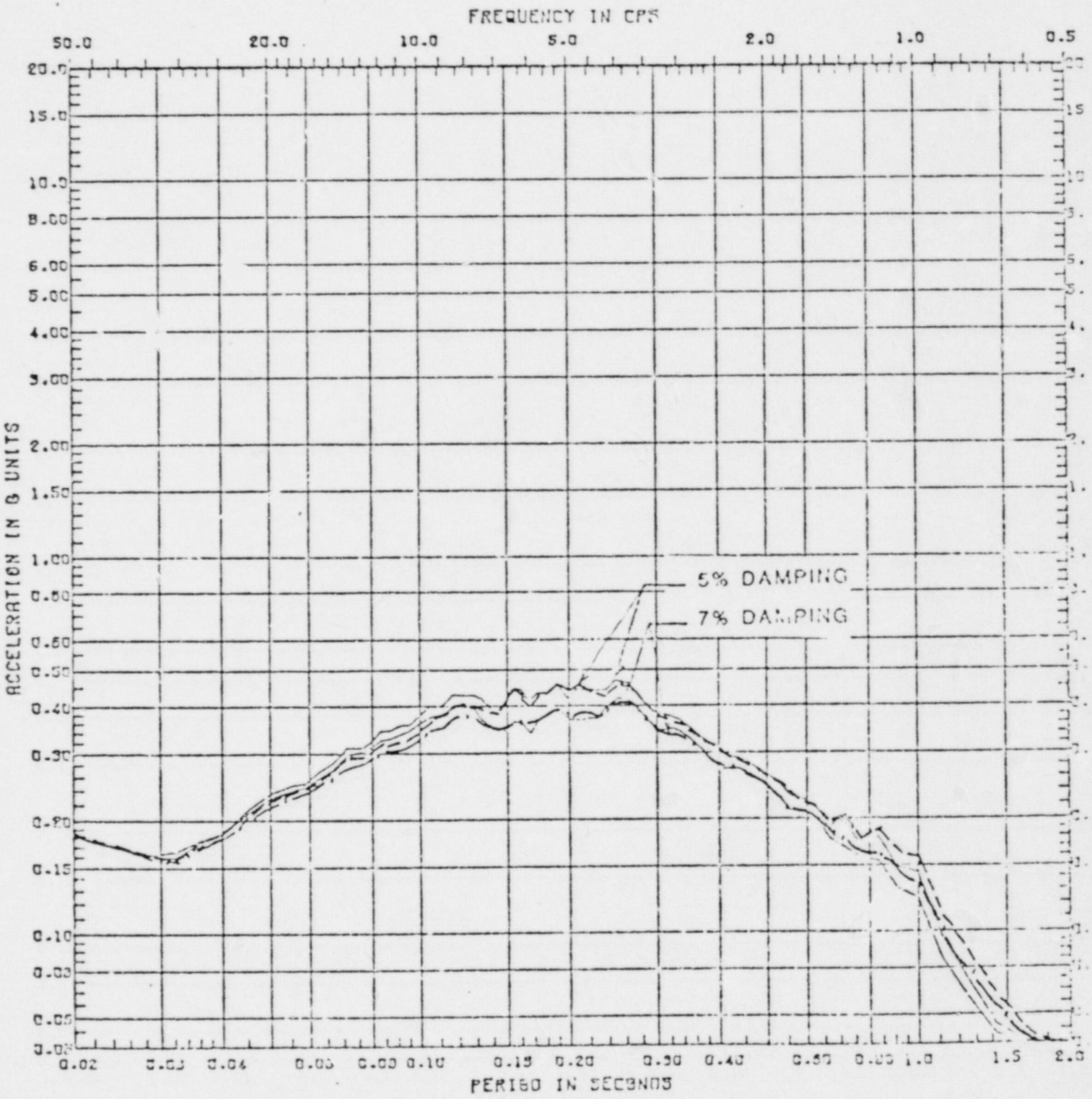
29 AUG 81

3120L

CALC NO. 300-0EC8-000
PROJECT FERMI-2 REV
PROJECT NO. 6139-38
DAMPING 0.050 0.070
PAGE

EF2-5+625

FIGURE 5



DESIGN SITE SPECTRUM

MODE BASE

DIRECTION NS ANGLE

SPECTRA NO. —— 5% SITE DAMP ---- 7% SITE DAMPING

ELEVATION 540'-0"

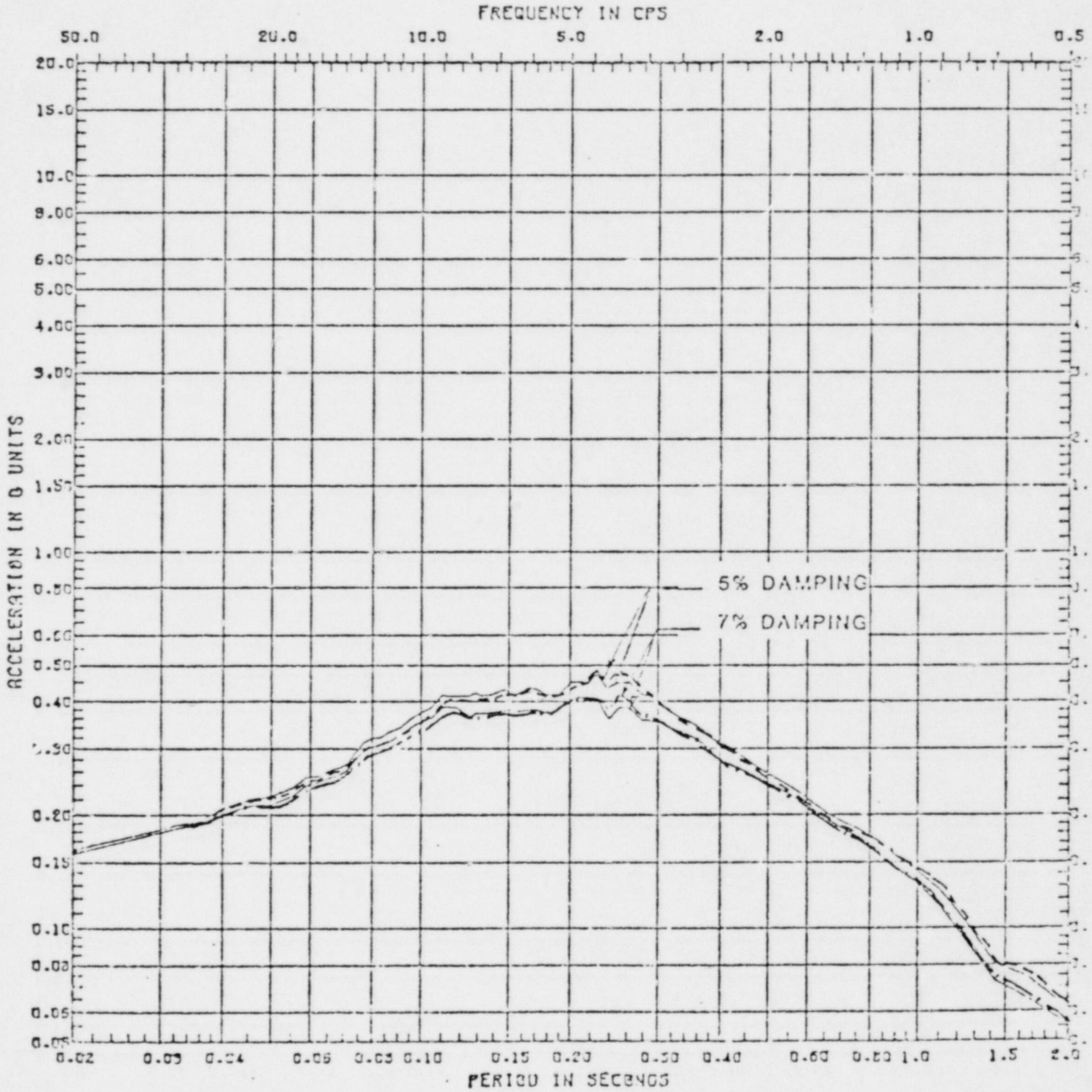
LOCATION REA-AUX BLDG

SARGENT & LUNDY
ENGINEERS

29 AUG 81
312[illegible]

CALC NO. 300-CEC3-000
PROJECT FERMI-2 REV
PROJECT NO. 6139-30
DAMPING 0.050 0.070
PAGE

EF2-54625
FIGURE 6



DESIGN SITE SPECTRUM

NODE BASE

DIRECTION EW ANGLE

SPECTRA NO. — 5% SITE DAMP [illegible] 7% SITE DAMPING

ELEVATION 540'-0"

LOCATION REA-AUX BLDG

1

SARGENT & LUNDY
ENGINEERS
CHICAGO

ATTACHMENT 1
EF2 - 54,265

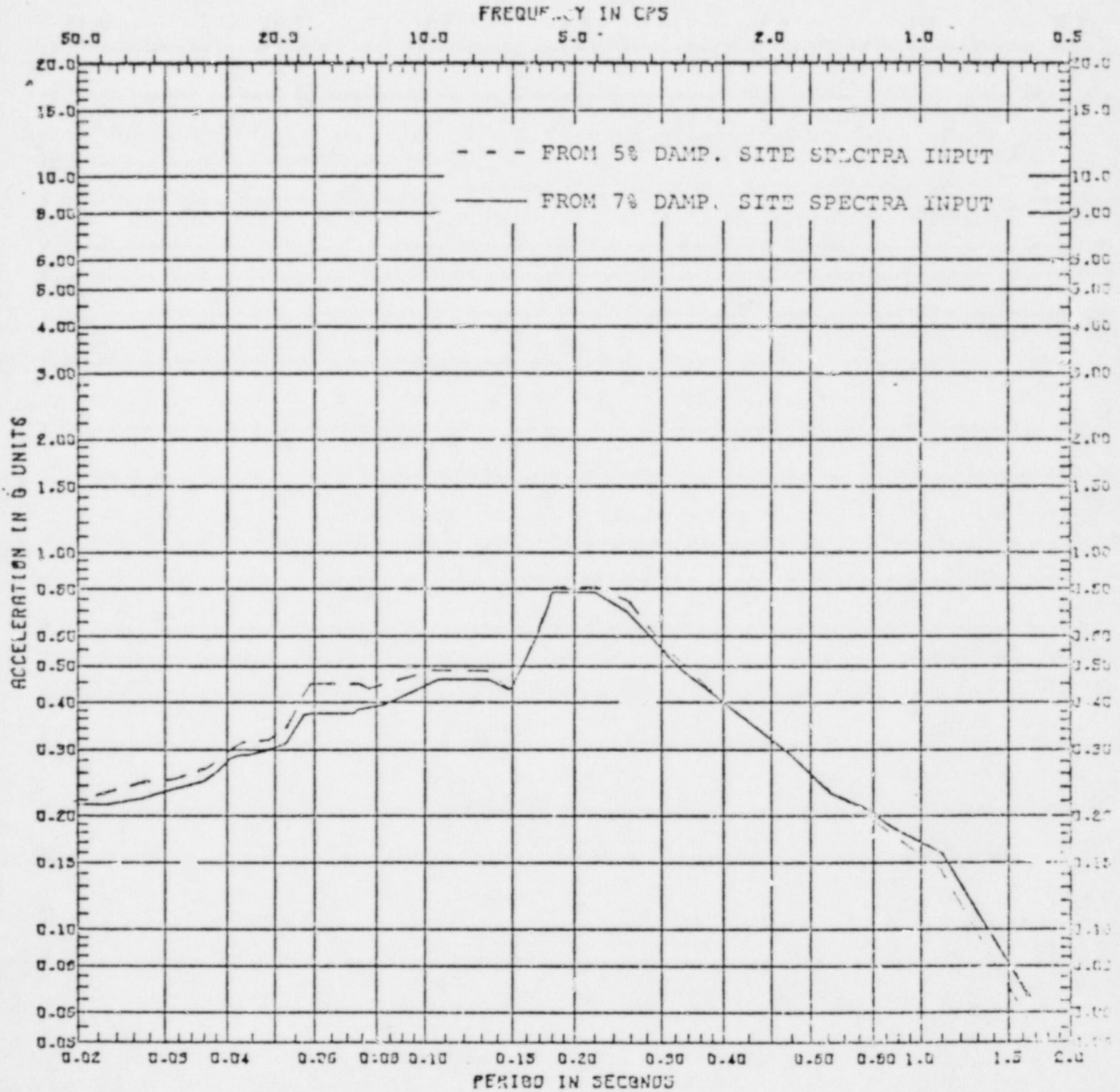
SPECTRA COMPARISON FOR 5% EQUIPMENT DAMPING - REACTOR-AUXILIARY BUILDING COMPLEX

SARGENT & LUNDY ENGINEERS

28 AUG 81

2240L

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



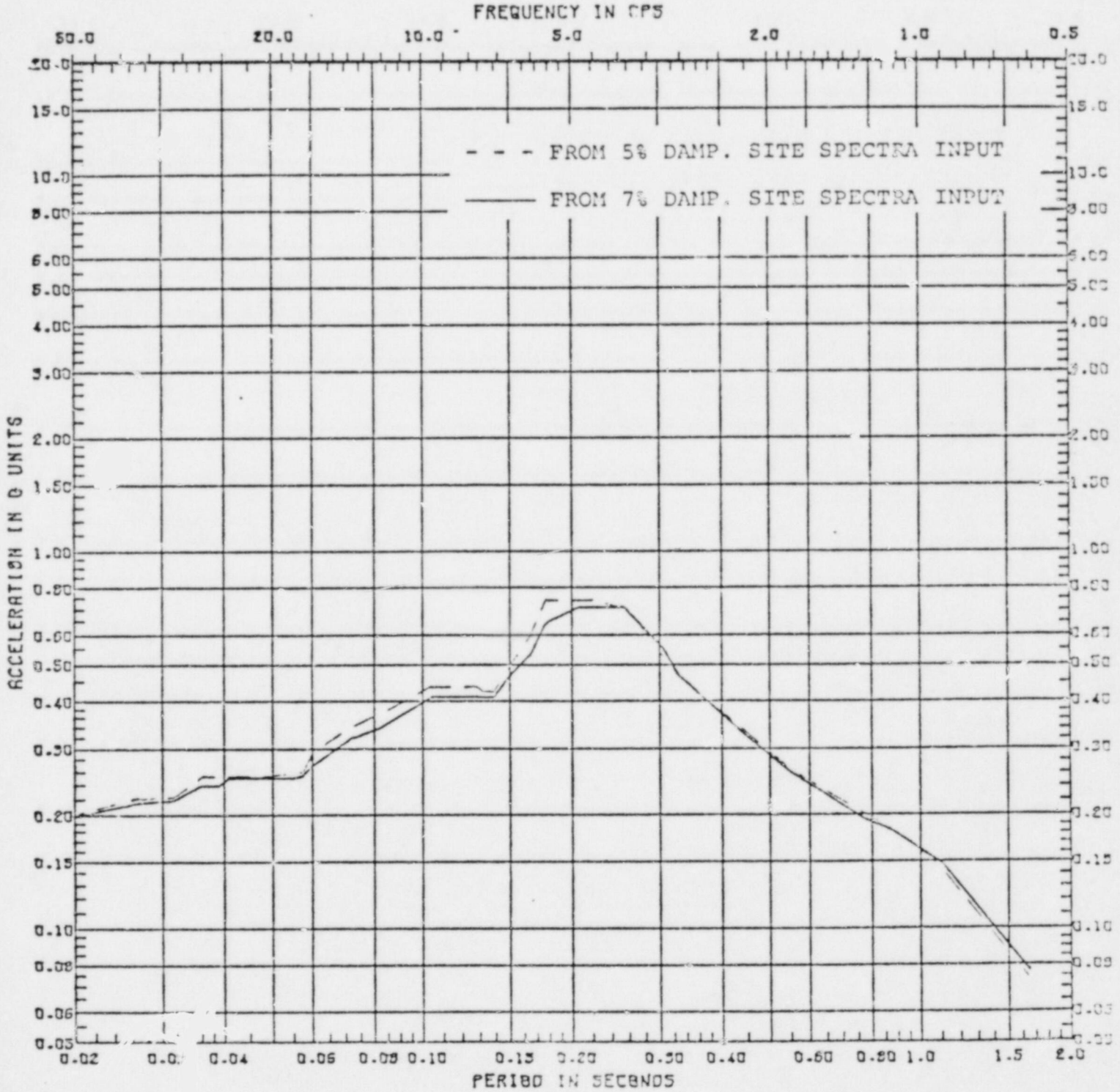
REA-AUX 33E/SPECTRA COMPARISON
NODE 1
DIRECTION N3

SPECTRA NO. B-29
ELEVATION 583'-6"
LOCATION REA-AUX BLDG. SLAB 1

SARGENT & LUNDY ENGINEERS

28 AUG '81
224DL

CALC NO. SSE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



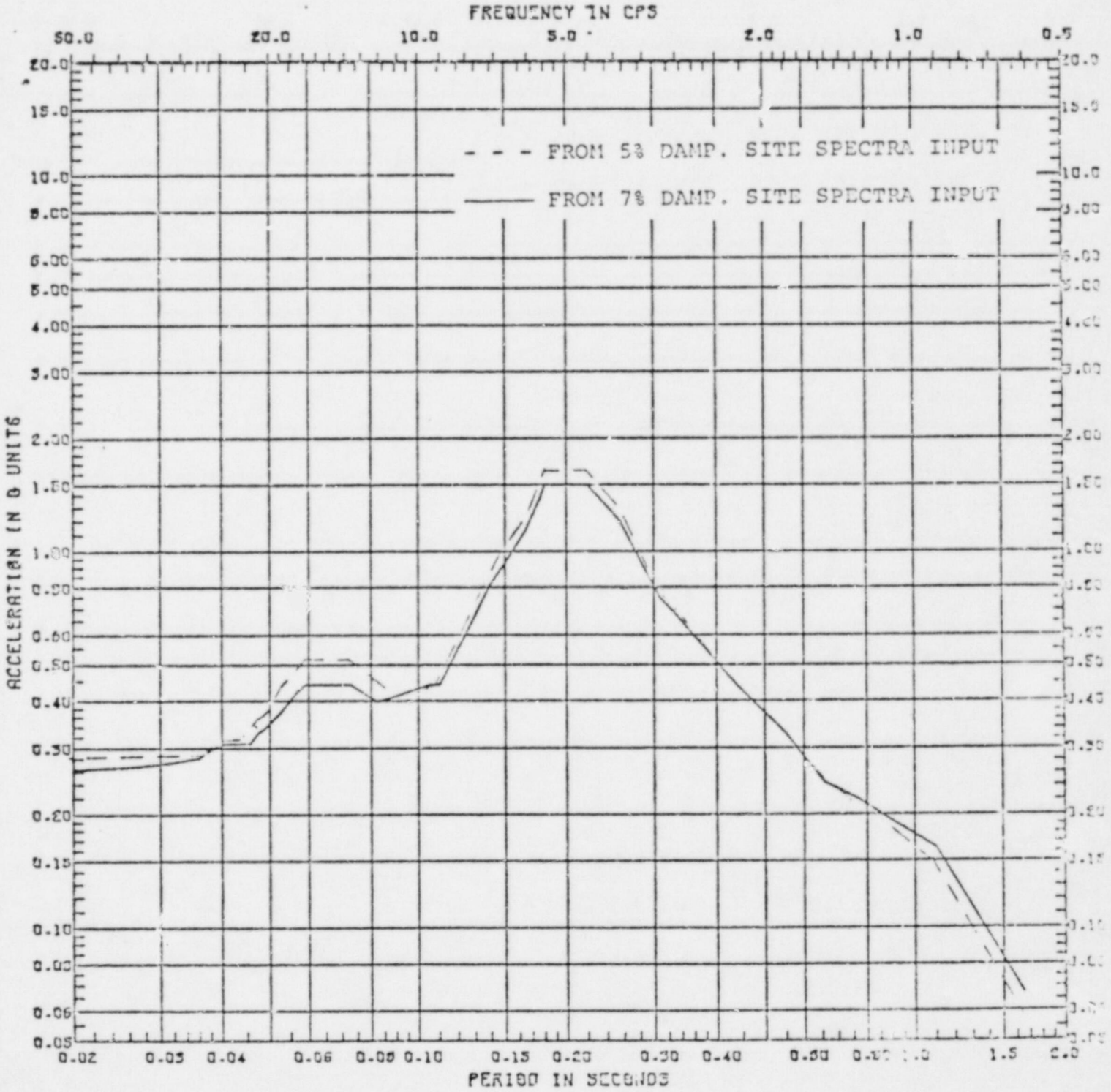
REA-AUX SSE/SPECTRA COMPARISON
NODE . 1
DIRECTION EW

SPECTRA NO. B-30
ELEVATION 583'-6"
LOCATION REA-AUX BLDG. SLAB 1

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-33
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



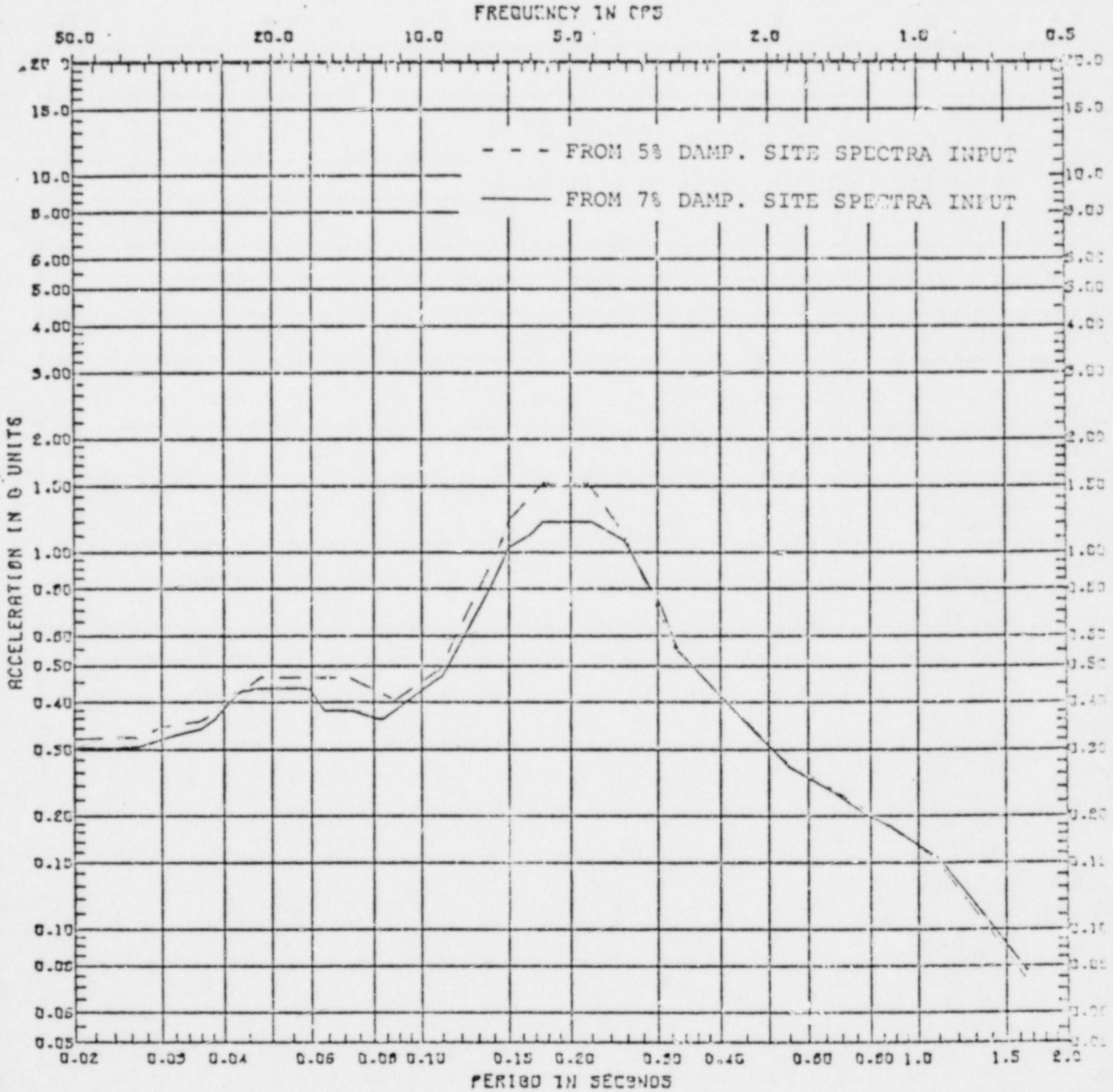
REA-AUX 33E/SPECTRA COMPARISON
NODE 2
DIRECTION N3
SPECTRA NO. B-31
ELEVATION 613'-6"
LOCATION REA-AUX BLDG. BLDG 2

SARGENT & LUNDY ENGINEERS

28 AUG 81

224DL

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-33
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



REA-AUX 33E/SPECTRA COMPARISON
NODE 2
DIRECTION EW

SPECTRA NO. B-32
ELEVATION 613'-6"
LOCATION REA-AUX BLDG. SLAB E

SARGENT & LUNDY ENGINEERS

28 AUG 81
224DL

CALC NO. 55E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6130-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
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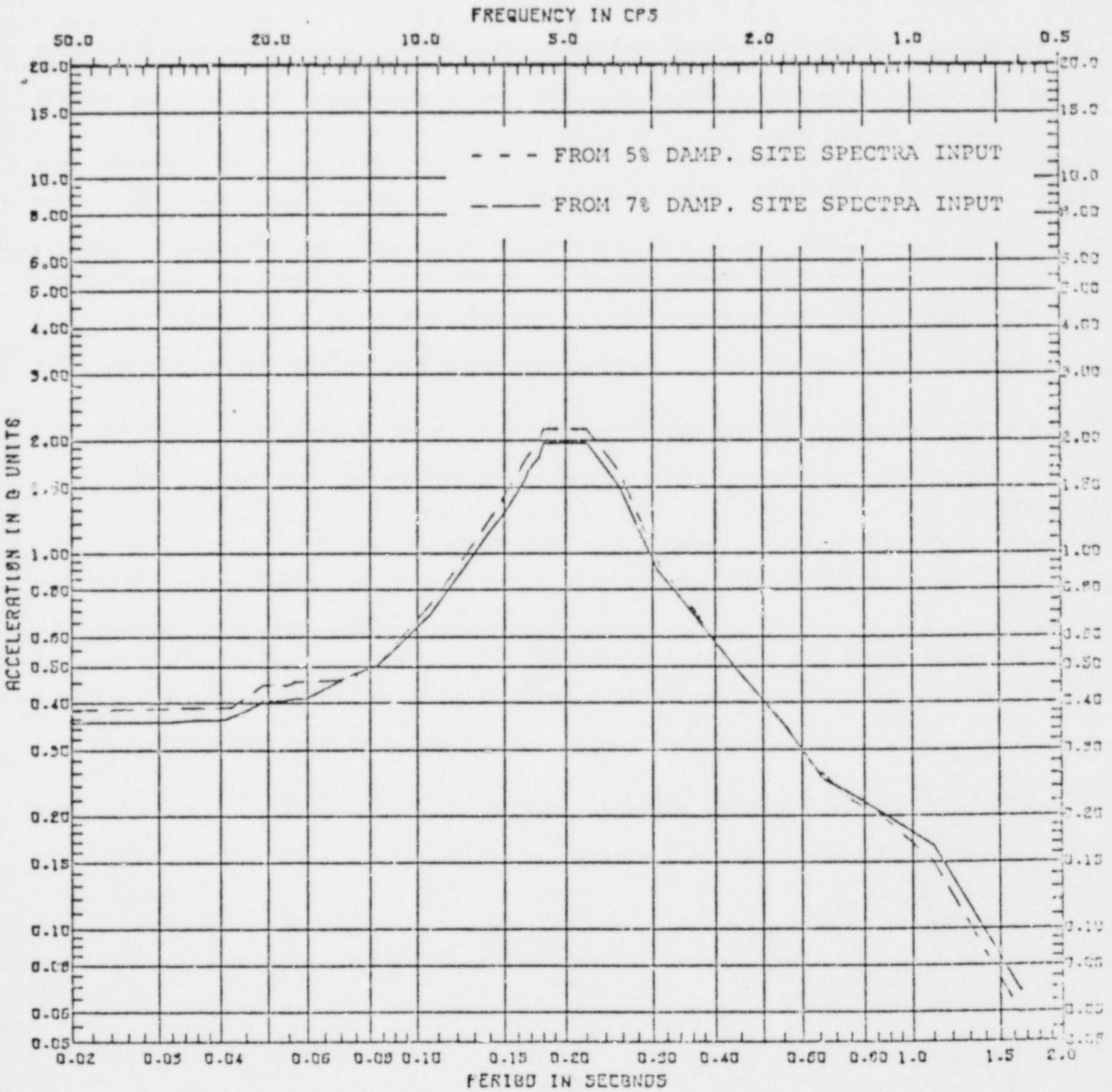


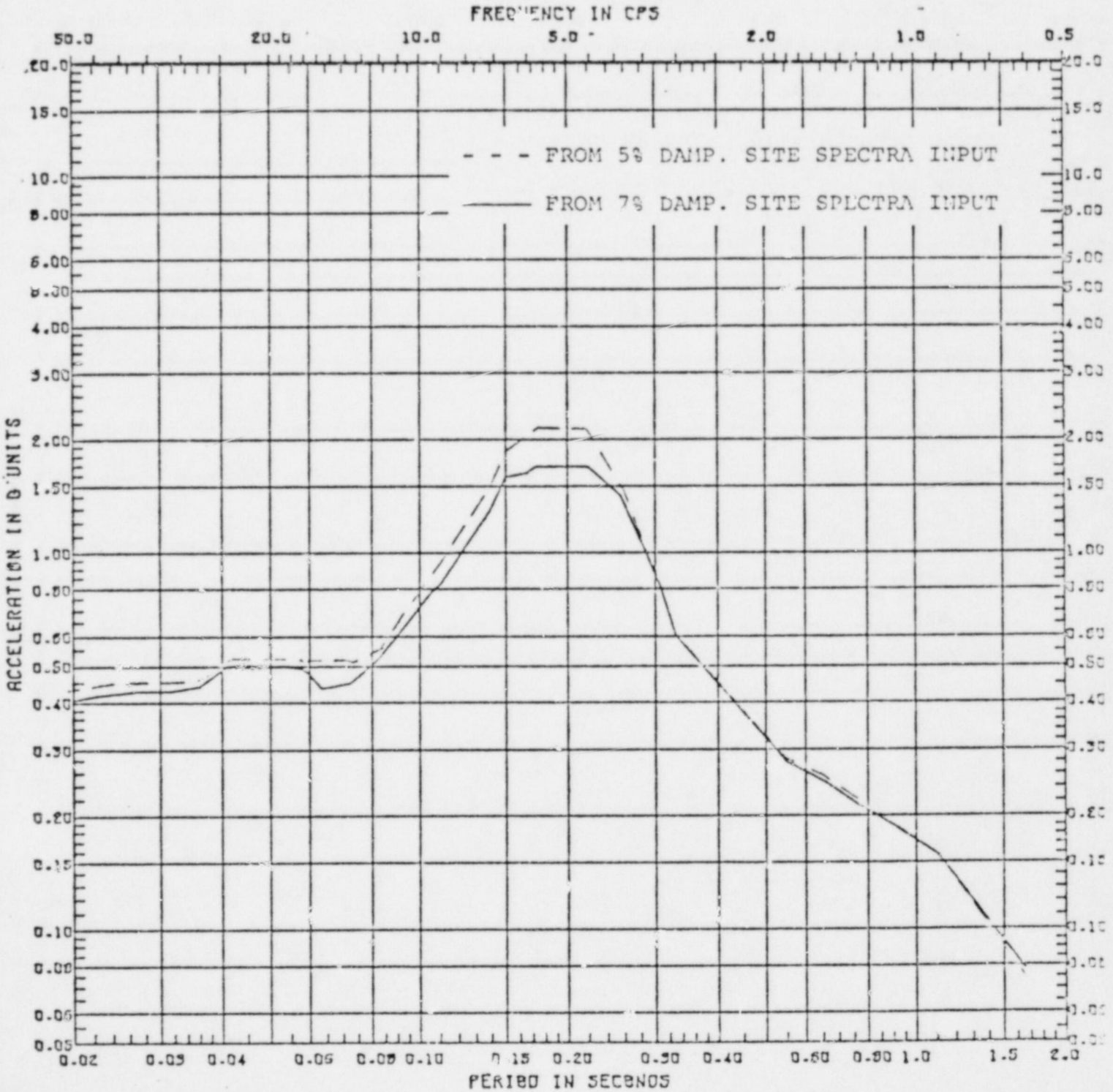
RER-RUX SSE/SPECTRA COMPARISON
NODE 3
DIRECTION NS

SPECTRA NO. G-33
ELEVATION 641'-6"
LOCATION RER-RUX BLDG. SLAB 3

SARGENT & LUNDY
ENGINEERS

28 AUG 81
2240L

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6130-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



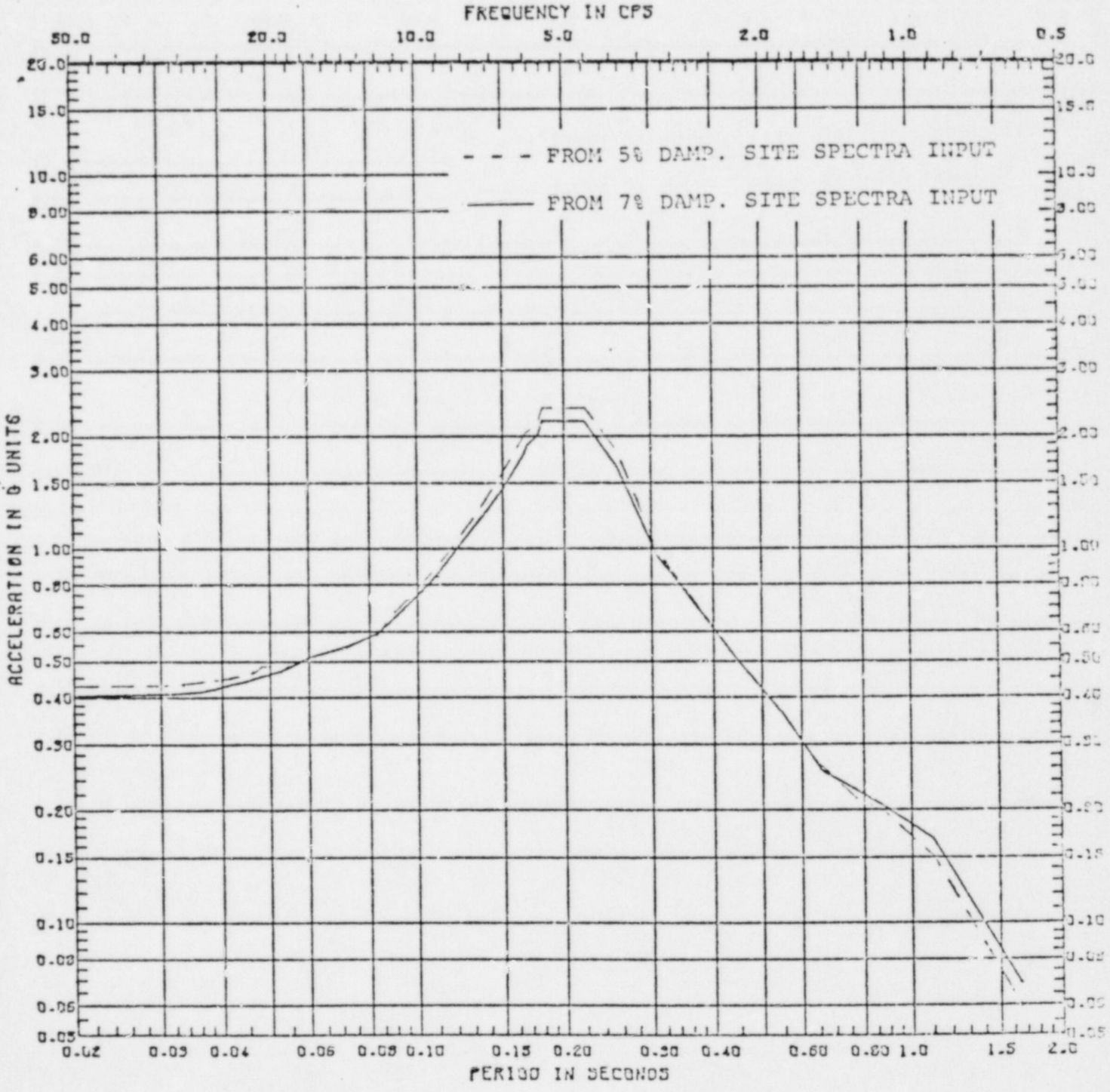
REA-AUX 33E/SPECTRA COMPARISON
NODE 3
DIRECTION EW

SPECTRA NO. B-34
ELEVATION 641'-6"
LOCATION REA-AUX BLDG. SLAB 3

SARGENT & LUNDY
ENGINEERS

28 AUG 81
2240L

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-33
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



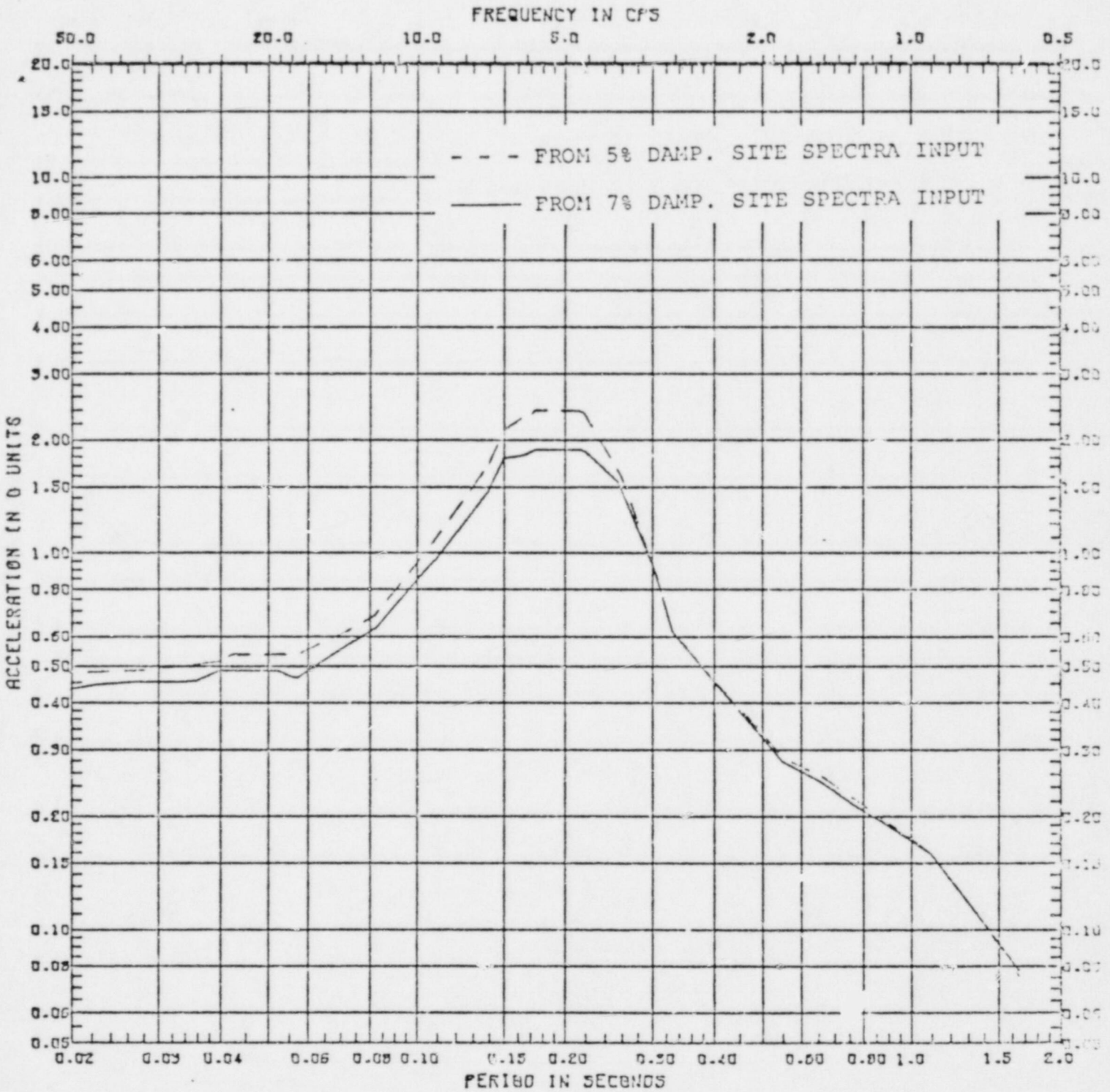
REA-AUX SSE/SPECTRA COMPARISON
NODE 4
DIRECTION N3

SPECTRA NO. B-35
ELEVATION 659'-0"
LOCATION REA-AUX BLDG. SLAB 4

SARGENT & LUNDY
ENGINEERS

20 AUG 81
2240L

CALC NO. SSE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6159-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



REA-AUX SSE/SPECTRA COMPARISON
NODE 4
DIRECTION EW

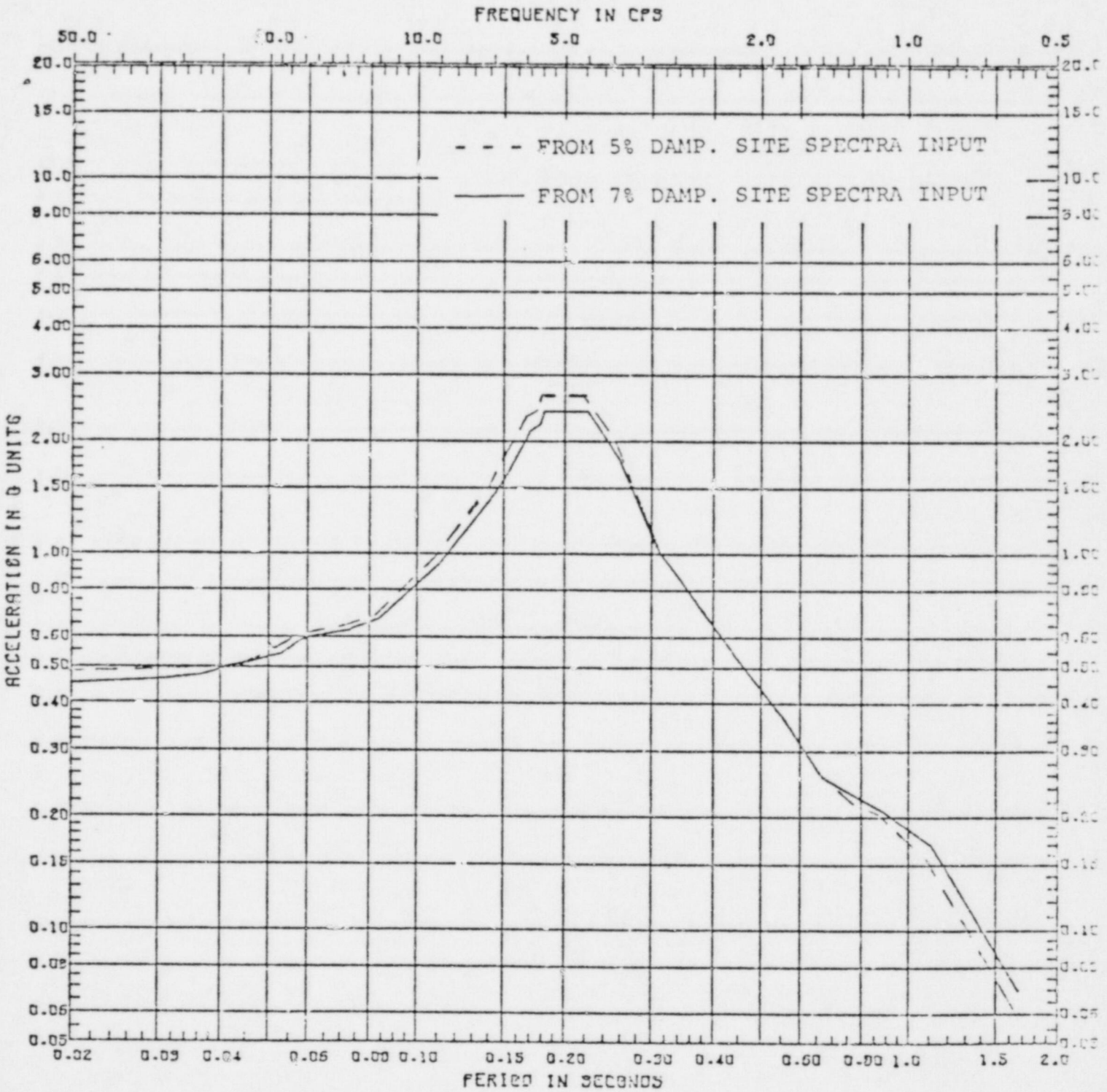
SPECTRA NO. B-35
ELEVATION 659'-0"
LOCATION REA-AUX BLDG. SLAB 4

SARGENT & LUNDY ENGINEERS

'8 AUG 81

224DL

CALC NO. 3SE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6129-58
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



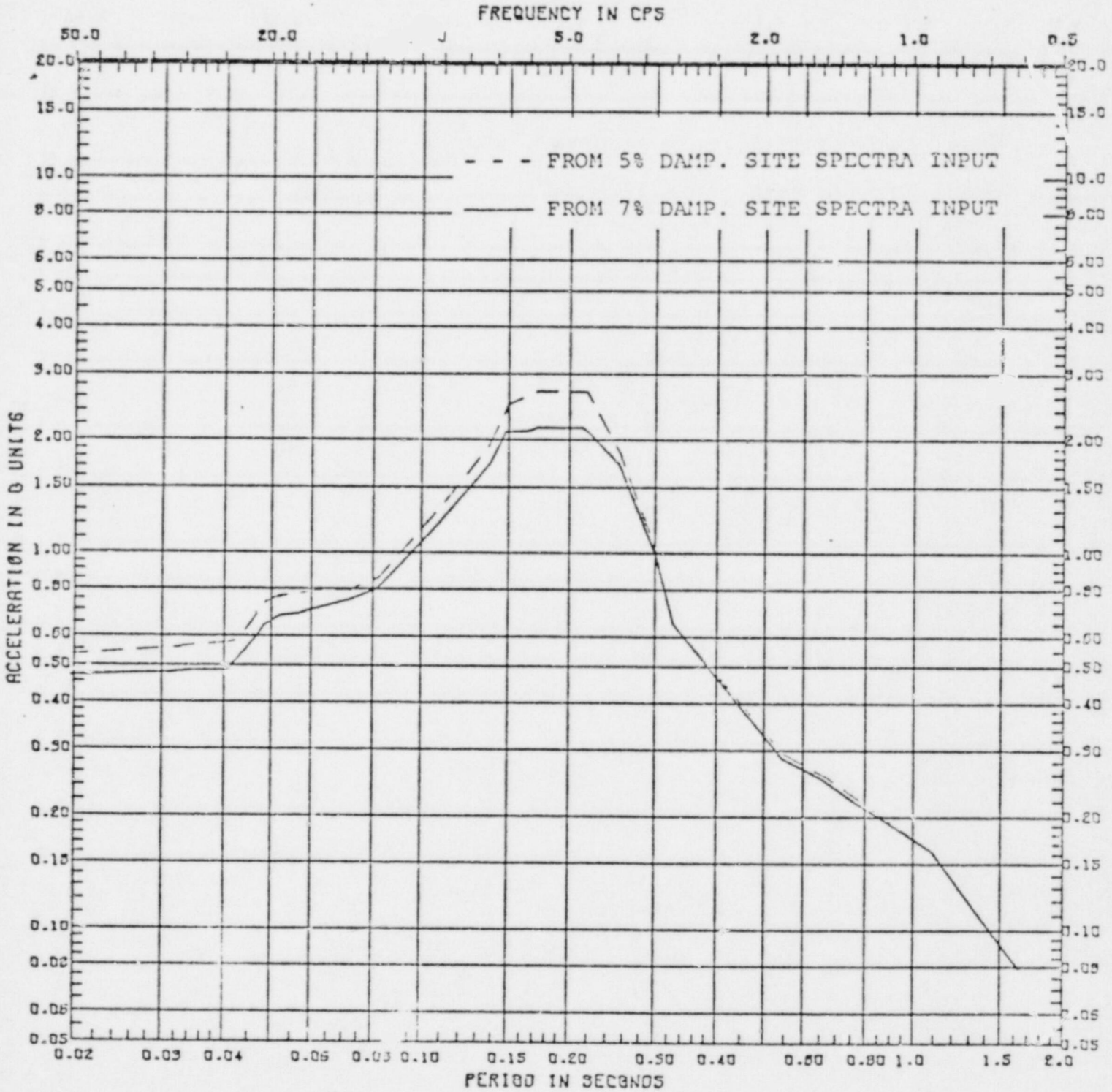
REA-AUX SSE/SPECTRA COMPARISON
NODE 5
DIRECTION N3

SPECTRA NO. B-37
ELEVATION 694'-6"
LOCATION REA-AUX BLDG. SLAB 5

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. SSE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



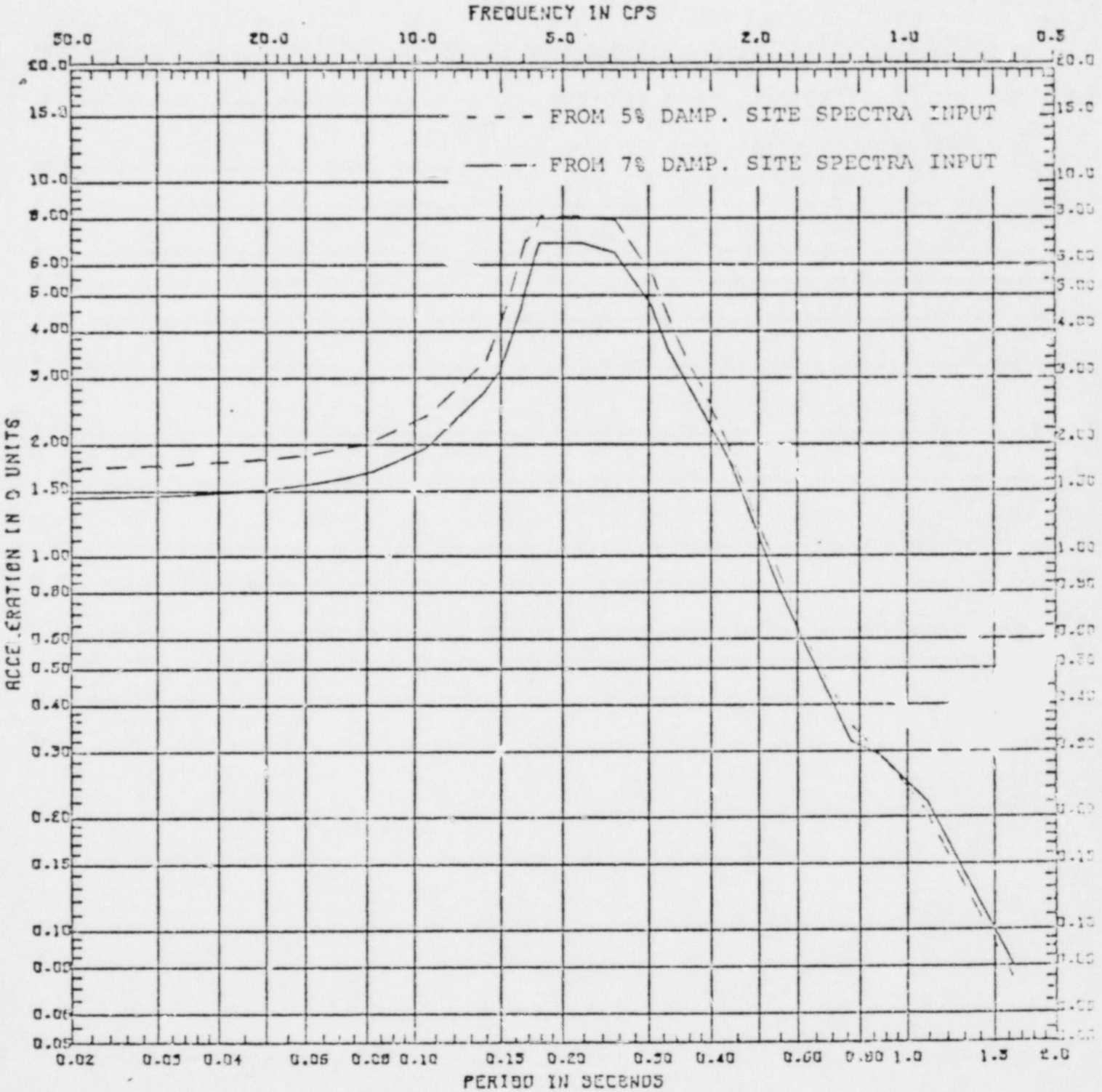
REA-AUX SSE/SPECTRA COMPARISON
NODE 5
DIRECTION EW

SPECTRA NO. B-38
ELEVATION 684'-6"
LOCATION REA-AUX BLDG. SLAB 5

SARGENT & LUNDY ENGINEERS

28 AUG 81
2240L

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



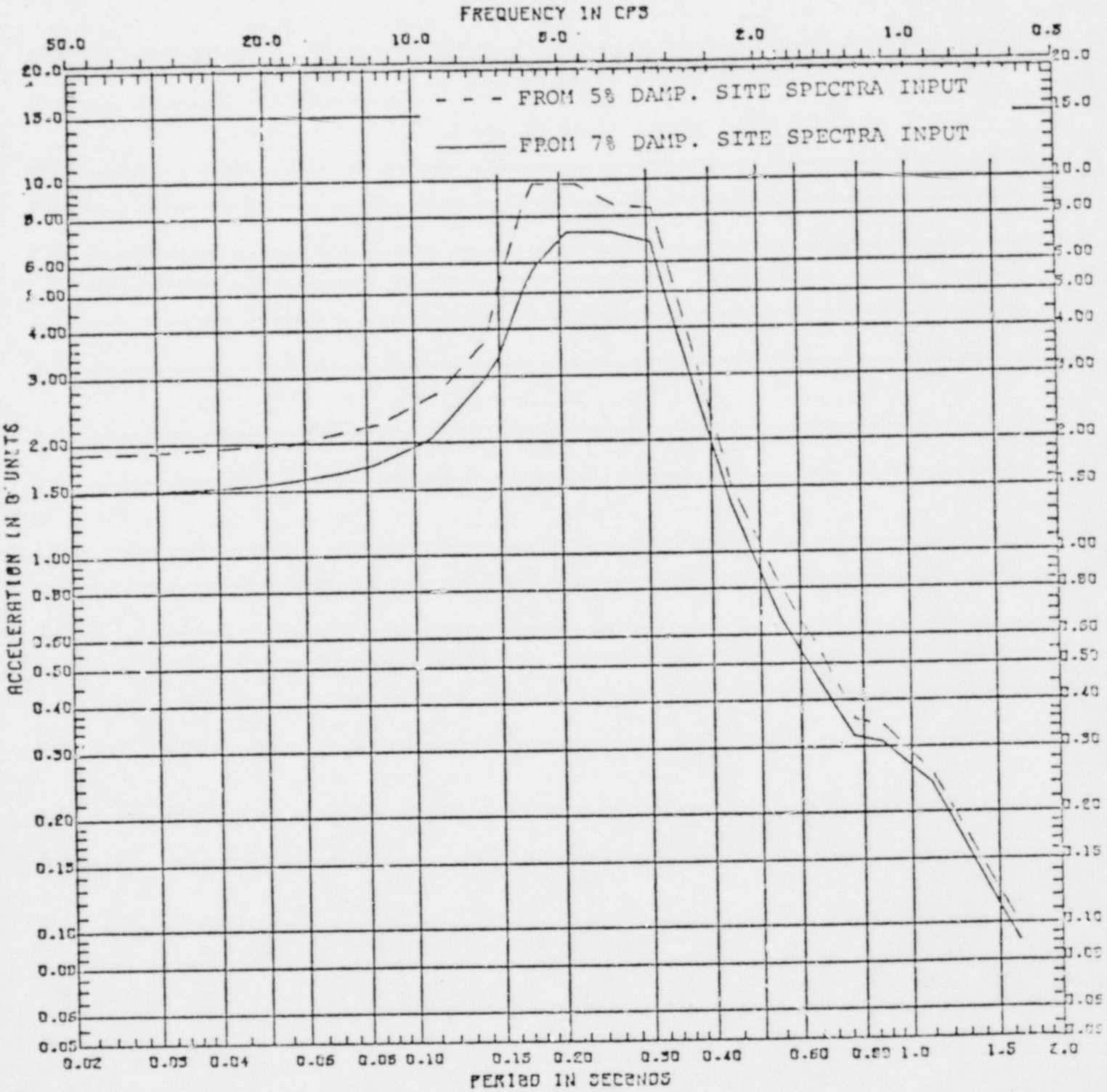
REA-AUX 33E/SPECTRA COMPARISON
NODE 91
DIRECTION NS

SPECTRA NO. . B-33
ELEVATION
LOCATION CRANE(ADJ COL 17)

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NB. 35E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT N'. 6139-35
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



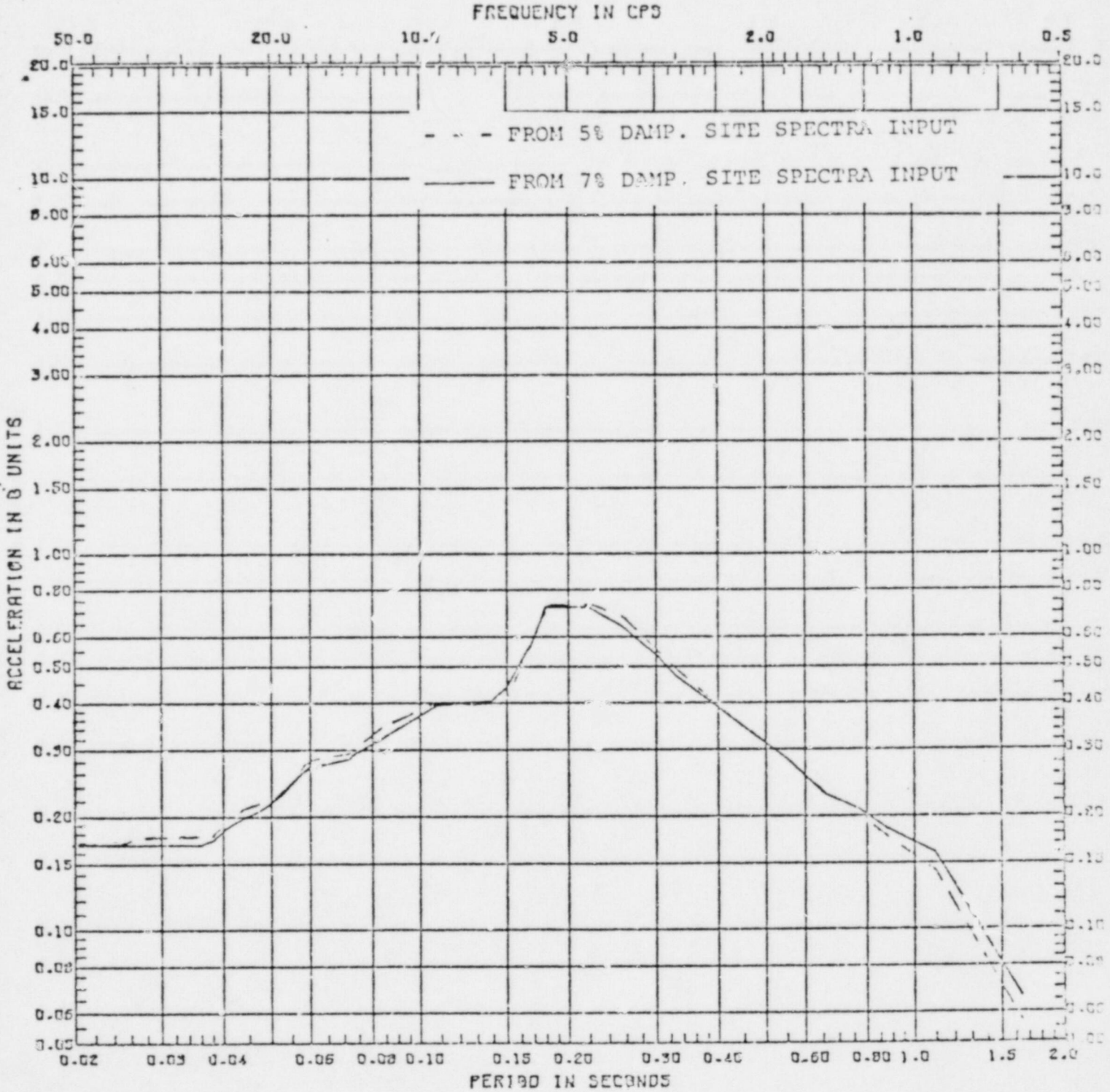
XEA-AUX 35E/SPECTRA COMPARISON
NODE 91
DIRECTION EW

SPECTRA NB.. B-40
ELEVATION
LOCATION CRANE(ADJ CBL 17)

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. 99E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-98
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



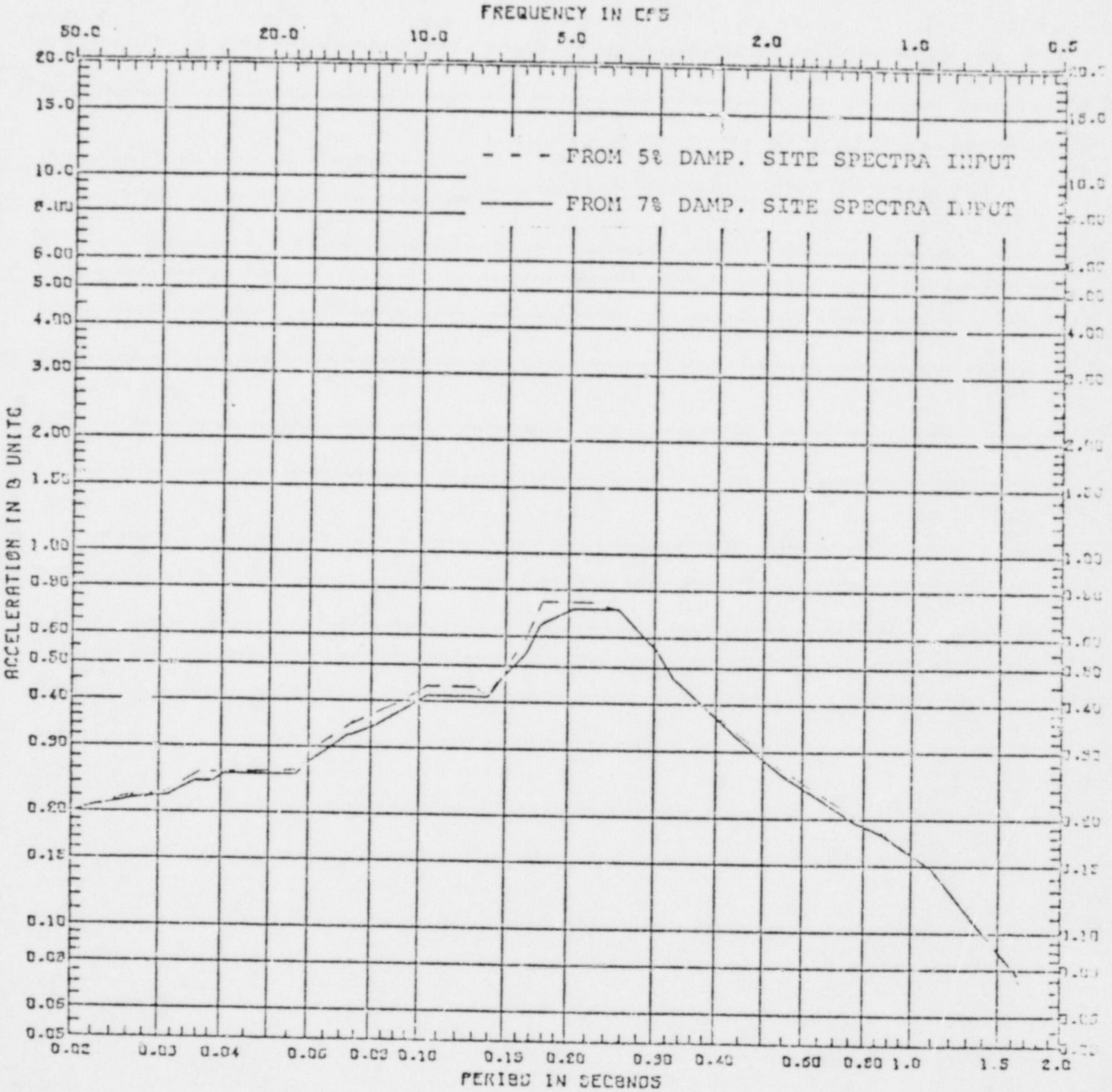
RER-AUX 99E/SPECTRA COMPARISON
NODE 13
DIRECTION N3

SPECTRA NO. B-41
ELEVATION DRYWELL CONT
LOCATION 18'-0" BELOW REV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
2240L

CALC NO. SSE/5% & 7% DAMP SITE SPECTRA REV
PROJECT FERMI-2
PROJECT NO. 6139-28
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



REA-AUX SSE/SPECTRA COMPARISON
NODE 13
DIRECTION EW

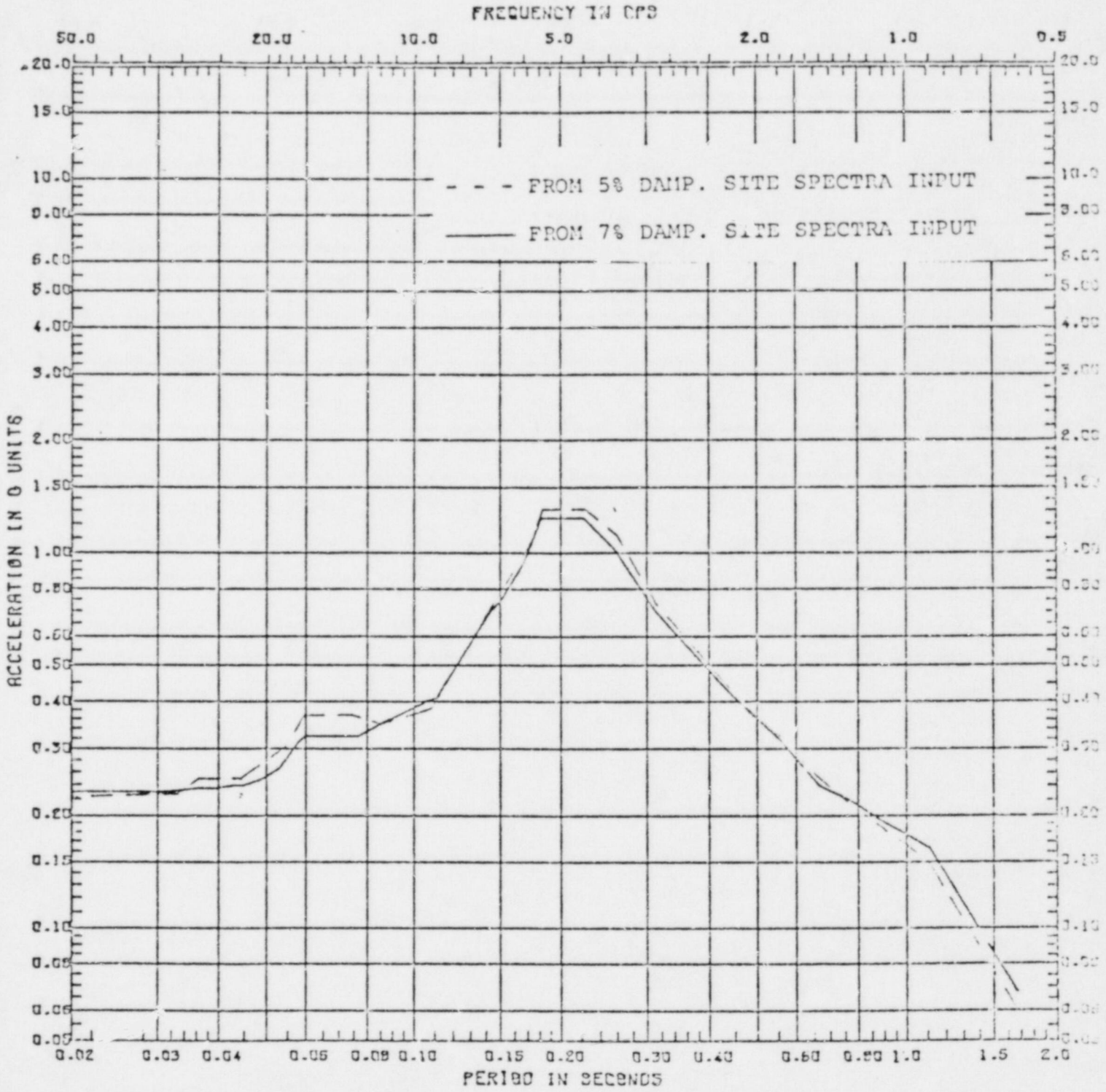
SPECTRA NO. B-42
ELEVATION DRYWELL CONT
LOCATION 18'-0" BELOW RPV INVERT

SARGENT & LUNDY ENGINEERS

28 AUG 81

224DL

CALC NO. 9SE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-98
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



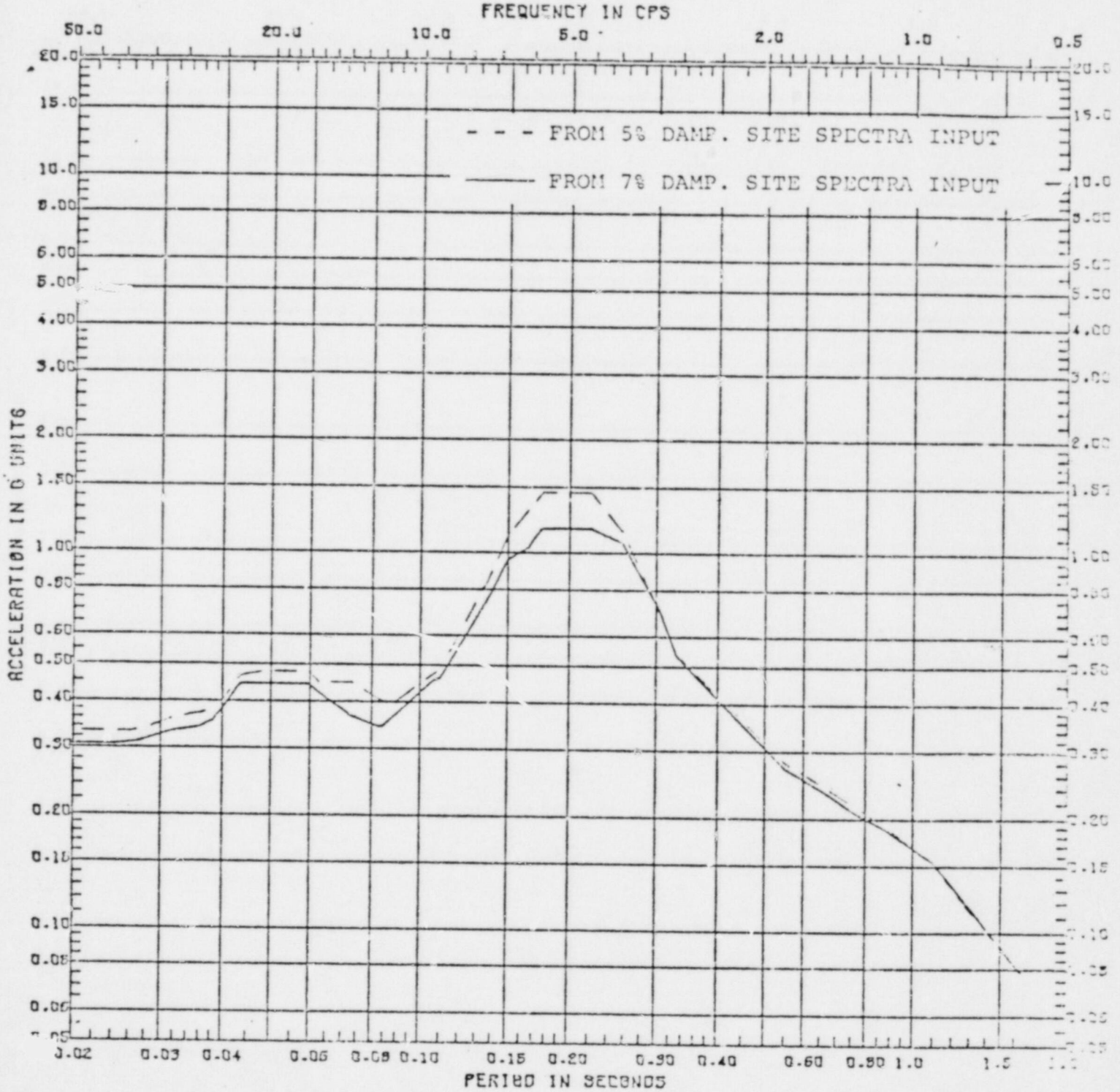
RCA-AUX SSE/SPECTRA COMPARISON
NODE 14
DIRECTION NS

SPECTRA NO. S-43
ELEVATION DRYWELL CONT
LOCATION 6'-0" BELOW RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. SSE/SZ & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-58
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



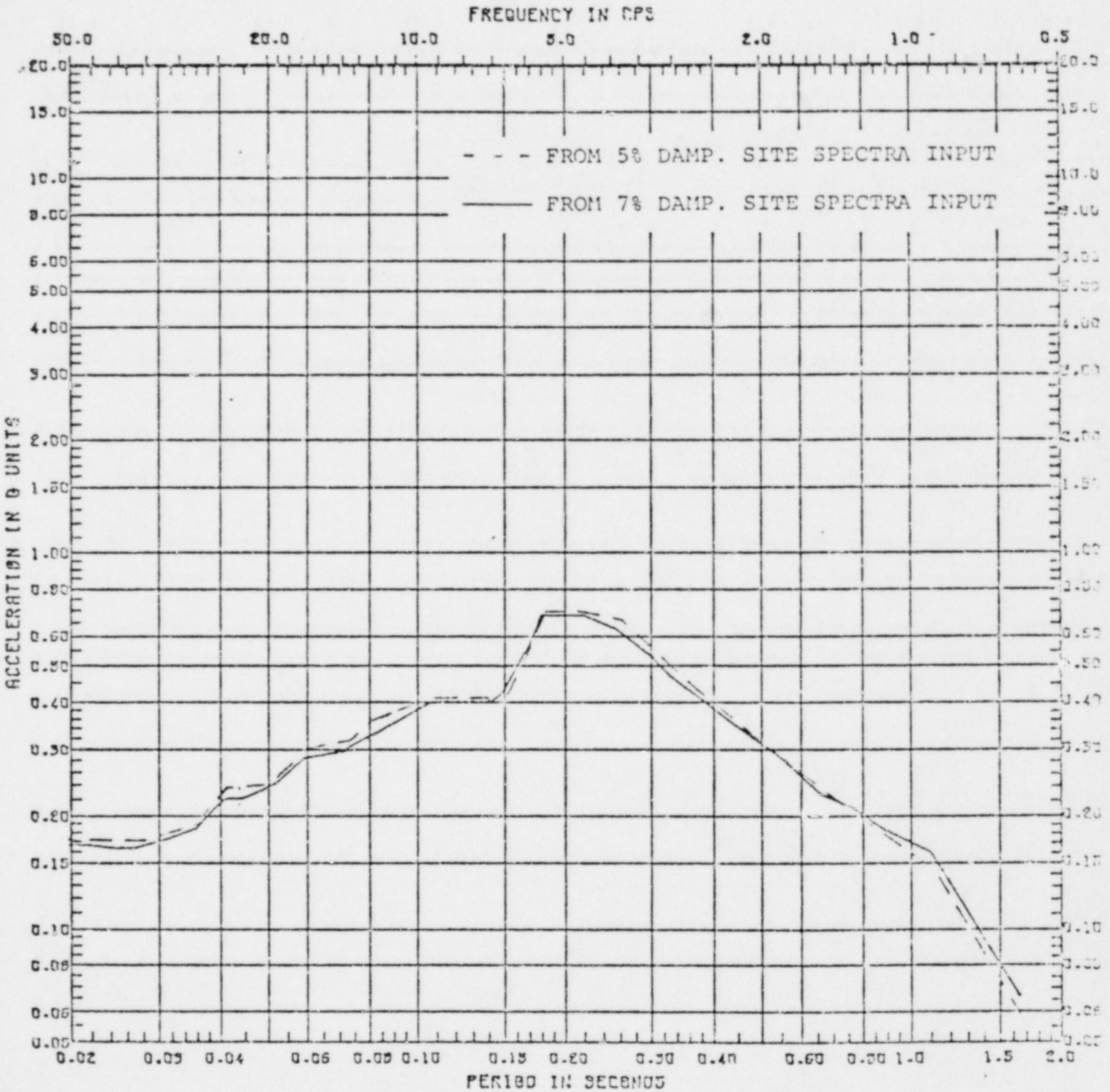
RER-AUX SSE/SPECTRA COMPARISON
NODE 14
DIRECTION EW

SPECTRA NO. D-44
ELEVATION DRYWELL CONT
LOCATION 6'-0" BELOW RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. 9SE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6100-98
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE

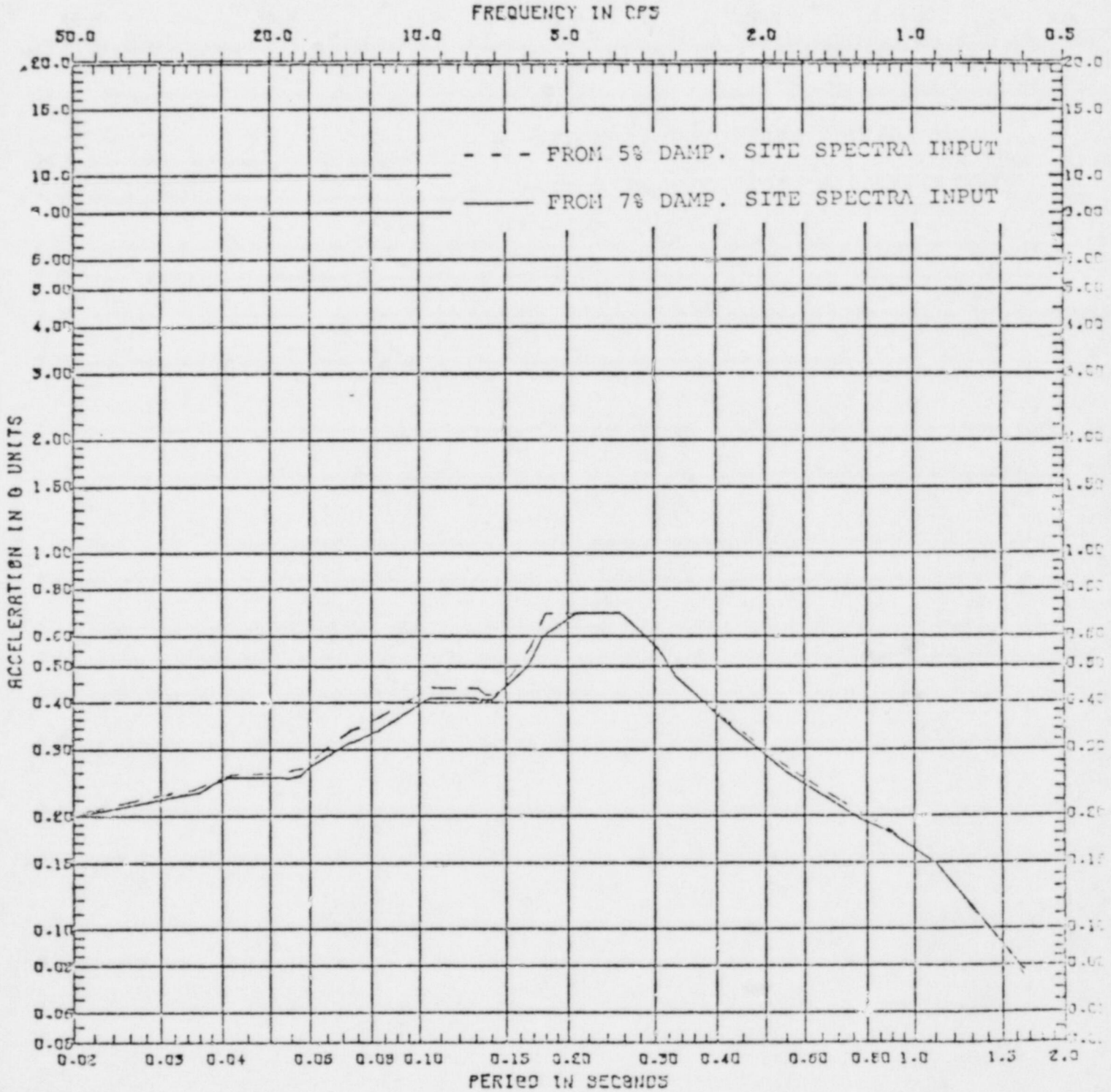


REA-AUX SSE/SPECTRA COMPARISON
NODE 28
DIRECTION N3
SPECTRA NO. B-43
ELEVATION REACTOR PED.
LOCATION 15'-0" BELOW RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. DBE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE

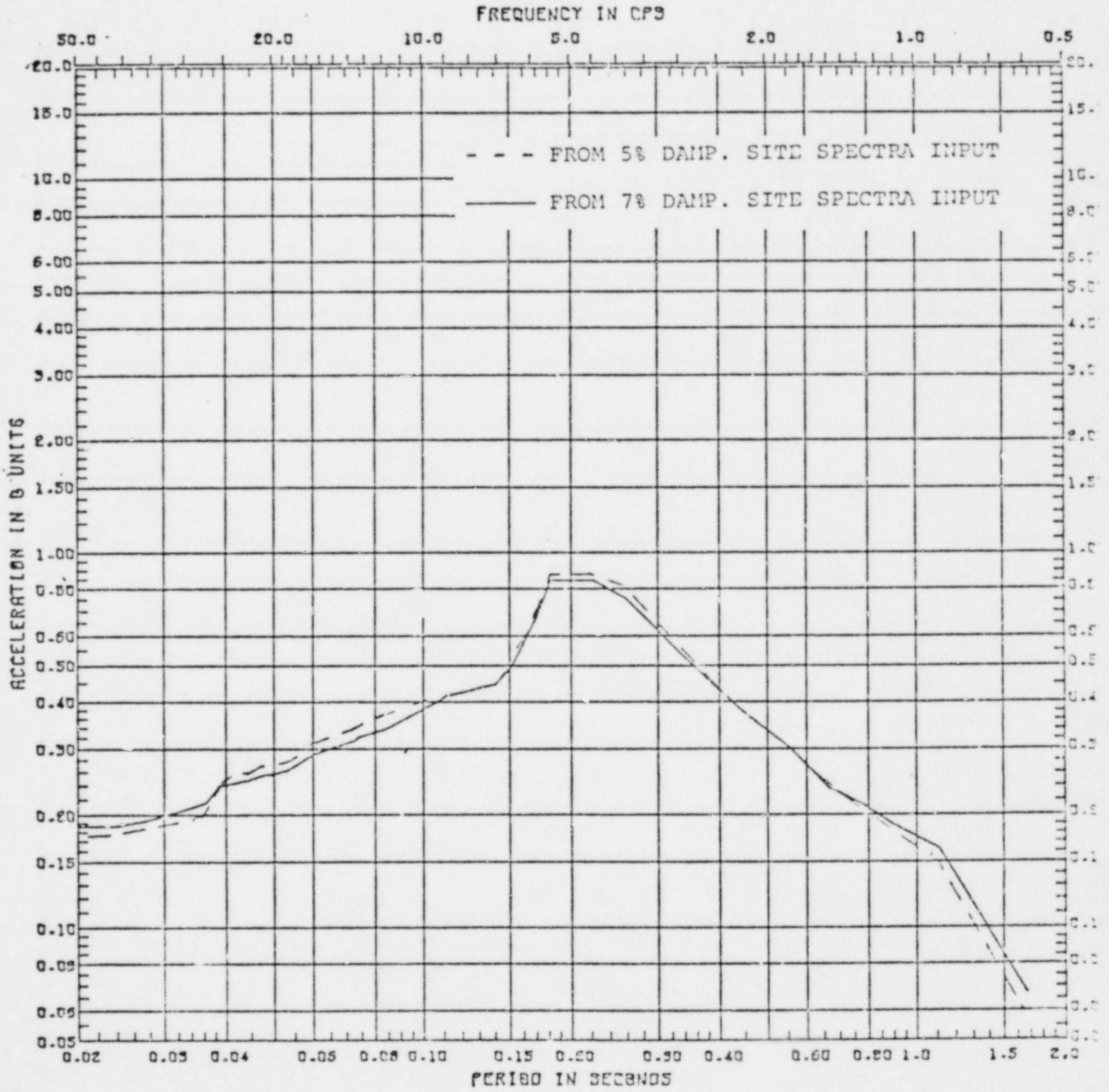


KER-AUX SSE/SPECTRA COMPARISON
NODE 20
DIRECTION EW
SPECTRA NO. B-46
ELEVATION REACTOR PED.
LOCATION 19'-0" BELOW REV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6109-98
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



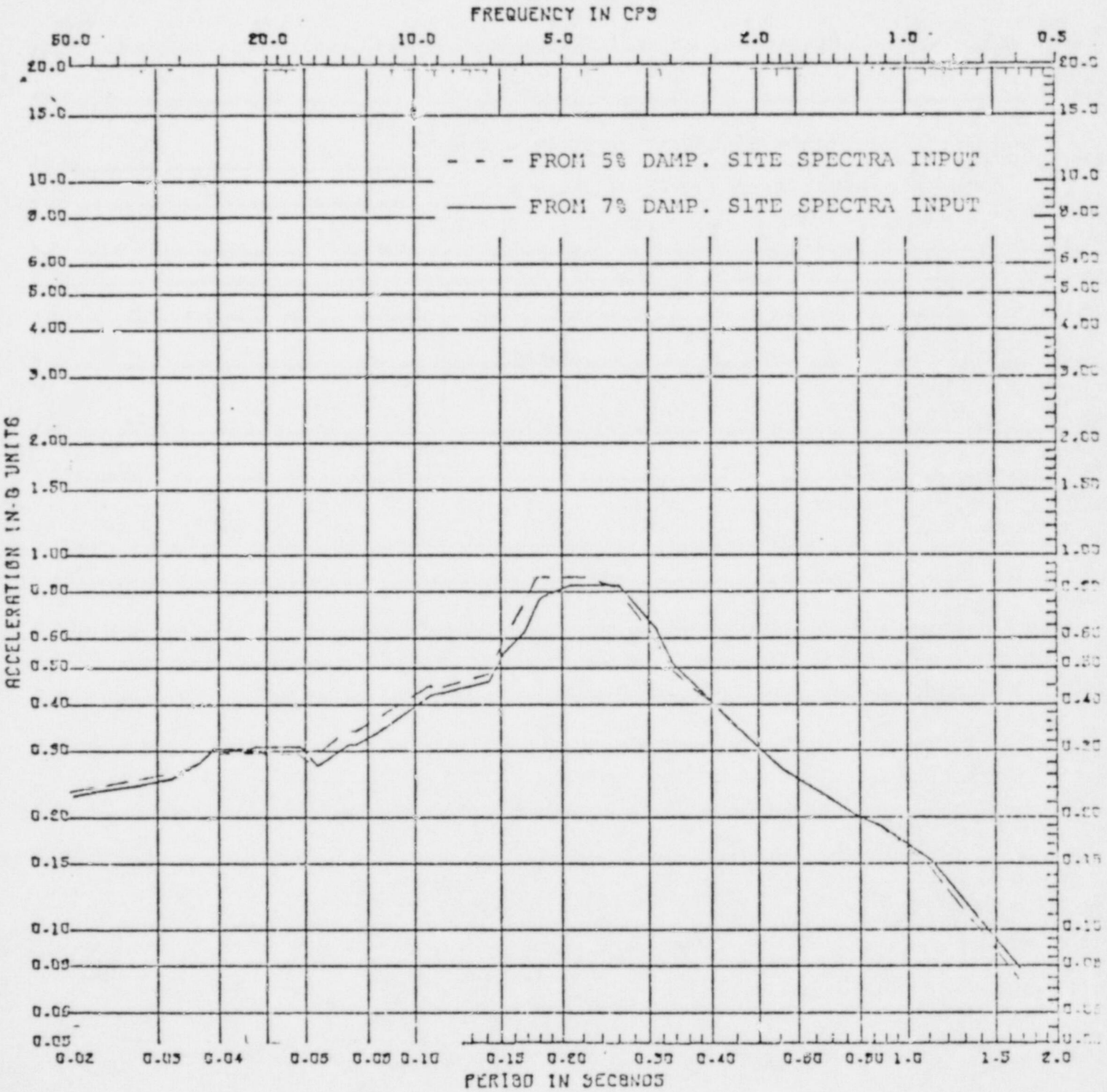
REA-AUX 33E/SPECTRA COMPARISON
NODE 29
DIRECTION NS
SPECTRA NO. B-47
ELEVATION
LOCATION TOP OF REACTOR PEDESTAL

SARGENT & LUNDY ENGINEERS

28 AUG 81

224DL

CALC NO. OBE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6159-39
PERMS WIDENED BY 10% ON E. & W SIDE
DAMPING 0.050
PAGE



RER-AUX BSE/SPECTRA COMPARISON — SPECTRA NO. B-48

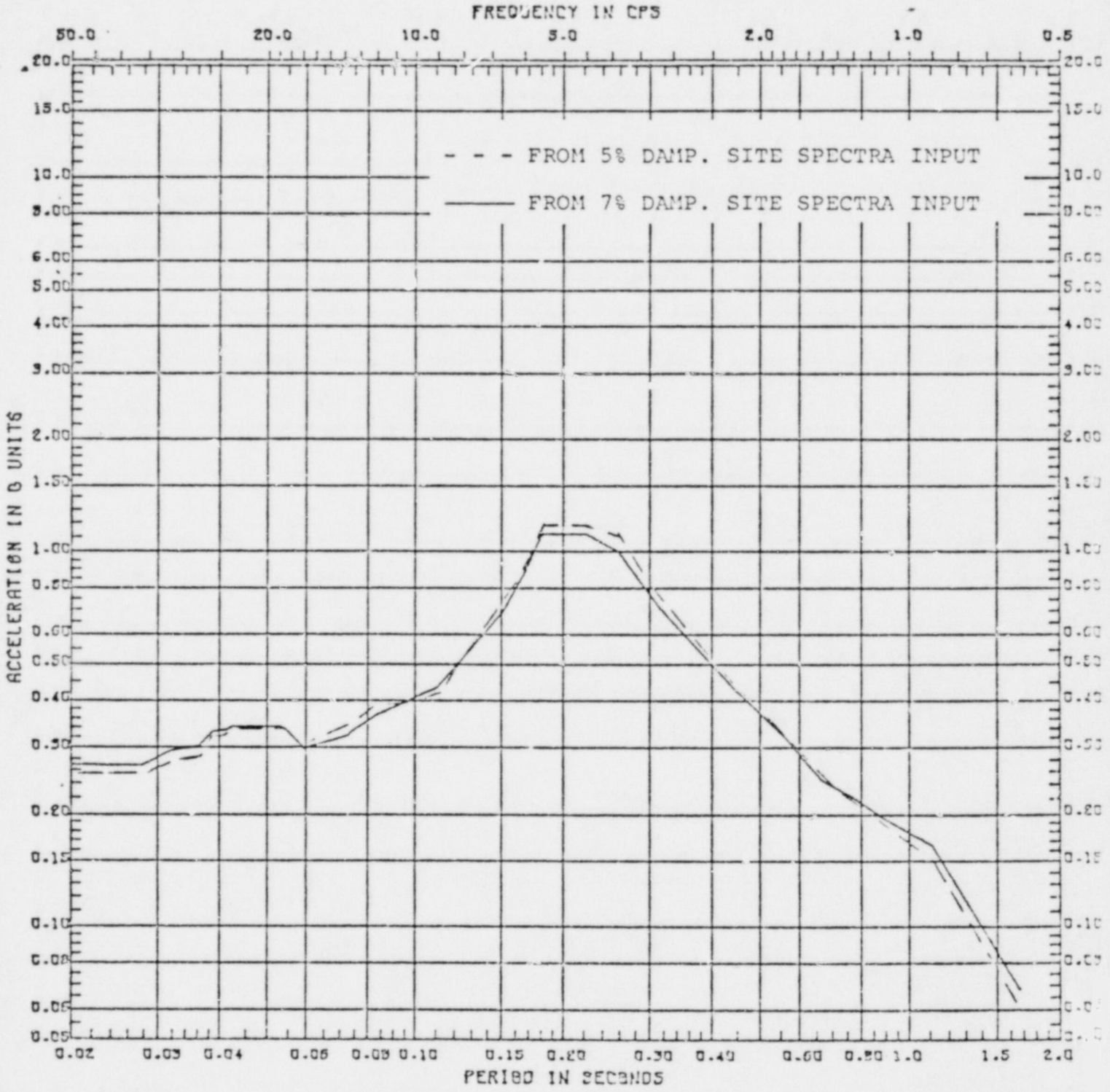
NODE 29 — ELEVATION

DIRECTION EW — LOCATION TOP OF REACTOR PEDESTAL

SARGENT & LUNDY
ENGINEERS

28 AUG 81
2240L

CALC NO. SSE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-SS
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
PAGE



RER-AUX SSE/SPECTRA COMPARISON
NODE 73
DIRECTION N3

SPECTRA NO. B-49
ELEVATION RPV
LOCATION 14'-1" ABOVE RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. 3SE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.05G
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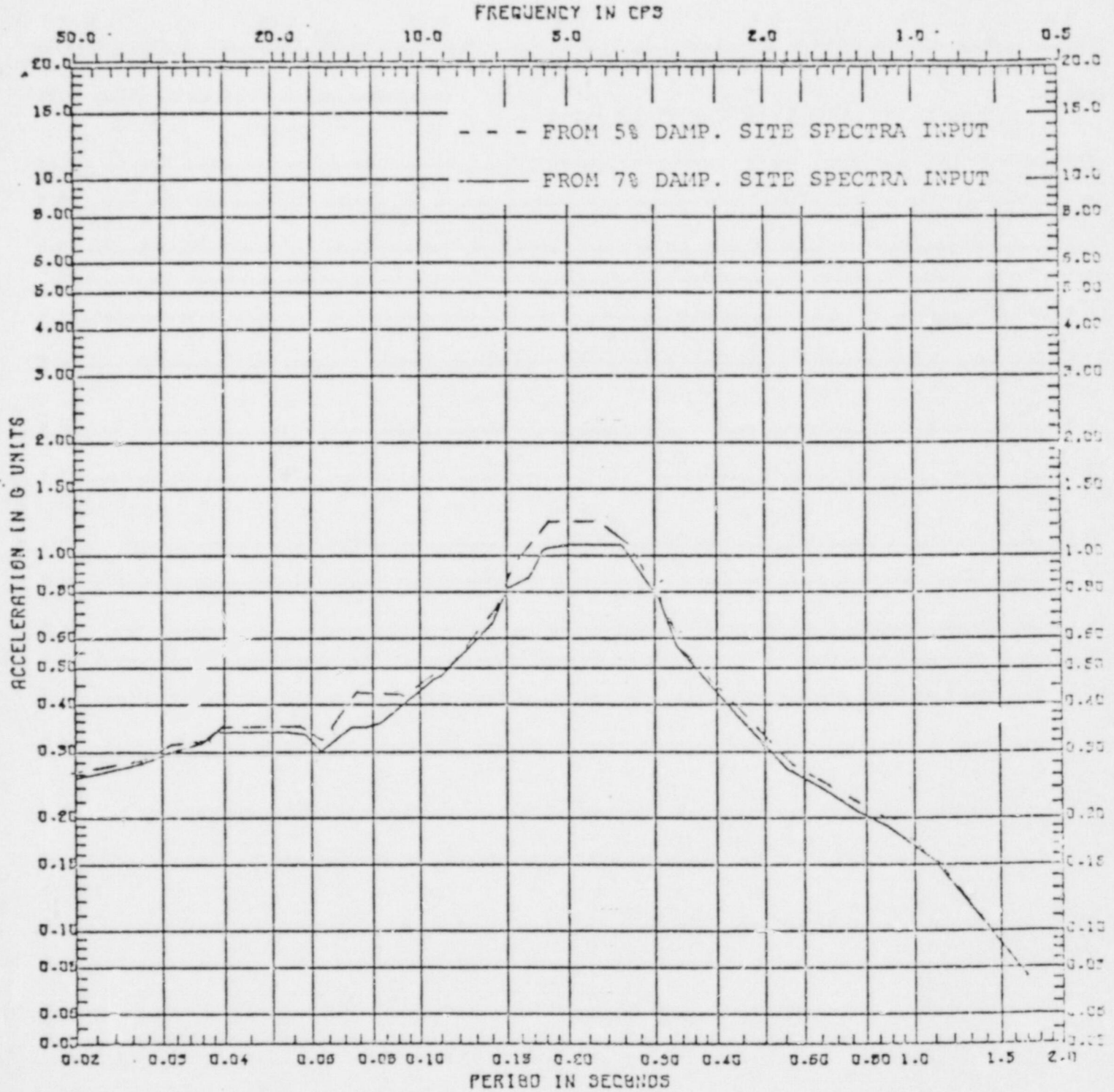

REA-AUX 3SE/SPECTRA COMPARISON
NODE 73
DIRECTION EW

SPECTRA NO. 8-50
ELEVATION RFV
LOCATION 14'-1" ABOVE RFV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. SSE/OBE & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6159-56
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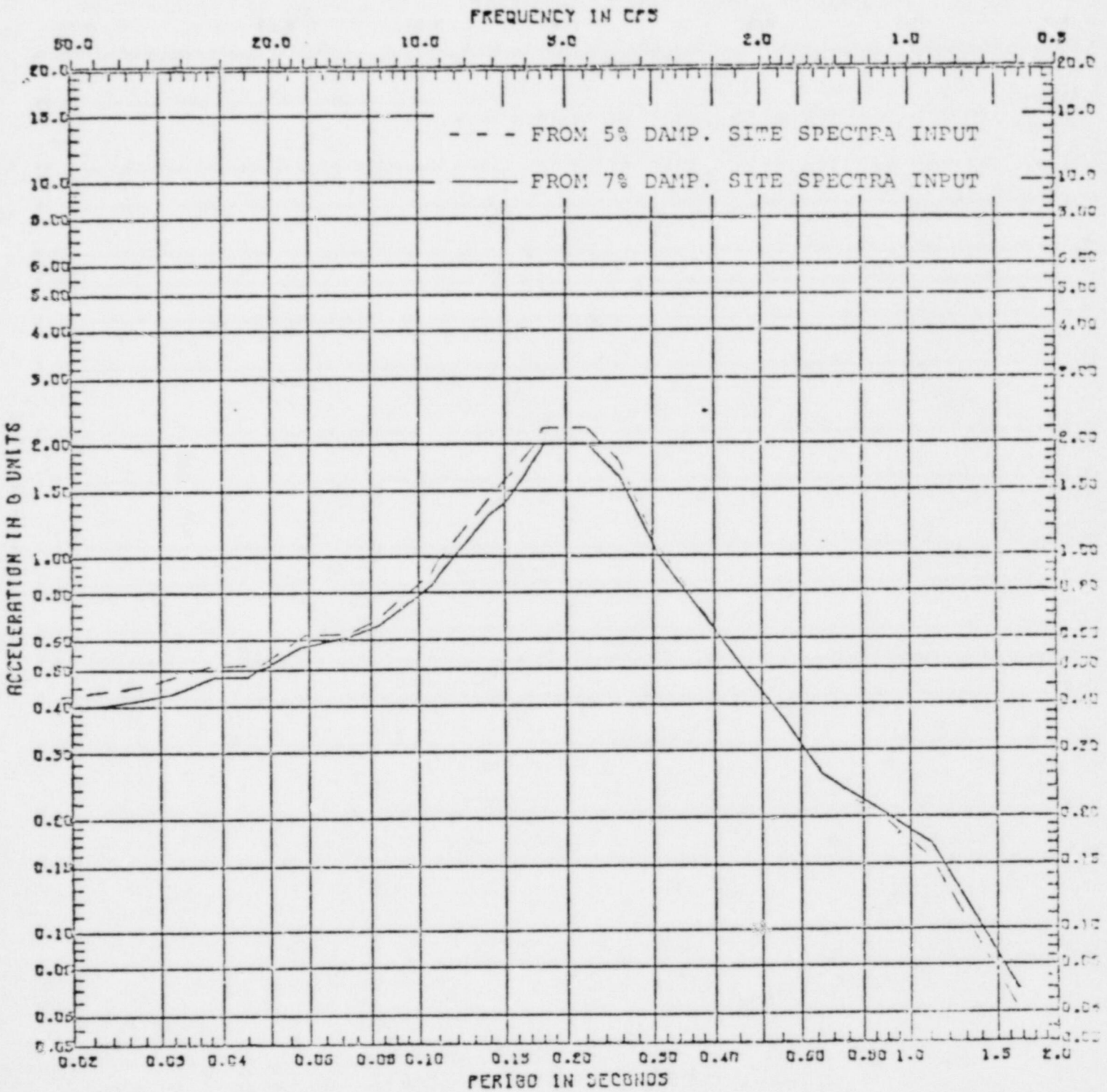

REA-AUX SSE/SPECTRA COMPARISON
NODE 60
DIRECTION NS

SPECTRA NO. 6-51
ELEVATION RPV
LOCATION 52'-11" ABOVE RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
2240L

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-38
PEAKS WIDENED BY 10% ON EACH SIDE
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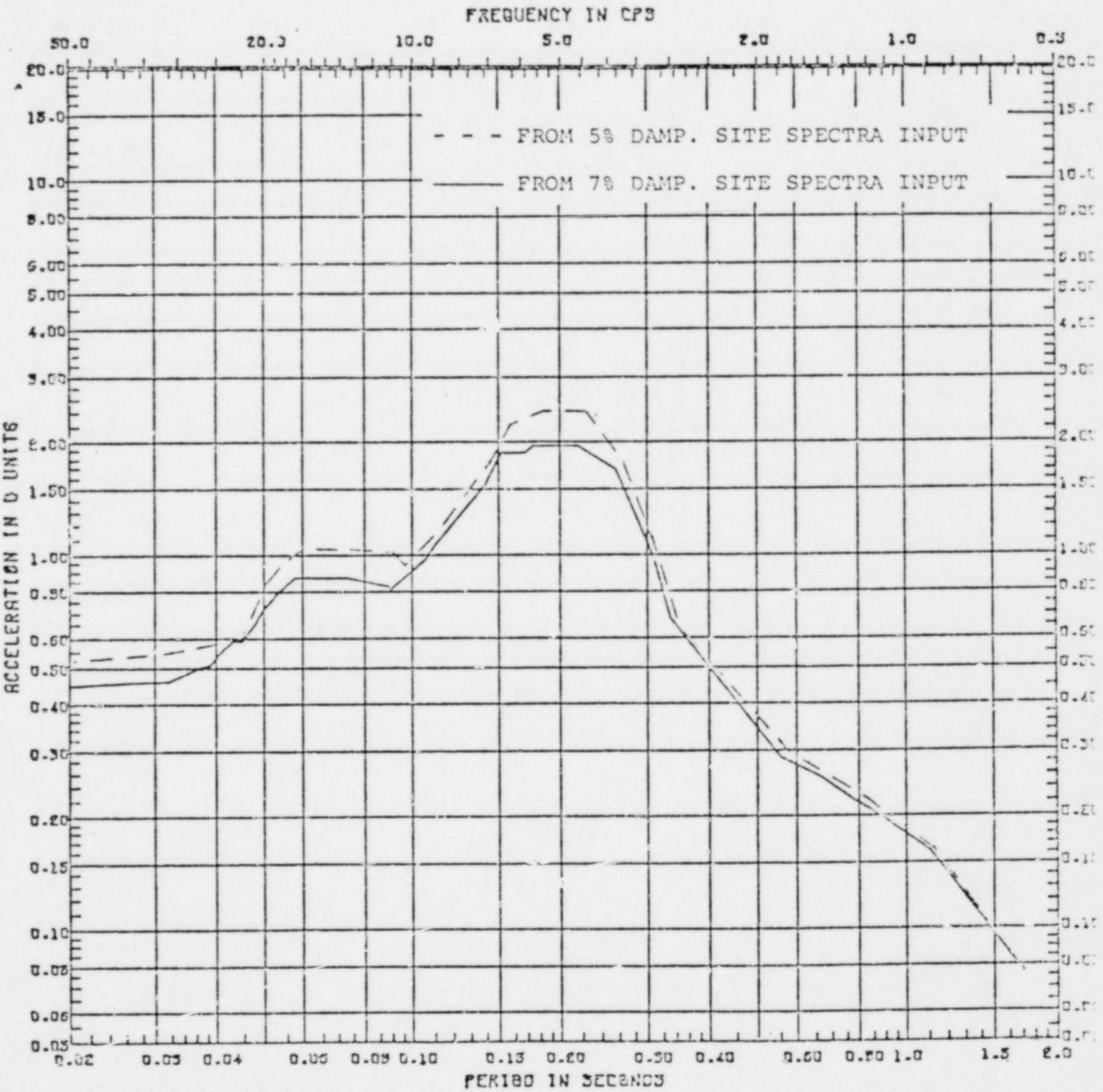

REA-AUX SSE/SPECTRA COMPARISON
NODE 60
DIRECTION EW

SPECTRA NO. 6-5Z
ELEVATION RPV
LOCATION 52'-11" ABOVE RPV INVERT

SARGENT & LUNDY ENGINEERS

28 AUG 81
2240L

CALC NO. 95E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 KEV
PROJECT NO. 6139-20
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.05%
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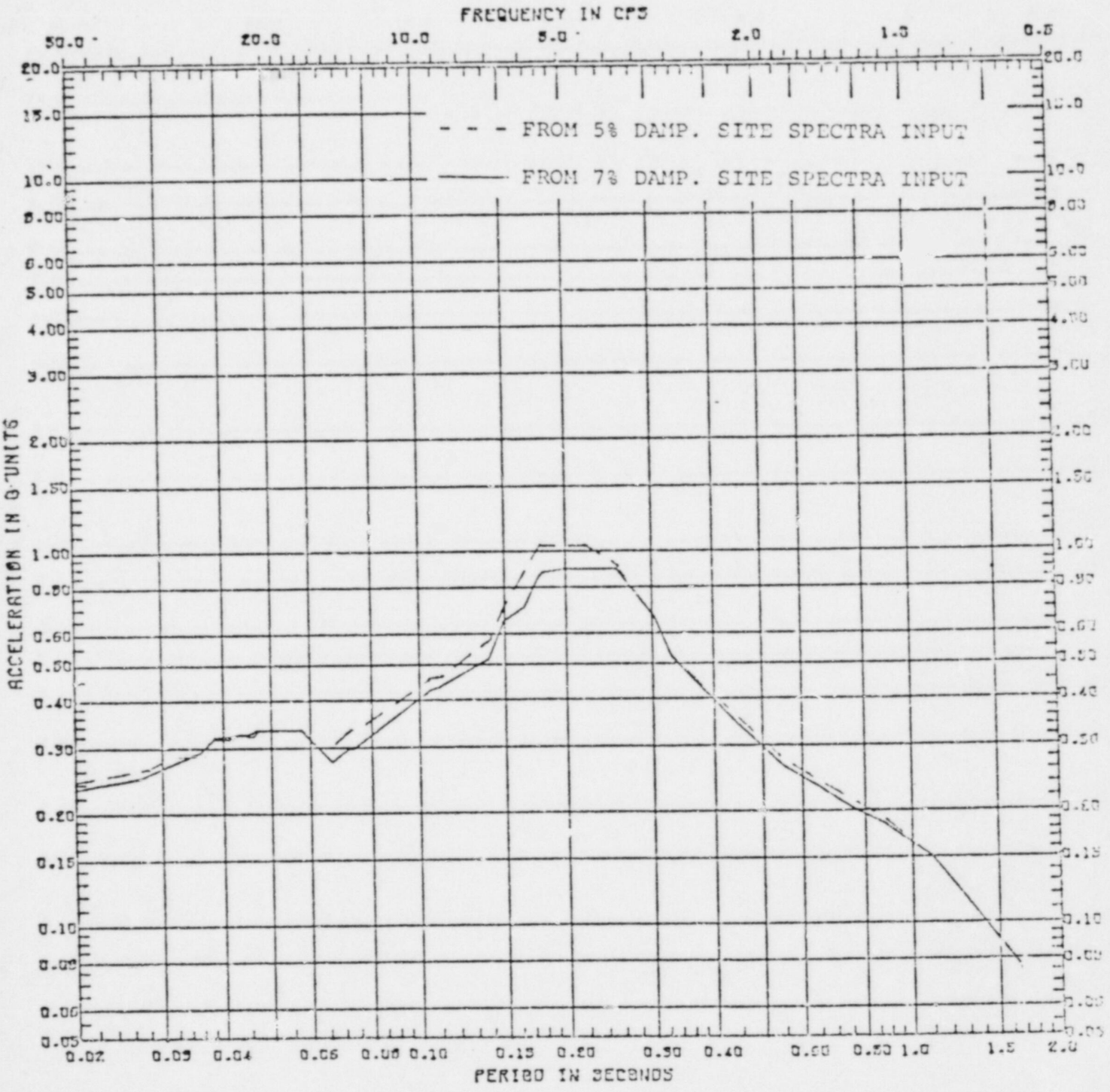

REA-AUX SSE/SPECTRA COMPARISON
MODE SO
DIRECTION EW

SPECTRA NO. 6-57
ELEVATION 606'-0''
LOCATION SACRIFICIAL SHIELD

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. SSE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-58
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
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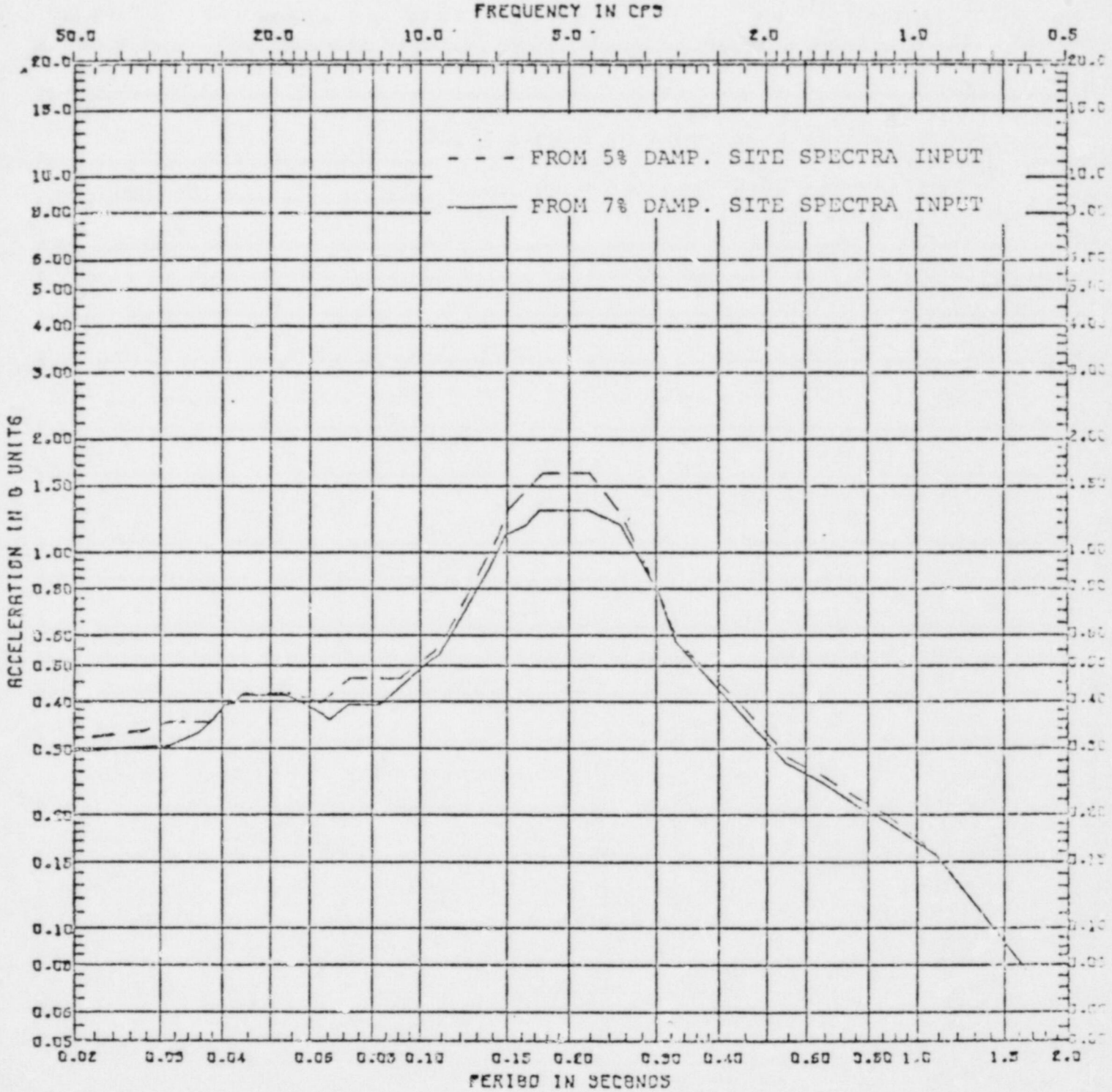

REA-AUX SSE/SPECTRA COMPARISON
NODE 31
DIRECTION EW

SPECTRA NO. 5-58
ELEVATION 627'-11"
LOCATION SACRIFICIAL SHIELD

SARGENT & LUNDY ENGINEERS

28 AUG 81
2240L

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-38
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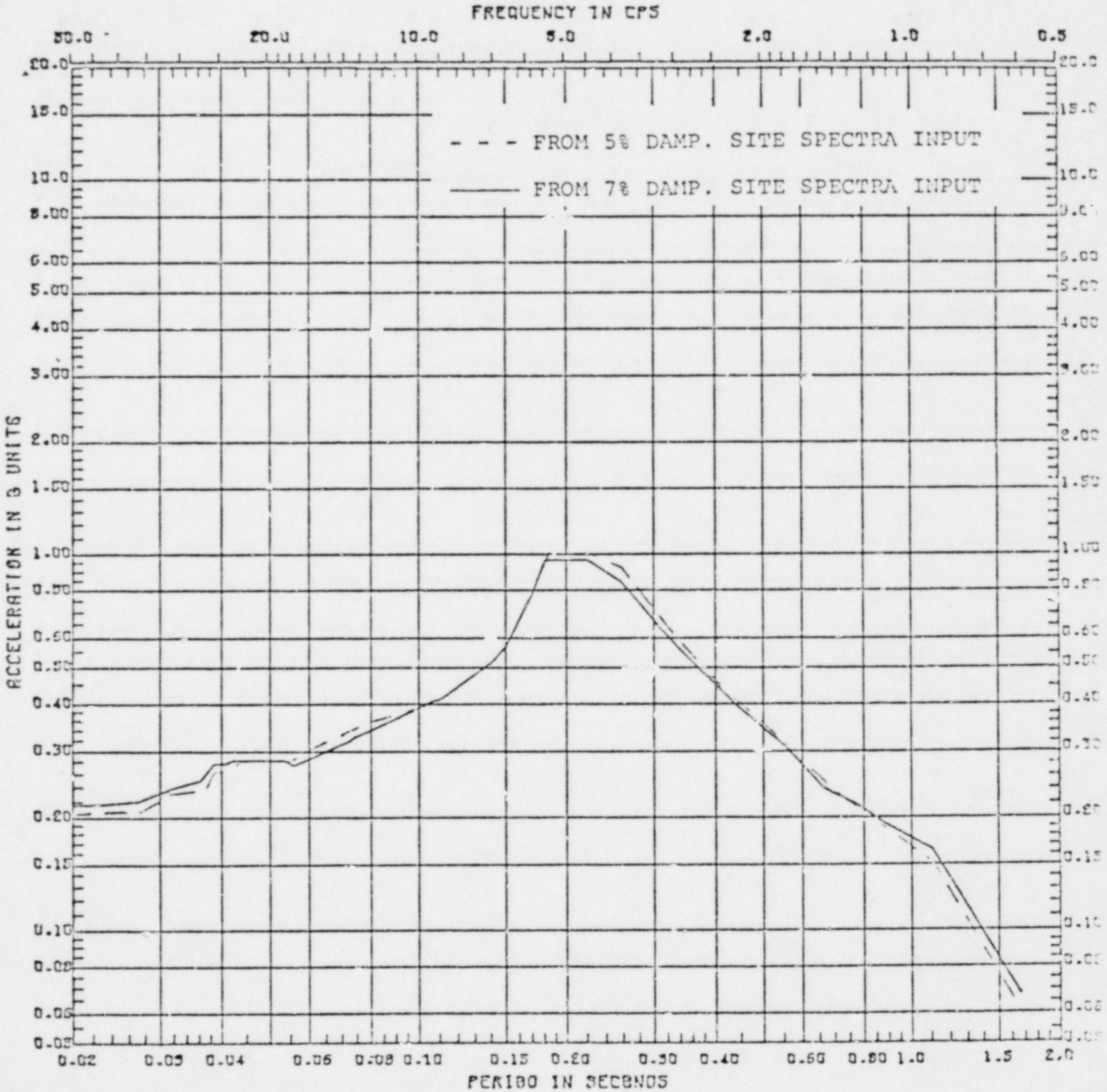

REA-AUX 33E/SPECTRA COMPARISON
NOZZ 30
DIRECTION N3

SPECTRA NO. 5-39
ELEVATION 606'-0"
LOCATION SACRIFICIAL SHIELD

SARGENT & LUNDY ENGINEERS

28 AUG 81
2240L

CALC NO. SSE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-38
PEAKS WIDENED BY 10% ON EACH SIDE
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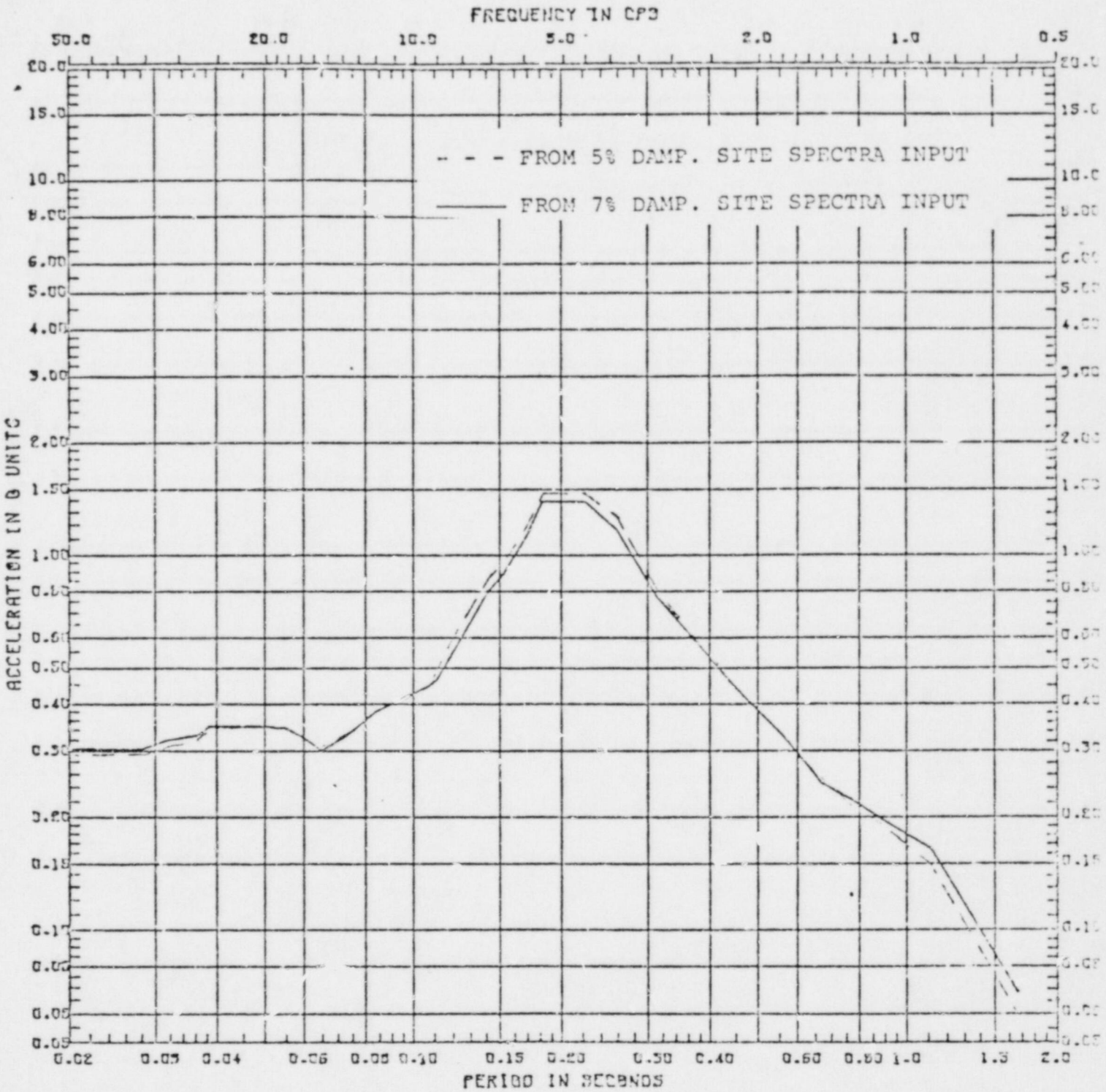

RCA-AUX SSE/SPECTRA COMPARISON
NODE 21
DIRECTION N3

SPECTRA NO. 6-60
ELEVATION 627'-11"
LOCATION SACRIFICIAL SHIELD

SARGENT & LUNDY ENGINEERS

28 AUG 81

224DL

CALC NO. 5%E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6159-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
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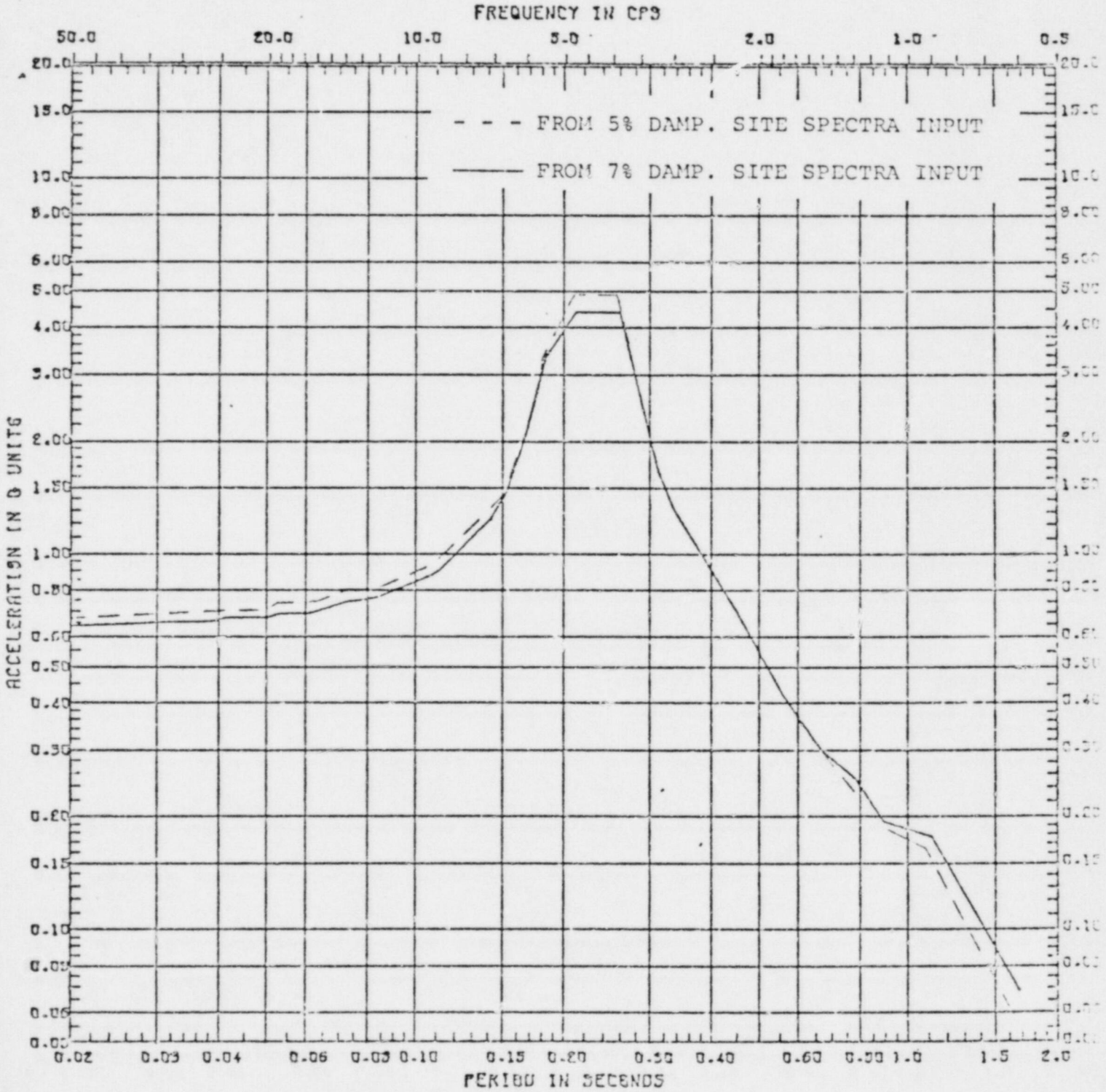

NER-AUX SSE/SPECTRA COMPARISON

NODE 47

DIRECTION N5

SPECTRA NO. B-61

ELEVATION SHROUD

LOCATION 33'-8" ABOVE REF INVERT

SARGENT & LUNDY
ENGINEERS

23 AUG 81
224DL

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-33
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING - 0.050
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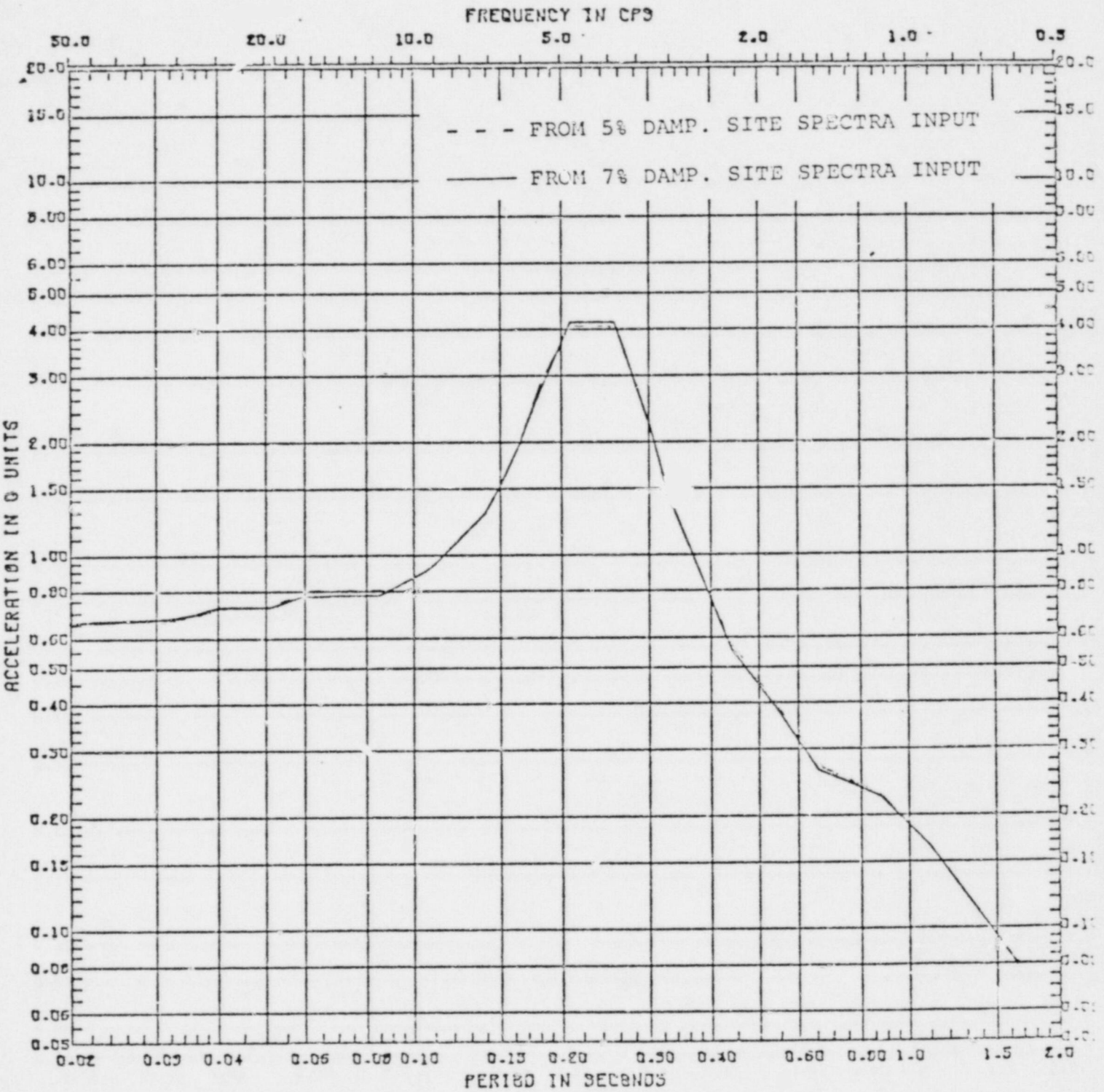


REA-AUX SSE/SPECTRA COMPARISON
NODE 47
DIRECTION EW

SPECTRA NO. 8-52
ELEVATION SHRBUD
LOCATION 33'-8" ABVE REV INVERT

SARGENT & LUNDY ENGINEERS

28 AUG 81

224DL

CALC NO. DSE/5% & 7% DAMP SITE SPECTRA

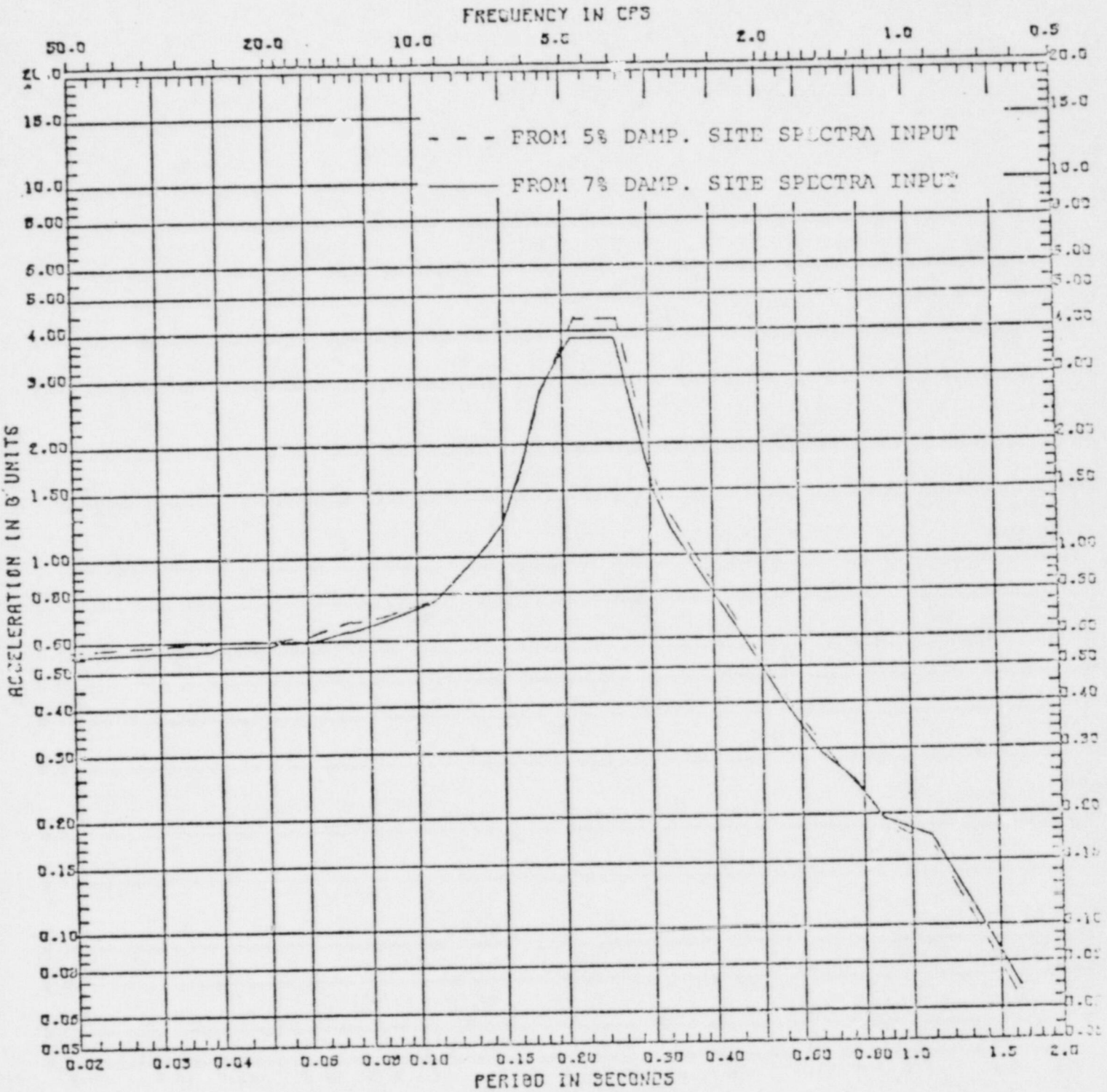
PROJECT FERMI-2 REV

PROJECT NO. 5159-38

PEAKS WIDENED BY 10% ON EACH SIDE

DAMPING 0.050

PAGE



REA-RUX DSE/SPECTRA COMPARISON

NODE 79

DIRECTION NS

SPECTRA NO. 6-63

ELEVATION SHROUD

LOCATION 30'-9'' ABOVE RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. SSE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
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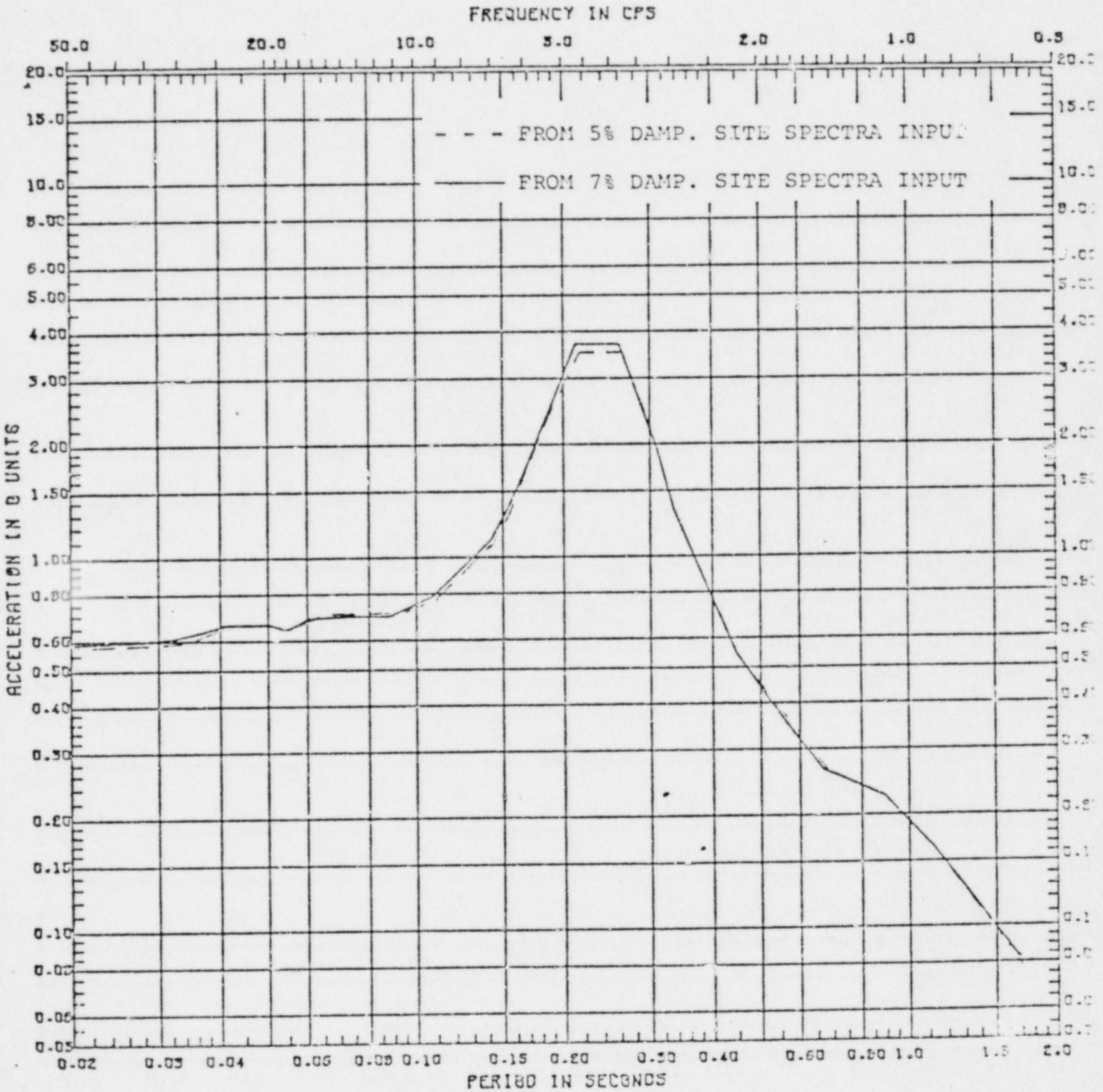


RER-AUX SSE/SPECTRA COMPARISON
NODE 78
DIRECTION EW

SPECTRA NO. B-64
ELEVATION SHROUD
LOCATION 50'-9" ABOVE RPV INVERT

SARGENT & LUNDY ENGINEERS

28 AUG 81

2240L

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA

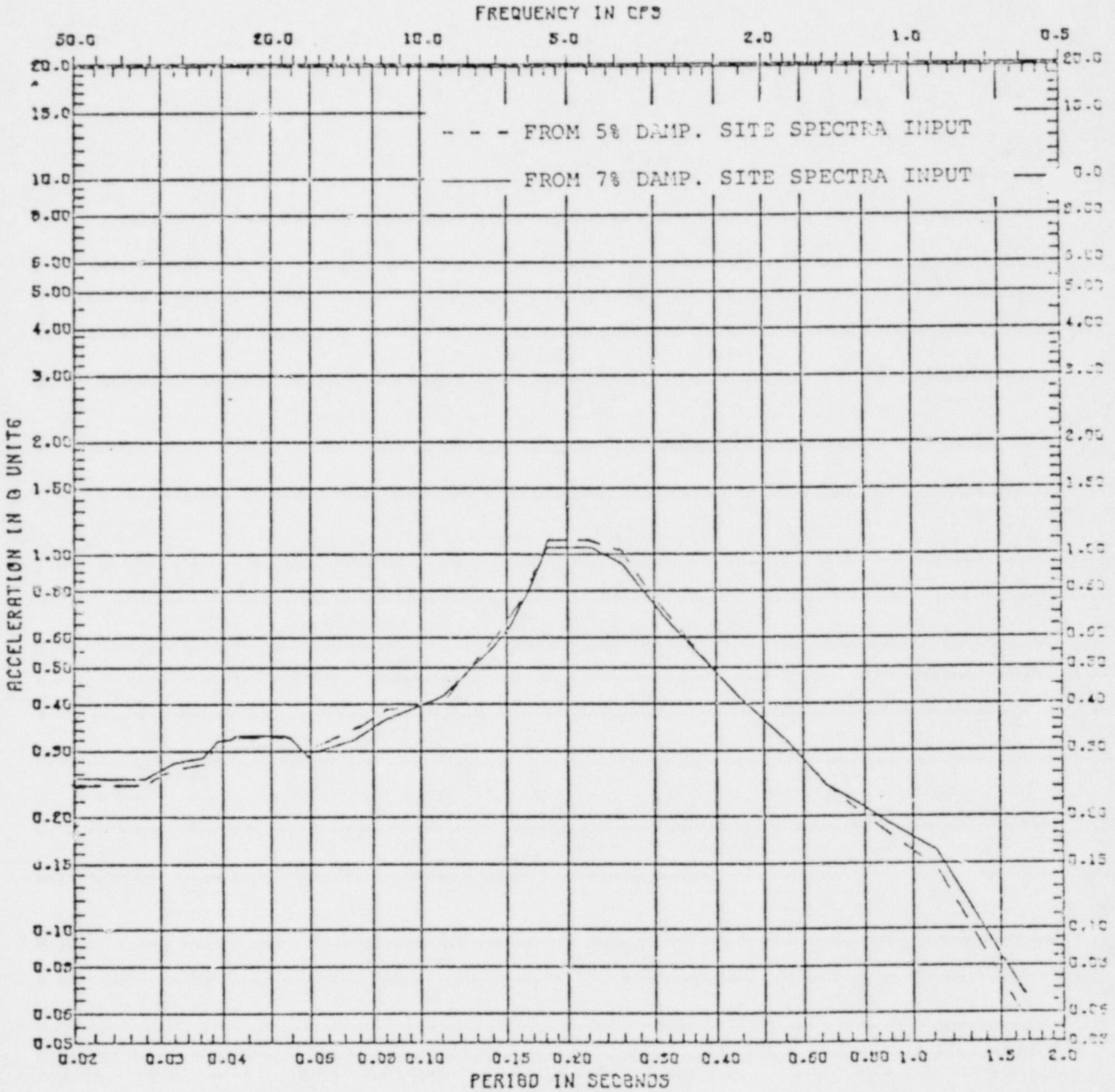
PROJECT FERMI-2 REV

PROJECT NO. 6130-38

PEAKS WIDENED BY 10% ON EACH SIDE

DAMPING 0.050

PAGE



RER-AUX 33E/SPECTRA COMPARISON

NODE 74

DIRECTION N3

SPECTRA NO. B-63

ELEVATION RPV

LOCATION 10'-11" ABOVE RPV INVERT

SARGENT & LUNDY ENGINEERS

28 AUG 81

224DL

CALC NO. 39E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6139-39
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
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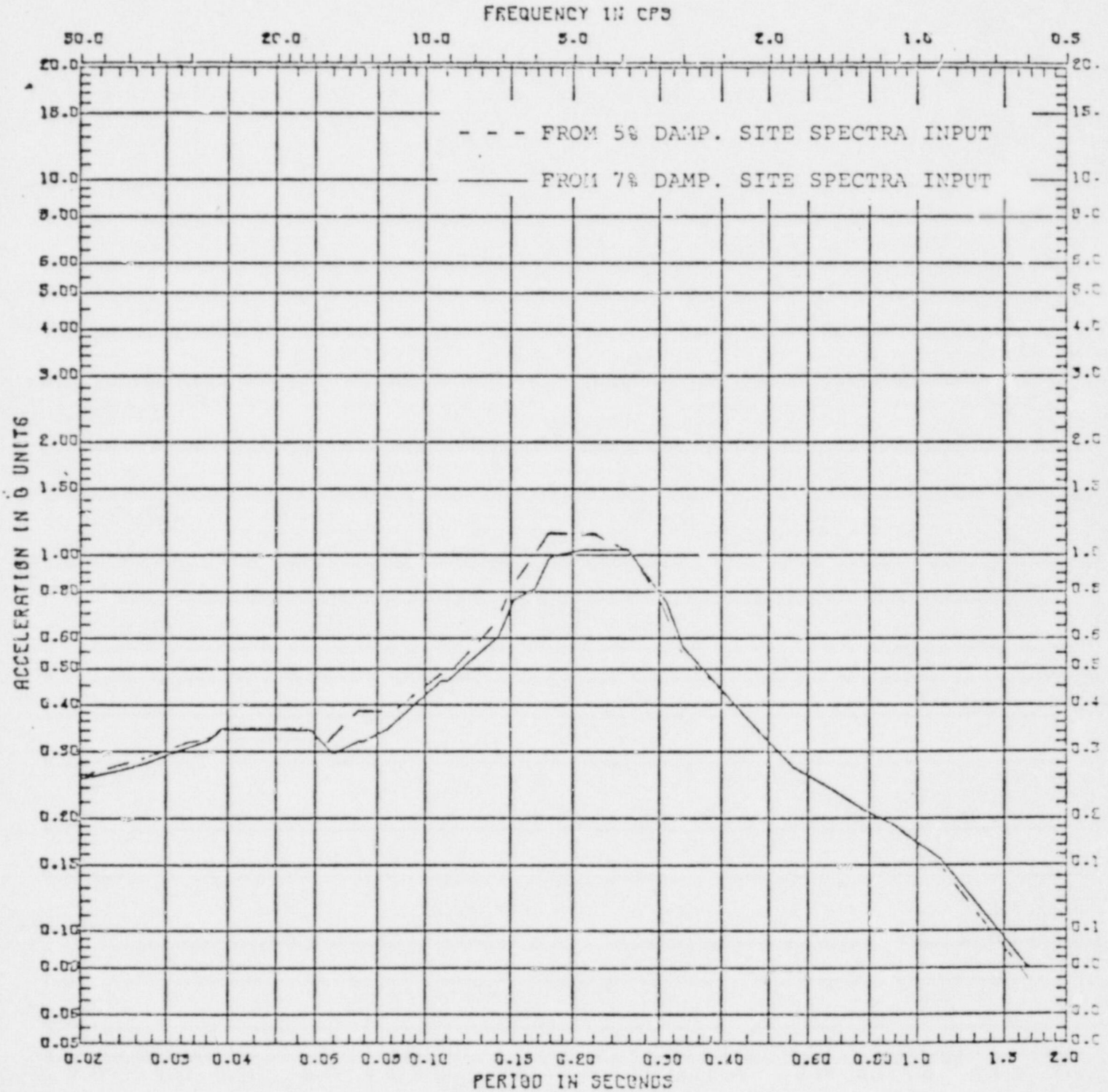

REA-AUX BSE/SPECTRA COMPARISON
NODE . 74
DIRECTION EW
SPECTRA NO. B-66
ELEVATION RPV
LOCATION 10'-11" ABOVE RPV INVERT

SARGENT & LUNDY ENGINEERS

26 AUG 81
224DL

CALC NO. SSE/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 5159-98
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
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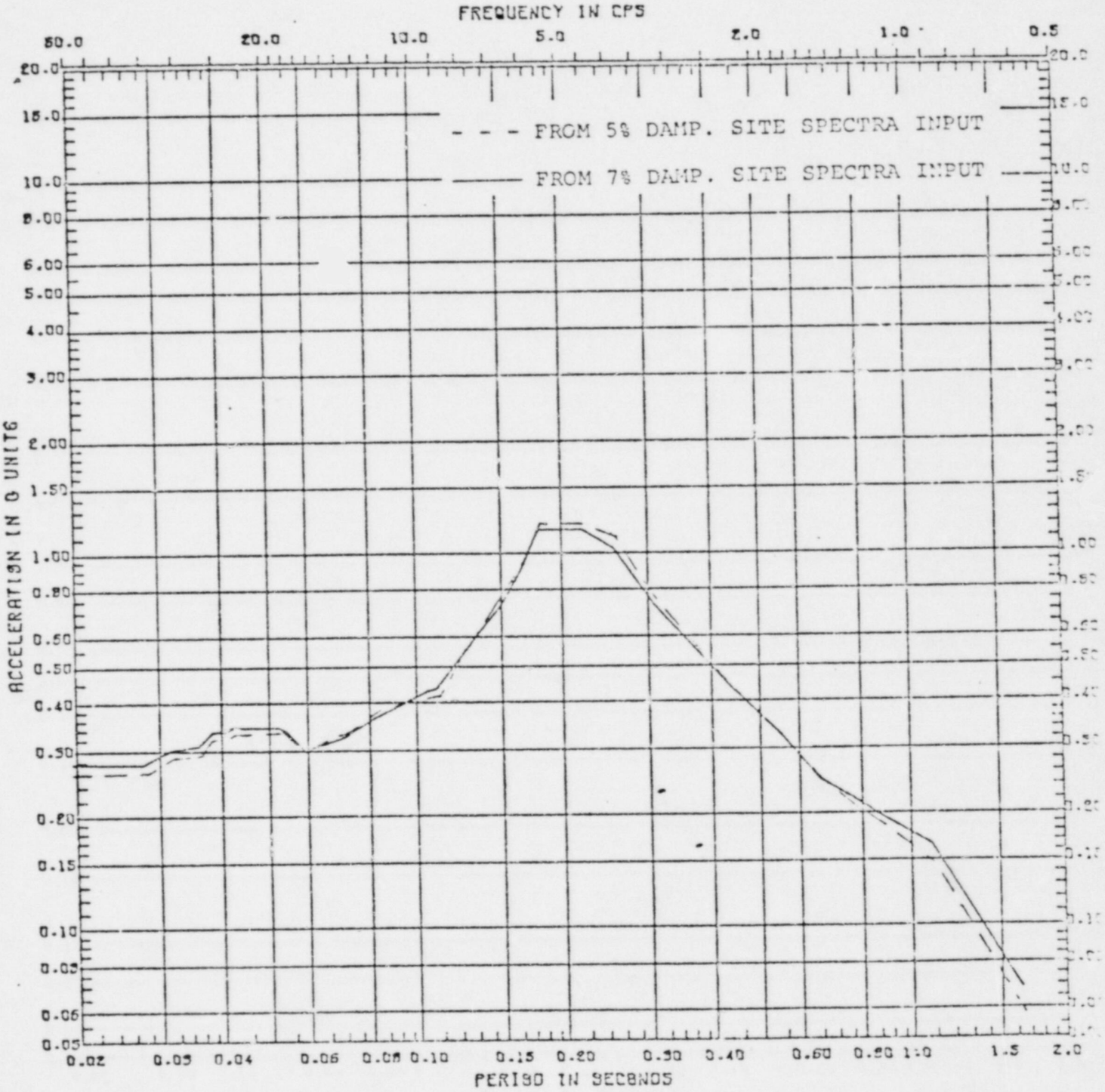

REA-AUX SSE/SPECTRA COMPARISON
NODE 72
DIRECTION N3

SPECTRA NO. 5-67
ELEVATION RPV
LOCATION 15'-11" ABOVE RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
2240L

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA REV
PROJECT FERMI-2
PROJECT NO. 6139-38
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
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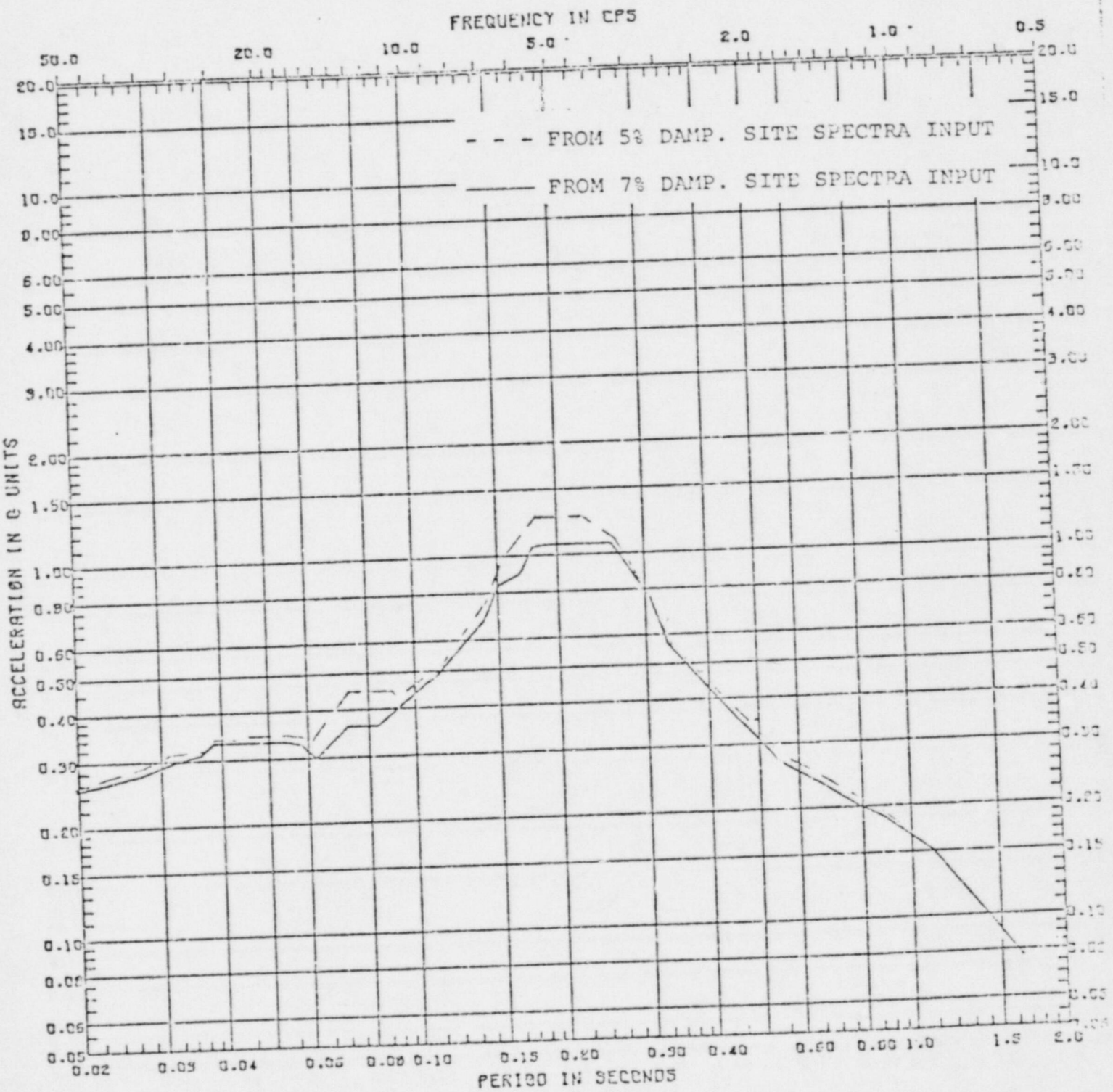


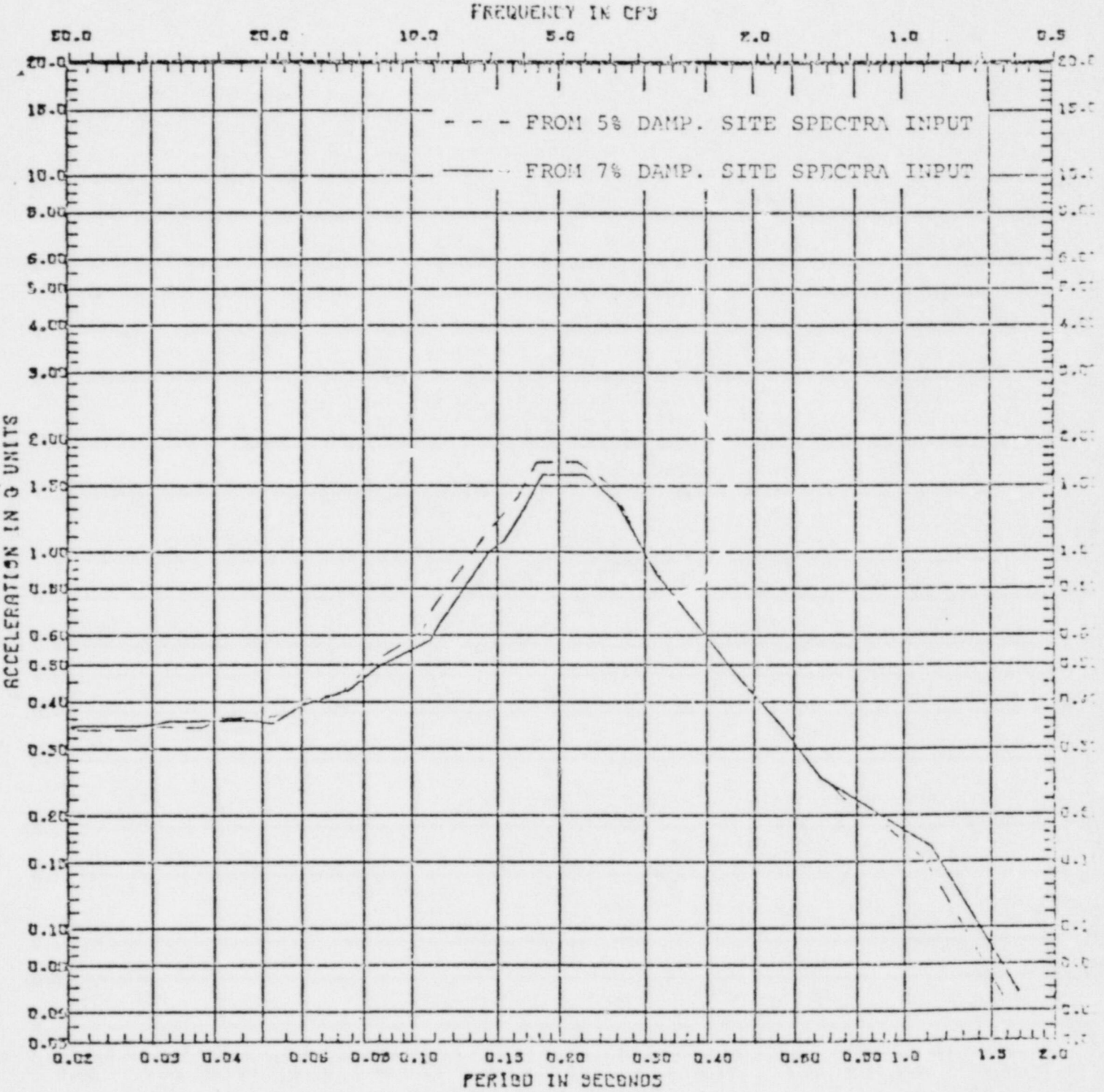
REA-AUX 33E/SPECTRA COMPARISON
NODE 72
DIRECTION EW

SPECTRA NO. - 3-68
ELEVATION RPV
LOCATION 15'-11" ABOVE RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
2240L

CALC NO. SSE/SZ & 7% DAMP SITE SPECTRA
PROJECT PERRY-K REV
PROJECT NO. 6139-58
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
FOSE



RCA-AUX SSE/SPECTRA COMPARISON
NODE 64
DIRECTION NS

SPECTRA NO. B-09
ELEVATION RPV
LOCATION 35'-10" ABOVE RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT PERRY-2 REV
PROJECT NO. 6139-98
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
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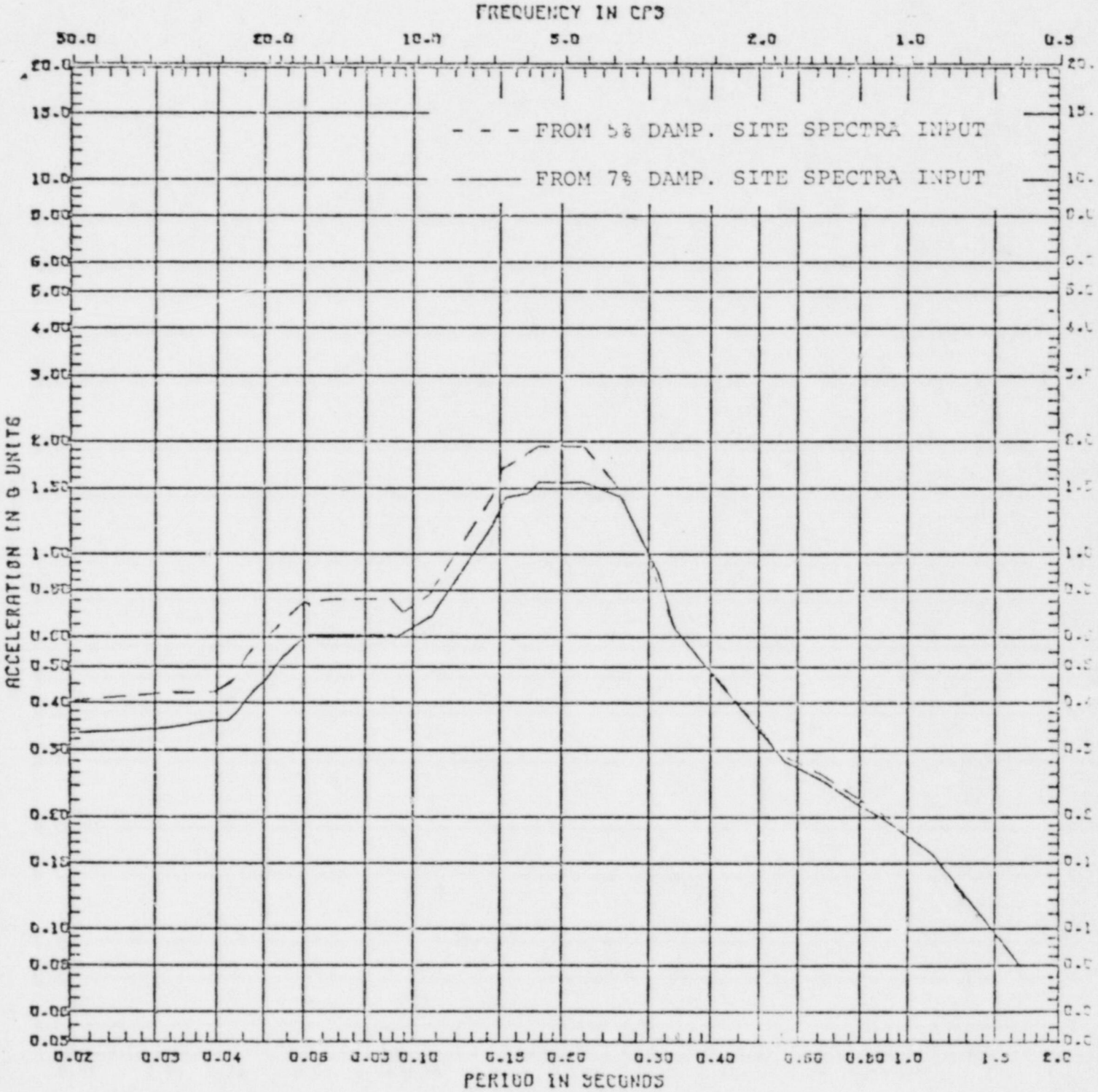

RCA-AUX 33E/SPECTRA COMPARISON
NODE 64
DIRECTION EW

SPECTRA NO. 8-70
ELEVATION RPV
LOCATION 36'-10" ABOVE RPV INVERT

61

SARGENT & LUNDY
ENGINEERS

28 AUG 81
2240L

CALC NO. DDE/DZ & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6130-99
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
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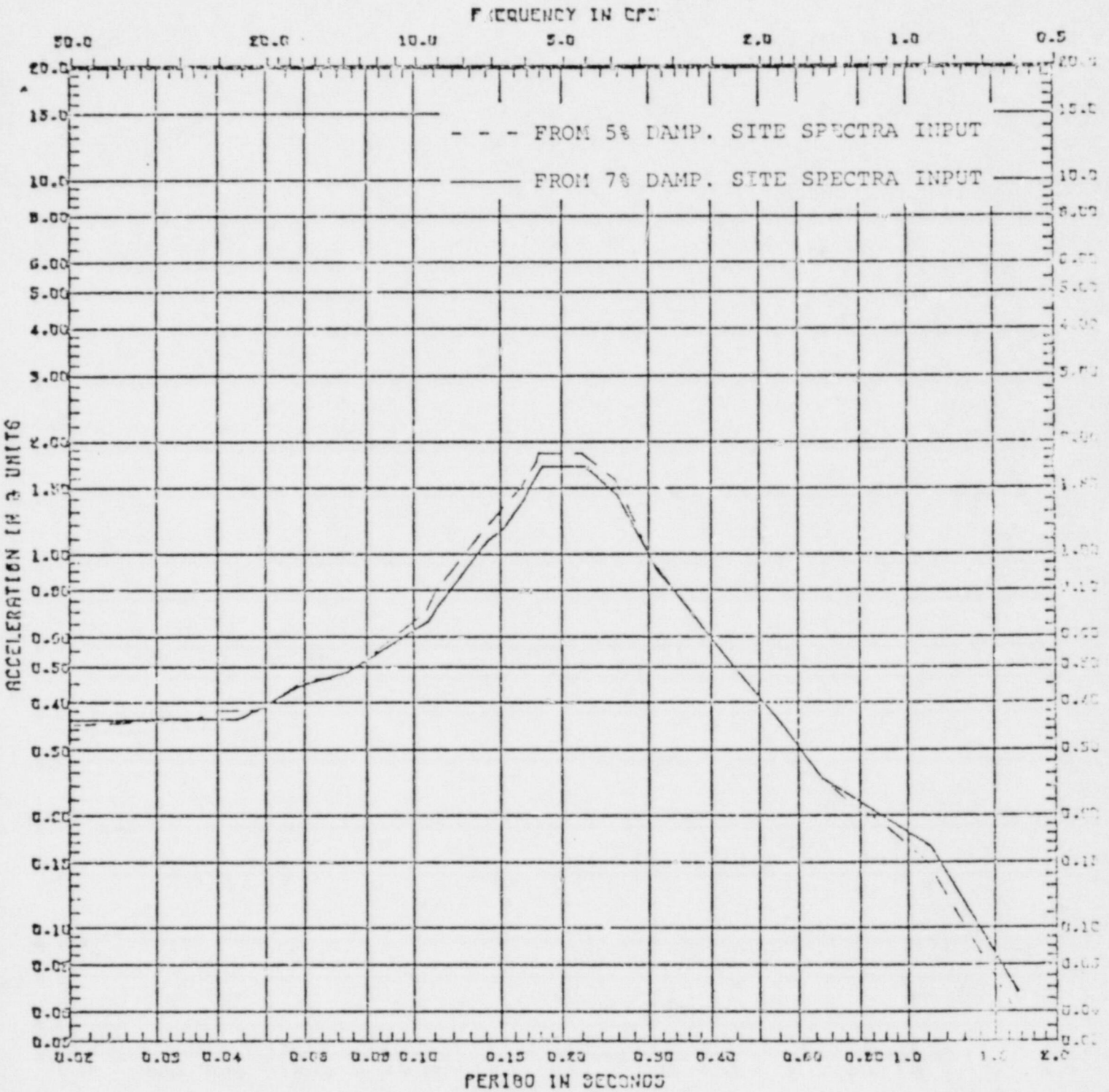

RER-AUX DDE/SPECTRA COMPARISON
MODE 63
DIRECTION NS

SPECTRA NO. B-71
ELEVATION RPV
LOCATION 42'1" ABOVE RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. 5SE/5% & 7% DAMP SITE SPECTRA
PROJECT PERRY-2 REV
PROJECT NO. 6758-56
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DAMPING 0.050
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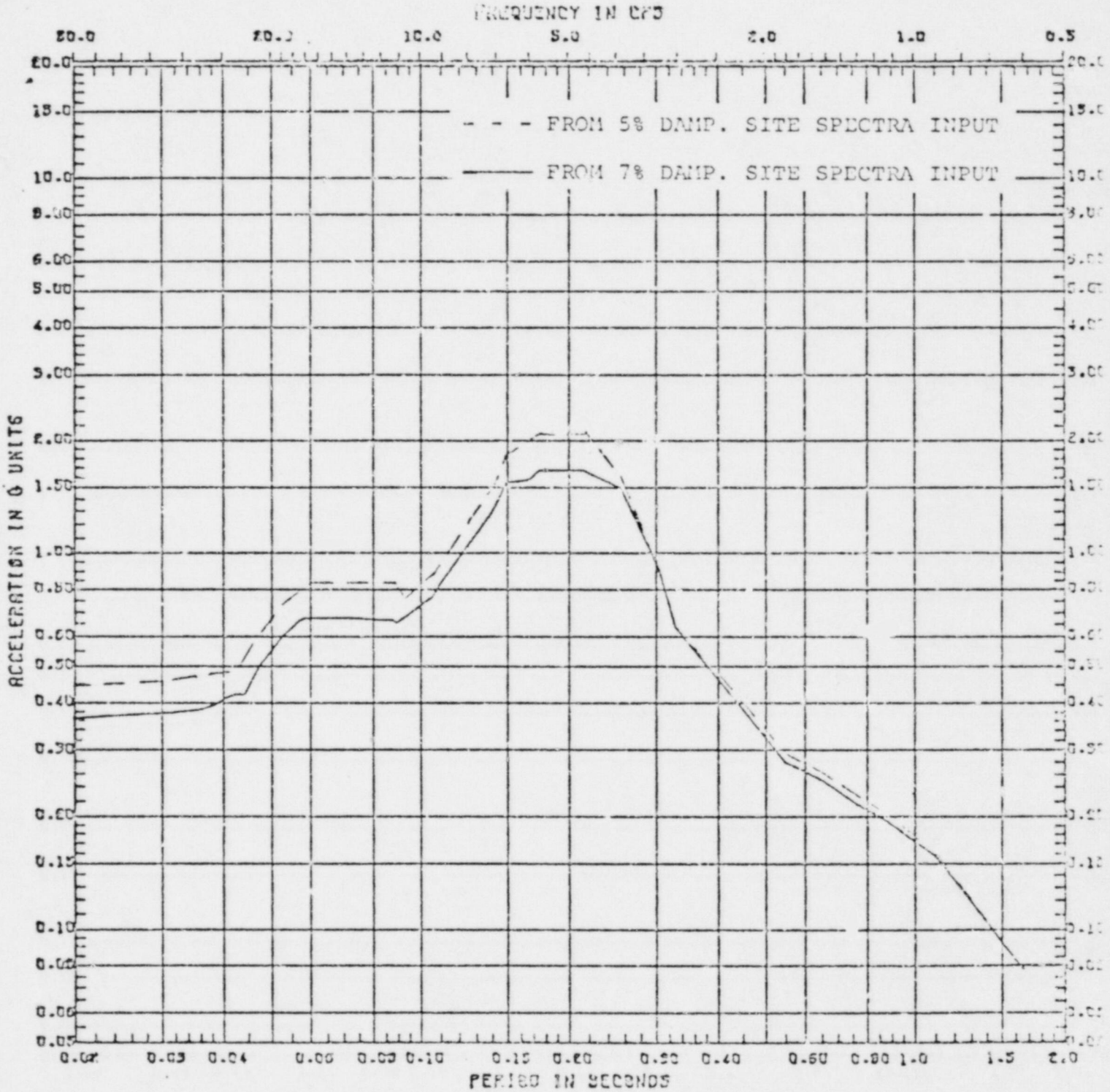

RER-RUX SSE/SPECTRA COMPARISON
NODE 63
DIRECTION EW

SPECTRA NO. S-72
ELEVATION RPV
LOCATION 42'1" ABOVE RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT PERRY-2 REV
PROJECT NO. 6139-98
PERRY WIDENED BY 10% ON EACH SIDE
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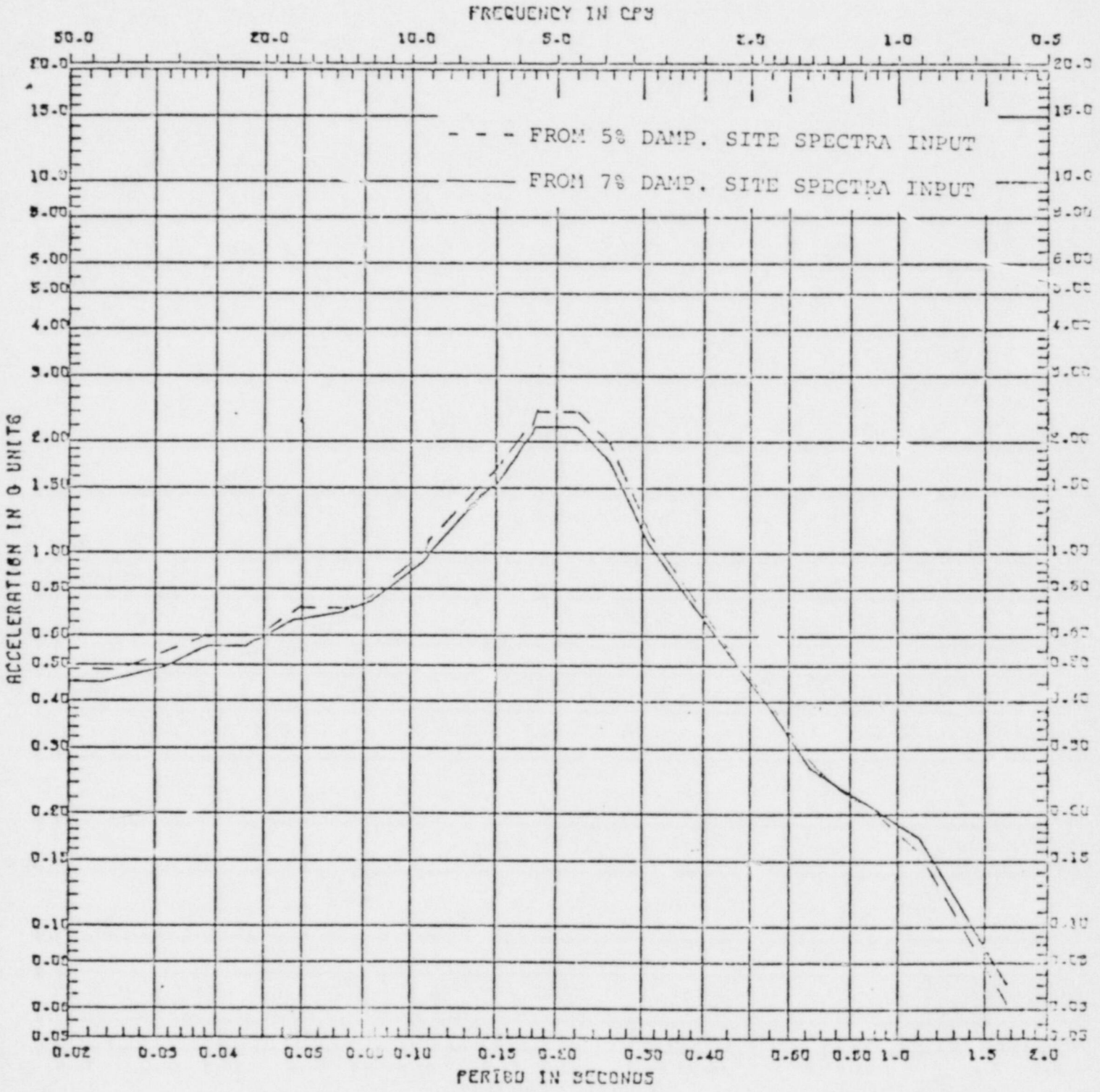

RER-AUX BDE/SPECTRA COMPARISON
NODE 59
DIRECTION NS

SPECTRA NO. B-73
ELEVATION RPV
LOCATION 59'-1" ABOVE RPV INVERT

SARGENT & LUNDY
ENGINEERS

28 AUG 81
224DL

CALC NO. 33E/5% & 7% DAMP SITE SPECTRA
PROJECT FERMI-2 REV
PROJECT NO. 6159-29
PEAKS WIDENED BY 10% ON EACH SIDE
DAMPING 0.050
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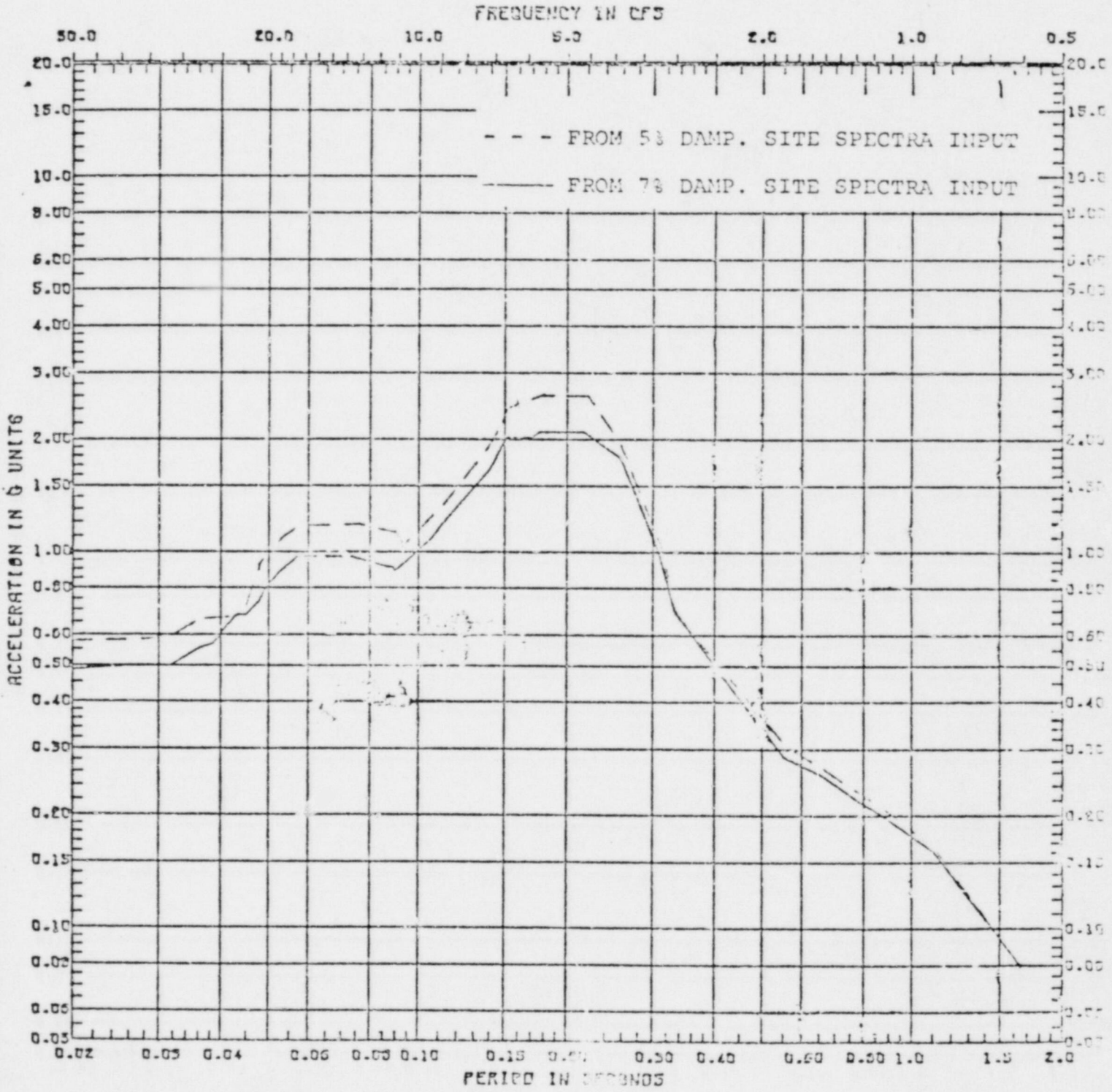


RCA-AUX 33E/SPECTRA COMPARISON
NODE 59
DIRECTION EW

SPECTRA NO. S-74
ELEVATION RFV
LOCATION 59'-1" ABOVE RFV INVERT

ATTACHMENT II
EF2 - 54,265

ENRICO FERMI ATOMIC POWER PLANT
UNIT 2

Constructed Equipment Response Spectra for 5% and 7% Structural Damping and 2% Equipment Damping

Prepared for: Detroit Edison Company
2000 Second Avenue
Detroit, Michigan 48226

Prepared by: Hopper and Associates
1840 S. Elena Avenue, Suite 208
Redondo Beach, CA 90277

August 27, 1981

1.0 INTRODUCTION

Equipment design spectra exist for the Fermi Design project based on the reassessment earthquake evaluation. These spectra have been generated assuming the structural damping to be 7%. This structural damping was rationally selected based upon anticipated structural response level to the newly postulated earthquake excitation. Subsequently, it was observed that anticipated structural response levels were not achieved and the justification for such high structural damping was questionable.

No concern exists relative to the structural adequacy of the critical Fermi building structures. However, internally housed equipment may experience loading more severe than that indicated by the existing internal equipment spectra generated from 7% structural damping phenomena.

To eliminate such concern, it was considered necessary to determine the influence of 5% structural damping on the existing internal equipment spectra generated for 7% structural damping.

The normal approach to this problem would be to simply reanalize the existing structure subjected to a given time history with 5% as opposed to 7% damping and generate the attendant internal equipment response spectra. However, basic problems apparently exists in synthisizing one time history that will appropriately envelope both 5% and 7% ground motion input response spectra.

Independent of any time history information we have developed internal equipment response spectra assuming 5% structural damping for comparison with spectra existing for 7% structural damping. This was accomplished by assuming that the response of the building structure could be approximated by a summation of damped sinusoidal acceleration time histories corresponding in frequencies to the primary structural response frequencies of the building structure.

The following sections of this report address the methodology by which comparative spectra were developed, a justification for the synthesization technique employed, a development of response phenomena to decaying sinusoid excitation, details of the technique employed for equipment spectra generation and a summary of results followed by representative equipment response spectra plots for representative building locations.

2.0 METHODOLOGY

2.1 Existing 7% structural damping equipment spectra were reproduced for detailed evaluation purposes. Concurrently, structural response phenomena for the primary Fermi safety related structures were excerpted from references 1 and 2. This information was used to establish the baseline upon which spectral synthesization activities were undertaken.

2.2 The response of internal equipment to decaying sinusoid excitation was established as a function of the sinusoidal decay ratio which is assumed as representative of the extent structural damping mobilized.

2.3 Spectra were synthesized for 7% sinusoidal damping assuming the total response at a given frequency could be represented by a summation of decaying sinusoidal excitations at frequencies equivalent to those associated with the primary structural response modes. Amplification factors for each of the decaying sinusoides were computed in such a way that the 7% excitation response spectra would be equivalent to the synthesized spectra at all predominant building response frequencies. Resulting amplification factors were then used to generate spectral acceleration values intermediate to structural response frequencies.

2.4 Five percent spectra were synthesized with equivalent summation factors and amplification ratios employed for the 7% response situation. Higher basic amplification response ratios associated with less severe sinusoidal decay caused amplification to occur in the 5% spectra relative to the 7% spectra in zones in proximity to primary building response frequencies.

2.5 Comparative response spectra were plotted for critical building locations to compare 5% structural damping equipment response spectra with 7% damped structural equipment response spectra. These comparative spectra were then used to establish maximum amplification ratios anticipated at various structural locations for equipment acceptability verification purposes.

3.0 SYNTHESIZATION TECHNIQUE JUSTIFICATION

3.1 The damped sinusoidal response summation approach was selected for internal equipment spectra generations purposes for several reasons. First, consistent and unquestionable basic time history ground motion time histories are unavailable

at this time. Second, we believe this damped sinusoidal model combination approach will yield amplification ratios between the 5% and 7% structural damping spectra that are definitely conservative.

Furthermore, this first approximation simplified approach avoids dangers associated with over sophistication whereby analytical complexities may obscure true structural response characteristics and introduce undetectable unrealistic computational phenomena.

3.2 Our spectral synthesization technique herein basically corresponds to an approach presented by J. M. Biggs and J. M. Rosette entitled "Seismic Analysis of Equipment Mounted on a Massive Structure". This approach was documented in a three day seminar at MIT on Seismic Design for Nuclear Power Plants held in the Spring of 1969. Although the accuracy of this approach is not precise our experience has shown it to yield conservative internal equipment response spectra and the simplicity of the technique seems appropriate for our specific application.

The basic approach is summarized following:

The acceleration for a given spectral frequency may be calculated as

$$Aem = \left[\sum^{n'} (A'emn)^2 + \frac{\sum^{n''} \left(\Gamma_{sn} \Phi_{sne} A''_{emn} \right)^2}{\sum^{all\ n} \left(\Gamma_{sn} \Phi_{sne} \right)^2} \right]^{1/2}$$

The first summation includes those modes for which $\frac{\text{Equipment Period}}{\text{Structural Period}} = \frac{Tem}{Tsn} < 1.25$; the numerator of the second term includes the remaining modes while the denomiator includes all modes.

$$A'emn = \left(\frac{Aemn}{Asne}\right) Asne$$

where

$$Asne = \left[\Gamma_{sn} \Phi_{sne} \right]$$

and

$\frac{Aemn}{Asne}$ = Damped sinusoid amplification

$$A''emn = \left(\frac{Aemn}{Aemg}\right) Aemg$$

where

Aemg = Aem due to direct ground motion

and

$\frac{Aemn}{Aemg}$ = Ground motion amplification

also

Aon = Ground acceleration at period Tsn

Γ_{sn} = Mode n participation factor

Φsne = Mode n eigenvector

In our spectra simulation approach we neglect ground motion factors, combine the modal input by direct sum, and compute necessary participation factors to match the baseline spectra.

3.3 The approach taken should also yield conservative spectral amplification ratios between various structural damping input excitation. A major criticism of the technique for general analytical purposes rests upon the argument that modal amplification factors obtained thereby due not account for lengthy earthquake excitations in which total responses may remain at a constant level for several excitation cycles prior to there ultimate damped sinusoidal characteristic response. This phenomena would yield higher amplification ratios for a given piece of equipment but would make the ratio of amplification factors between the various structural damping ratios diminish. This makes results obtained employing this technique conservative.

3.4The unproven nature of more advanced techniques for internal equipment spectra generation coupled with our ability to check the adequacy of this approach relative to a known 7% response spectrum makes it justifiable to employ the simple approach for spectral synthesization comparative purposes.

4.0 RESPONSE TO DECAYING SINUSOID EXCITATION

4.1 The decaying sinusoid used as a representation of the building modal response was represented by the following acceleration time history.

$$a(t) = \frac{1}{\sqrt{1-\xi'^2}} \operatorname{Sin} \omega_d t \times \exp\left\{ \frac{-\xi'}{\sqrt{1-\xi'^2}} \omega_d t - \arcsin \sqrt{1-\xi'^2} \right\}$$

where

ξ' = Sinusoidal damping factor

ωd = Damped frequency of sinusoid

4.2 Response time histories were generated for a simple single degree of freedom system subjected to the aforedescribed base excitation. The following equation of motion was solved as a function of time employing the linear acceleration computational sequence described.

$$\ddot{y} + \omega^2 y + 2\omega\xi\dot{y} = -a(t)$$

where

y = system relative displacement

ω = system natural frequency

ξ = system damping factor

for a given integration time interval h,

$$\dot{y}_n = \ddot{y}_{n-1} + \frac{1}{2}\ddot{y}_{n-1} + \frac{1}{2}\ddot{y}_n \frac{h}{2}$$

$$y_n = y_{n-1} + h\dot{y}_{n-1} + \frac{h^2}{3}\ddot{y}_{n-1} + \frac{h^2}{6}\ddot{y}_n$$

and

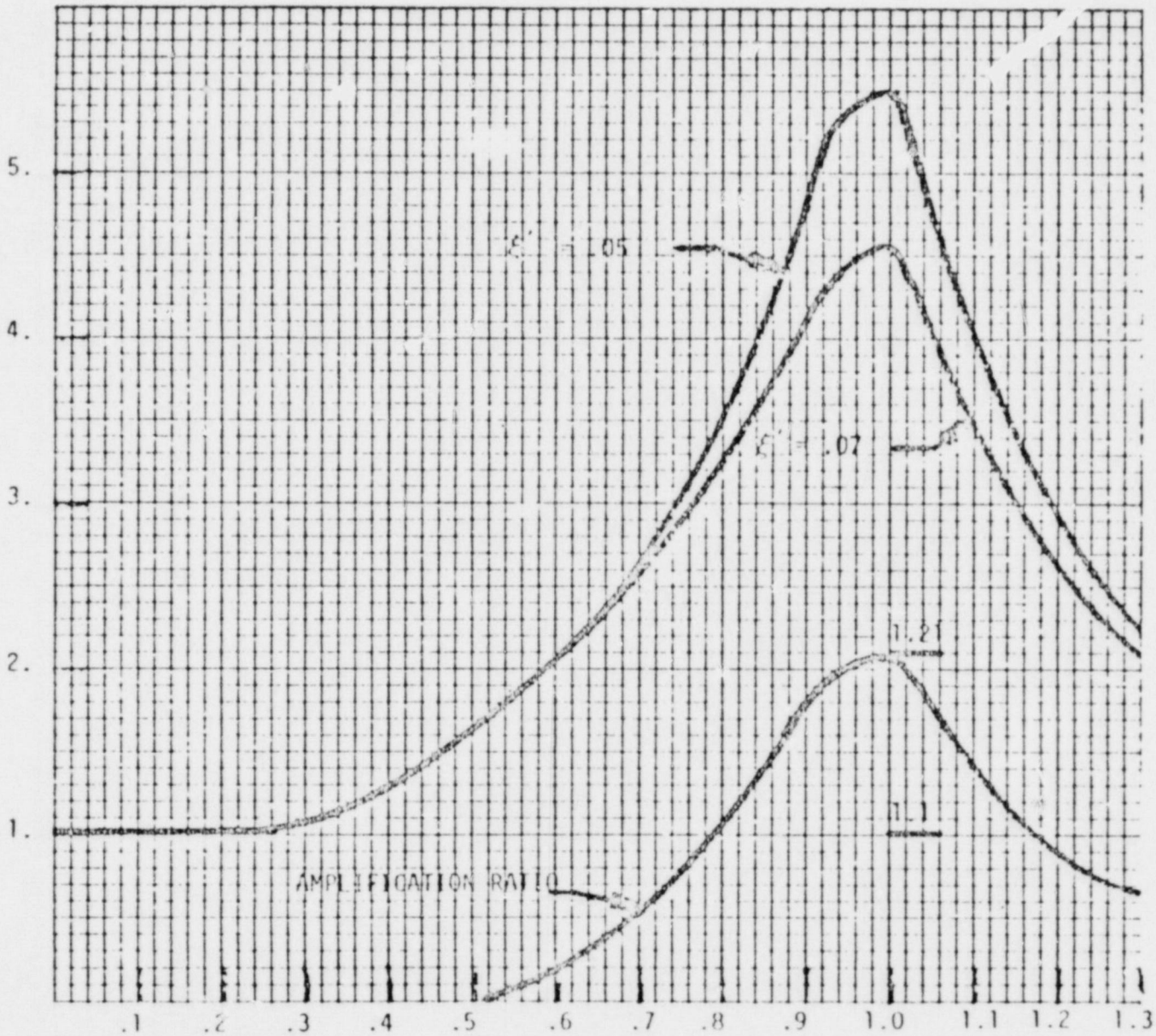
$$\ddot{y}_n = -\left(1 + \omega^2\frac{h^2}{6} + 2\omega\frac{h}{2}\right)^{-1} x$$

$$an + \omega^2\left(y_{n-1} + h\dot{y}_{n-1} + \frac{h^2}{3}y_{n-1}\right)$$

$$+ 2\omega\xi\left(\dot{y}_{n-1} + \frac{h}{2}\ddot{y}_{n-1}\right)$$

The time history output for each frequency is searched for the maximum value of y. The associated absolute acceleration amplification or spectral acceleration amplification is then computed as $\omega^2 y$.

4.3 Spectral amplification summaries associated with the above calculation sequence are shown on the following figure. The maximum ratio between $\xi' = .07$ and $\xi' = .05$ is 1.208. This represents a maximum 21% increase in peak acceleration going from $\xi' = .07$ to $\xi' = .05$.



SPECTRA AMPLIFICATION SUMMARY

DAMPED SINUSOID EXCITATION

5.0 EQUIPMENT SPECTRA GENERATION

5.1 It is assumed that a given response spectrum may be constructed from a summation of accelerations associated with the response of damped sinusoids at primary structural response frequencies.

$$[A]\ (X) = (b)$$

where

[A] = Influence matrix

(X) = Modal amplification vector

(b) = Spectrum accelerations

A_{mn} corresponds to the sinusoidal amplification at frequency n associated with maximum amplification at frequency m.

An expanded influence matrix [C] may similiarly be constructed to encompass as many n frequencies as desired with a constant number m frequencies dependent of significant structural response modes.

$$[C]\ (X) = (d)$$

where (d) would encompass spectrum accelerations at as many frequencies as desired.

In our situation, we have selected (b) to match a given 7% spectrum. (X) was then computed to give the relative amplification for each mode. [C] (X) = (d) a full spectrum matching the existing 7% curve.

[C] is then modified for 5% structural damping and (d) is recomputed yielding a full spectrum simulating the 5% curve to be anticipated from equivalent ground excitation.

5.2 Building analysis data was taken from SL-2682 and SL-3147 and is summarized in the following tabular format:

BUILDING	CRITICAL MODES	PERIODS
N.S. Reactor/Auxiliary Building	7	.2221, .2011, .1994, .1877, .1845, .1548, and .0662
E.W. Reactor/Auxiliary Building	6	.2219, .2011, .1994, .1877, .1845 and .0634
Vert. Reactor/Auxiliary Building	3	.0814, 10656 and .0587
Horizontal RHR Complex	5	.1288, .1034, .0917, .0552 and .0419
Vertical RHR Complex	6	.0655, .0549, .0480, .0440, .0402 and .0321

5.3 Seven 5% structural damping excitation spectra were developed associated with critical locations and directions in each of the category 1 structures delineated in the preceeding section of this report. Based on those results and the consistency of the effect on spectral shape considerations, other representative spectra have been constructed and are included with this report.

6.0 SUMMARY OF RESULTS

Evaluation of comparative equipment response spectra for 7% structural damping and 5% structural damping reveals the maximum amplification the 5% to the 7% curves to be 21%. This maximum amplification varies as a function of building and location and at its minimum range equals 13%.

The observed amplification is apparent only in regions adjacent to significant structural response frequencies and is nonexistent at both the high and low frequency ends of the spectra. Enclosed following are references and an assembly of representative internal equipment response spectra for the Fermi facilities. The 7% building damping excitation spectra correspond identically to those in the reassessment analysis and the 5% building damping excitation spectra correspond to those generated by the synthesization technique described in this report.

REFERENCES

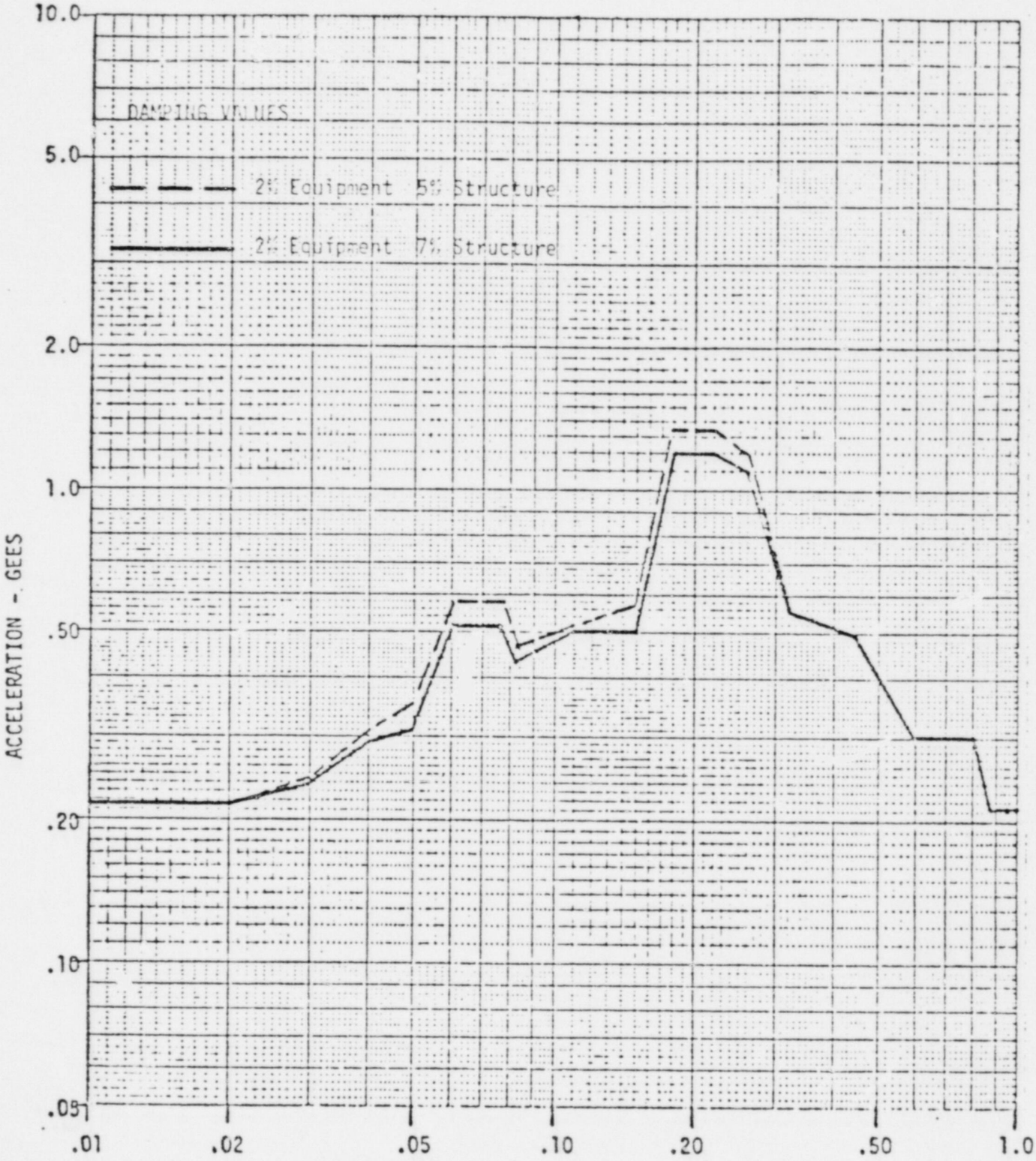
1. Seismic Analysis of the Reactor Auxiliary Building Complex Enrico Fermi Atomic Power Plant Unit 2, Report SL-2682, Sargent and Lundy Engineers, September 27, 1974.

2. Seismic Analysis of RHR Complex Enrico Fermi Atomic Power Plant Unit 2, Report SL-3147, Sargent and Lundy Engineers, July 15, 1980.

3. Seismic Re-Analysis for 7% Damping Site Spectra Reactor - Auxiliary Building, Report SDD-DECO-003, Sargent and Lundy Engineers, April 18, 1981.

4. Seismic Re-analysis of RHR Complex, Report SDD-DECO-001, Sargent and Lundy Engineers, April 18, 1981.

HOPPER AND ASSOCIATES
ENGINEERS

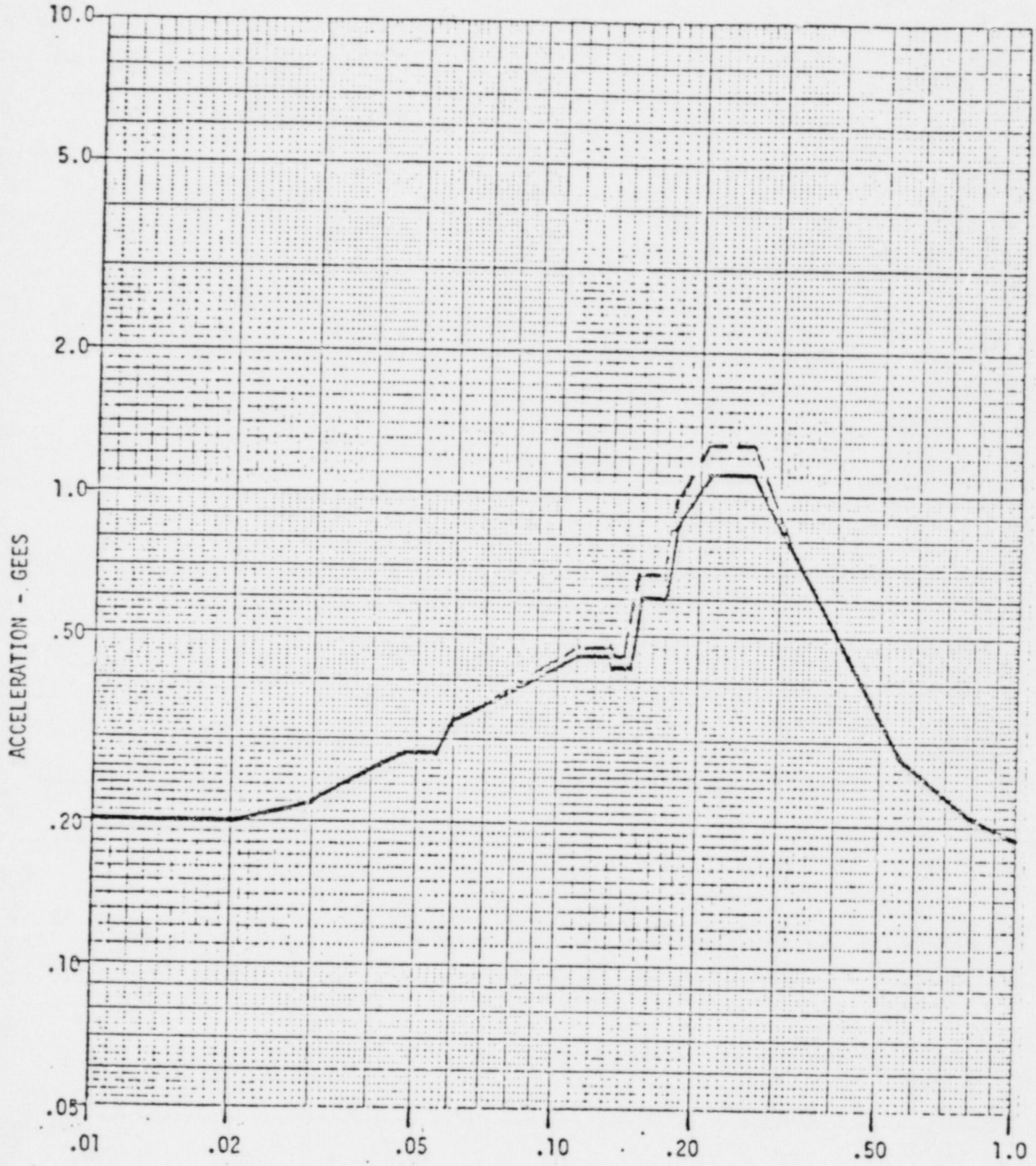


EQUIPMENT RESPONSE SPECTRUM

NS REACTOR/AUXILIARY BUILDING

SLAB 583'6''

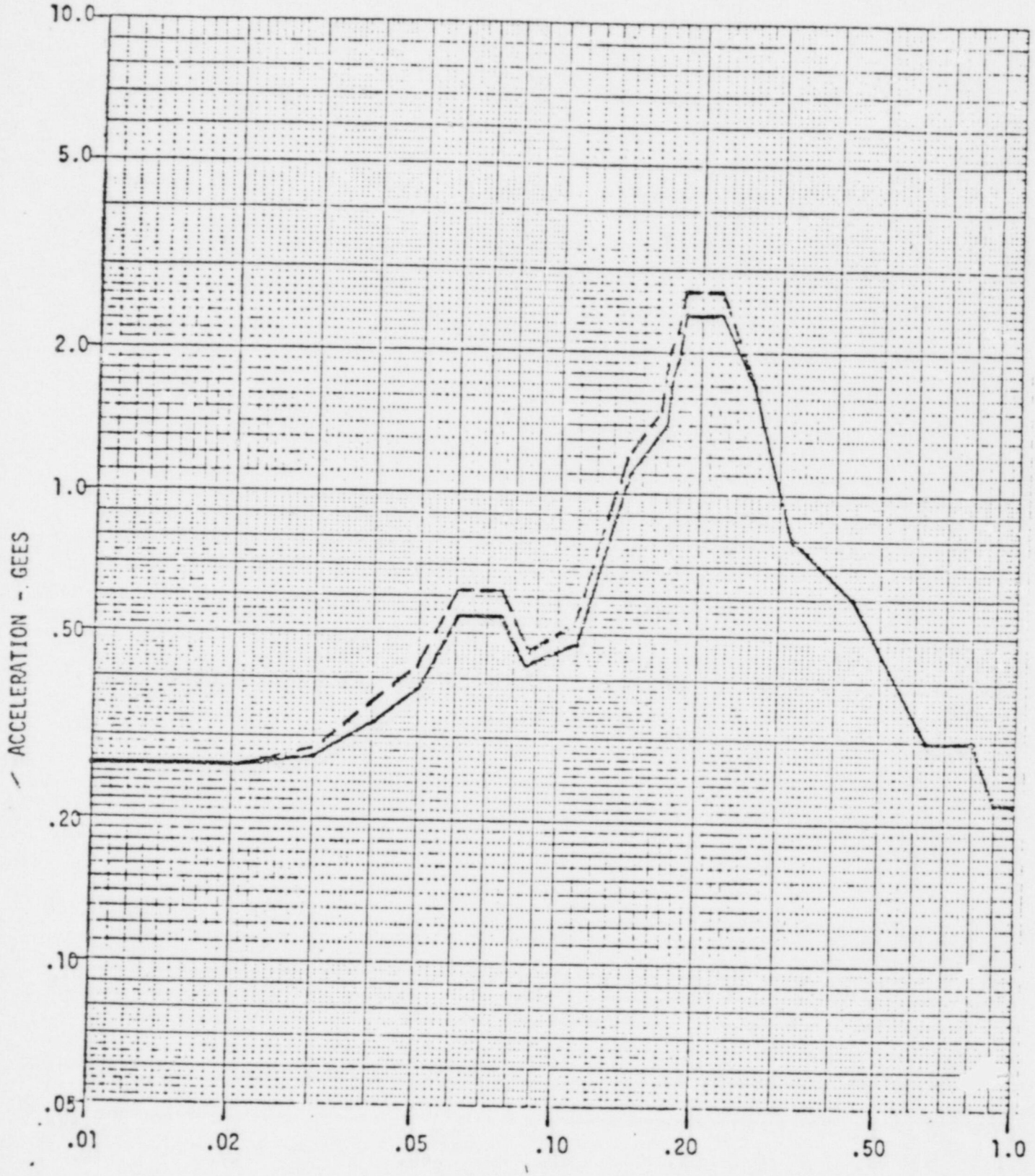
HOPPER AND ASSOCIATES
ENGINEERS



EQUIPMENT RESPONSE SPECTRUM

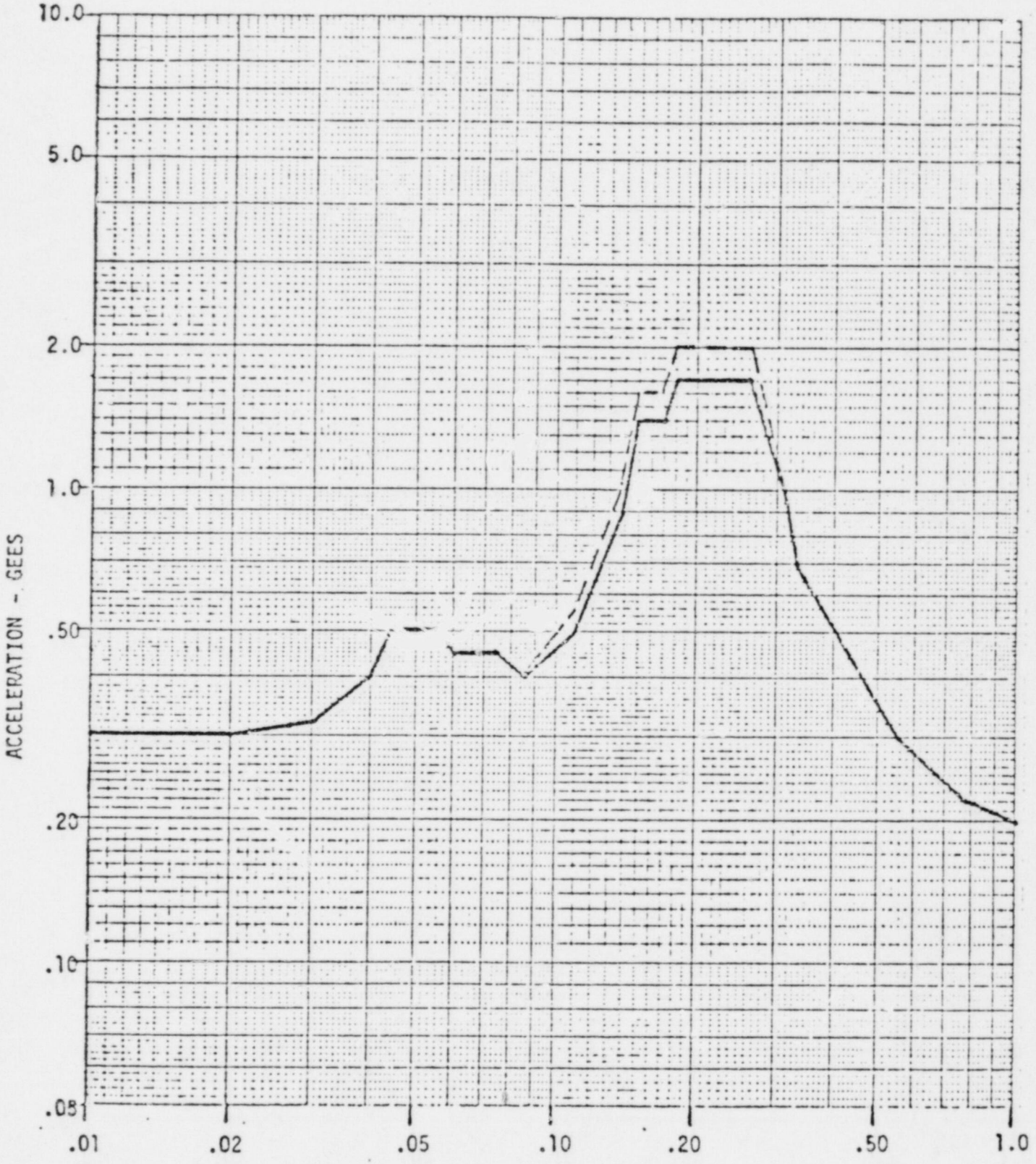
EW REACTOR/AUXILIARY BUILDING

SLAB 583'- 6"



EQUIPMENT RESPONSE SPECTRUM
NS REACTOR/AUXILIARY BUILDING

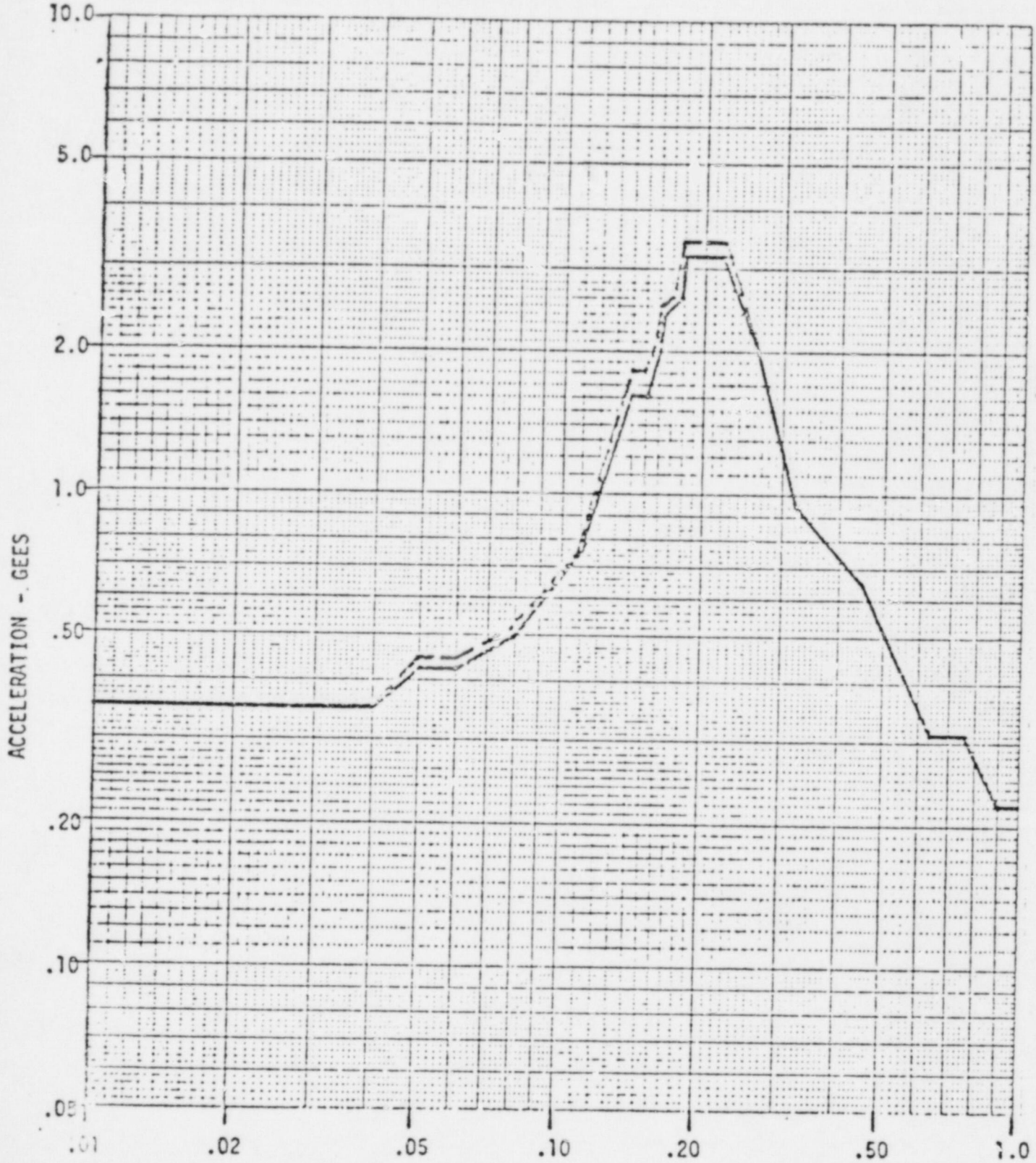
SLAB 613' - 6"



EQUIPMENT RESPONSE SPECTRUM

EW REACTOR/AUXILIARY BUILDING

SLAB 613' - 6"

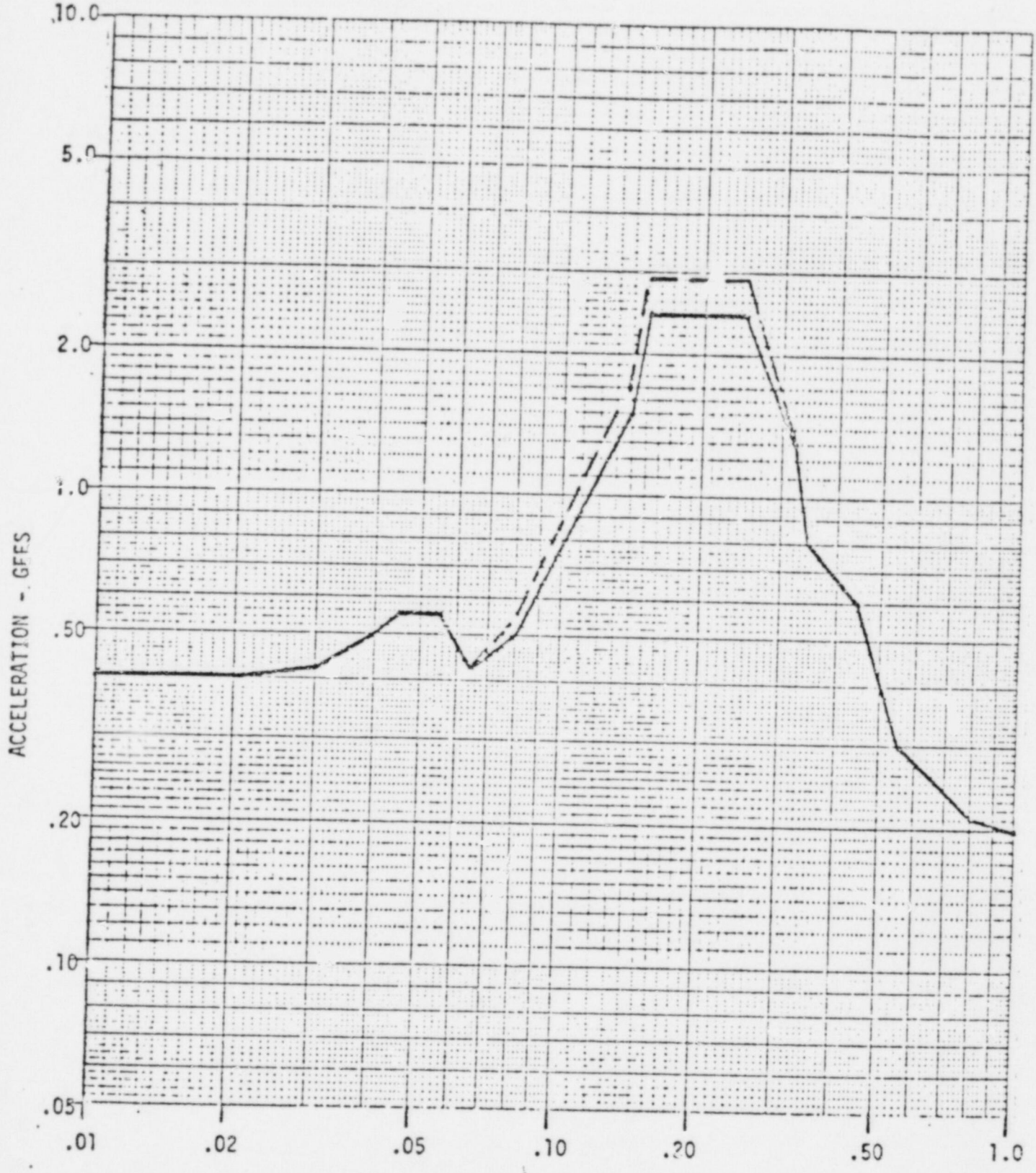


EQUIPMENT RESPONSE SPECTRUM

NS REACTOR/AUXILIARY BUILDING

SLAB 641' - 6"

HOPPER AND ASSOCIATES
ENGINEERS

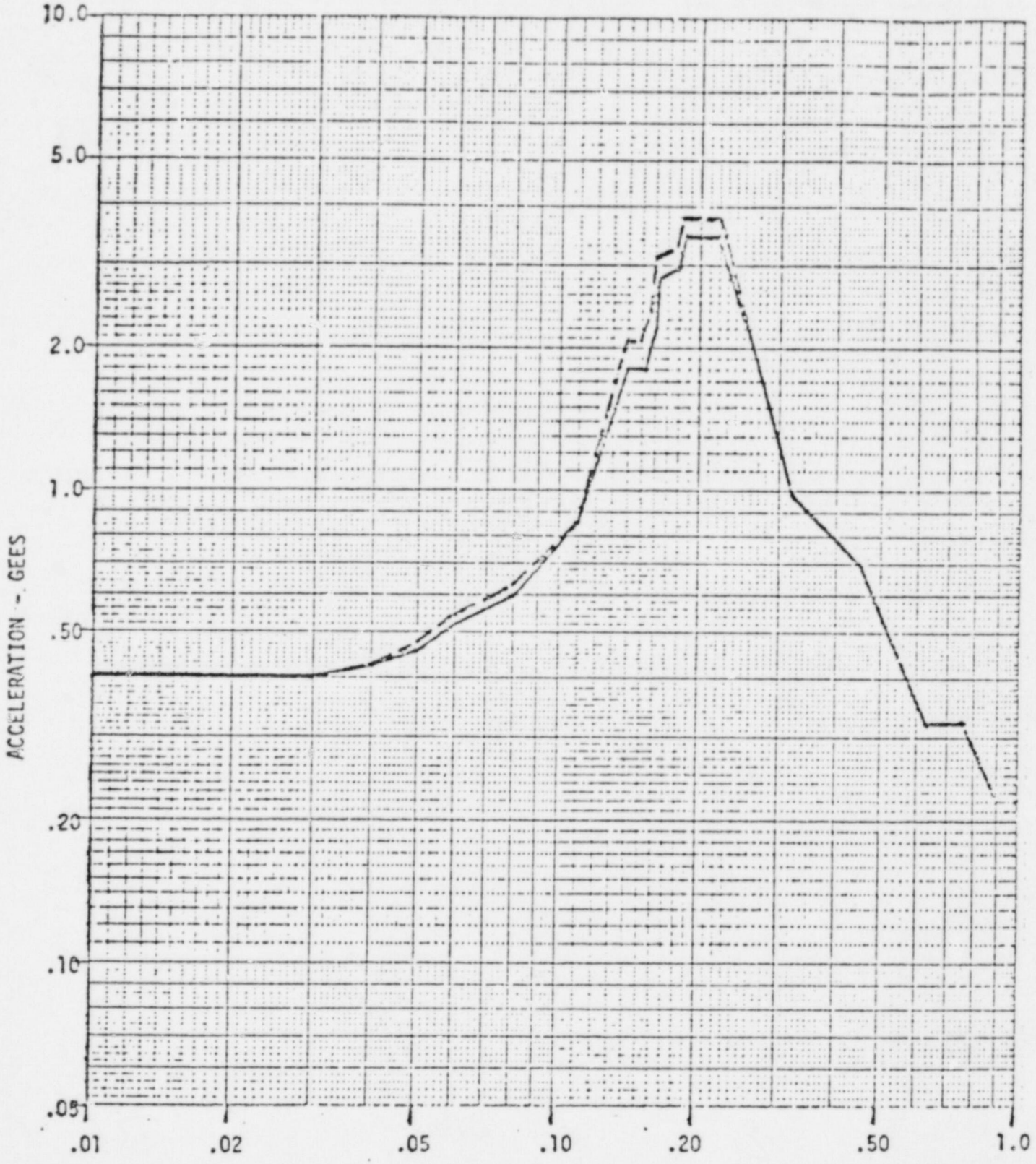


EQUIPMENT RESPONSE SPECTRUM

EW REACTOR/AUXILIARY BUILDING

SLAB 641' - 6"

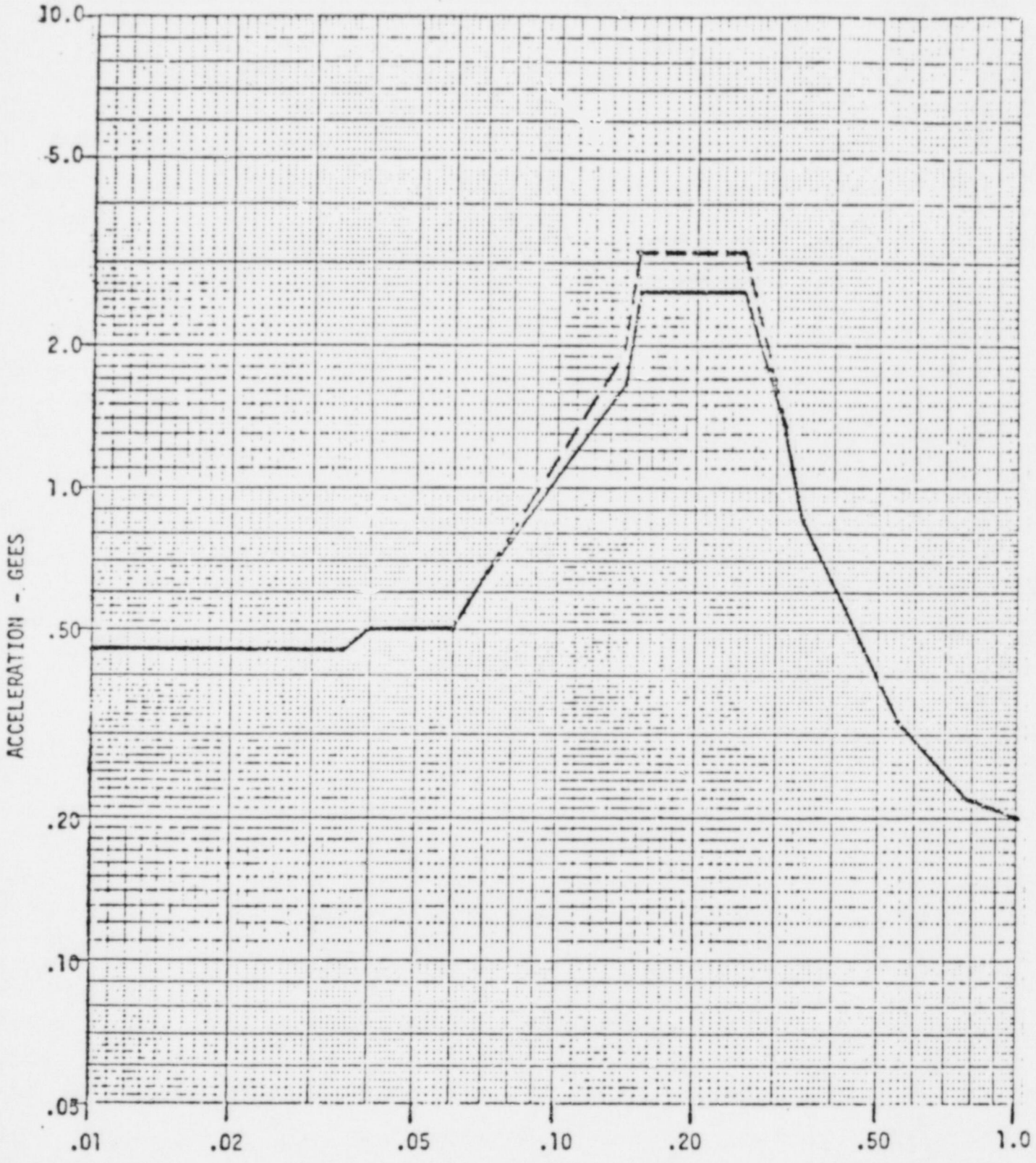
HOPPER AND ASSOCIATES
ENGINEERS



EQUIPMENT RESPONSE SPECTRUM

NS REACTOR/AUXILIARY BUILDING

SLAB 659' - 0"

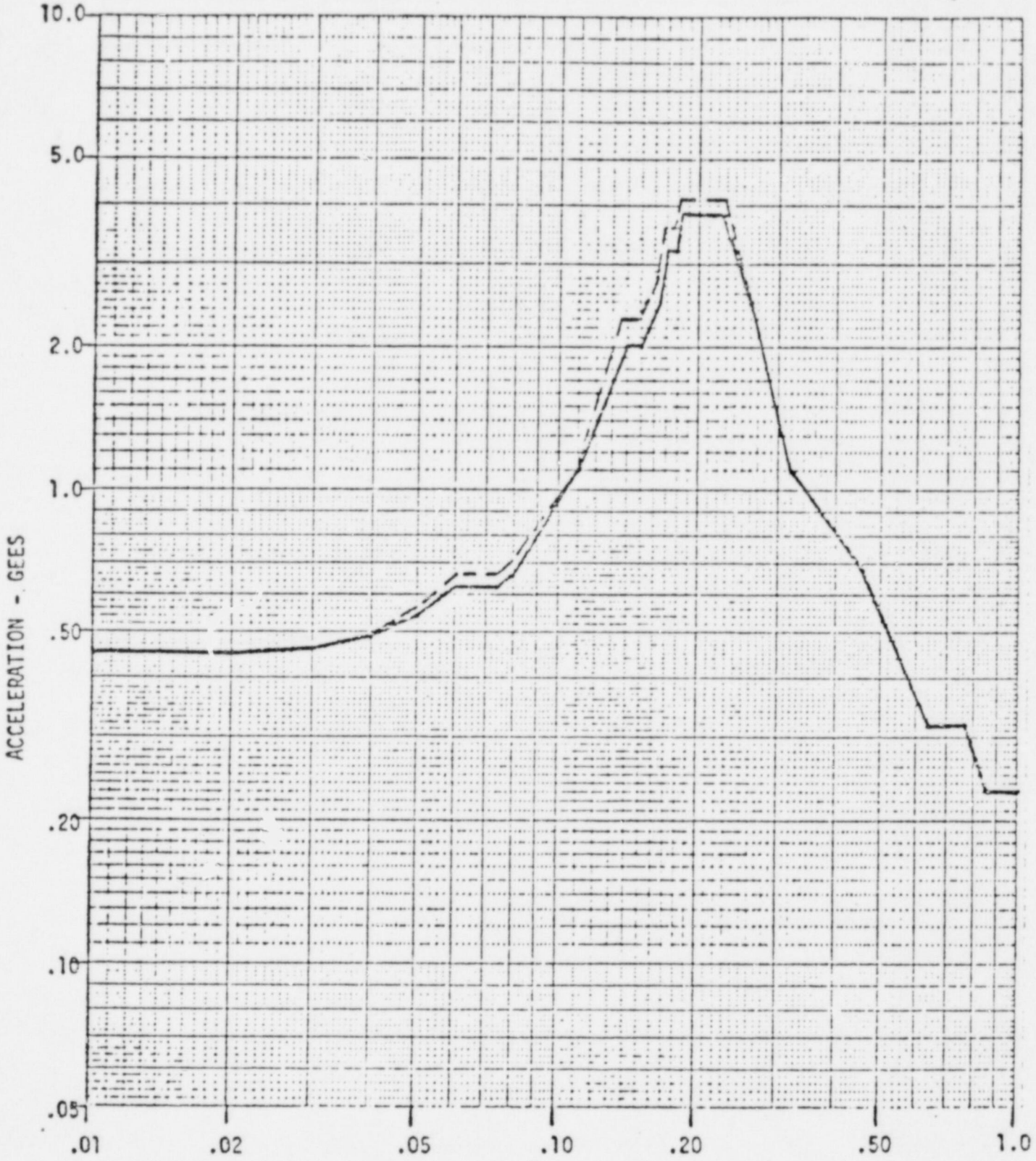


EQUIPMENT RESPONSE SPECTRUM

EW REACTOR/AUXILIARY BUILDING

SLAB 659' - 0"

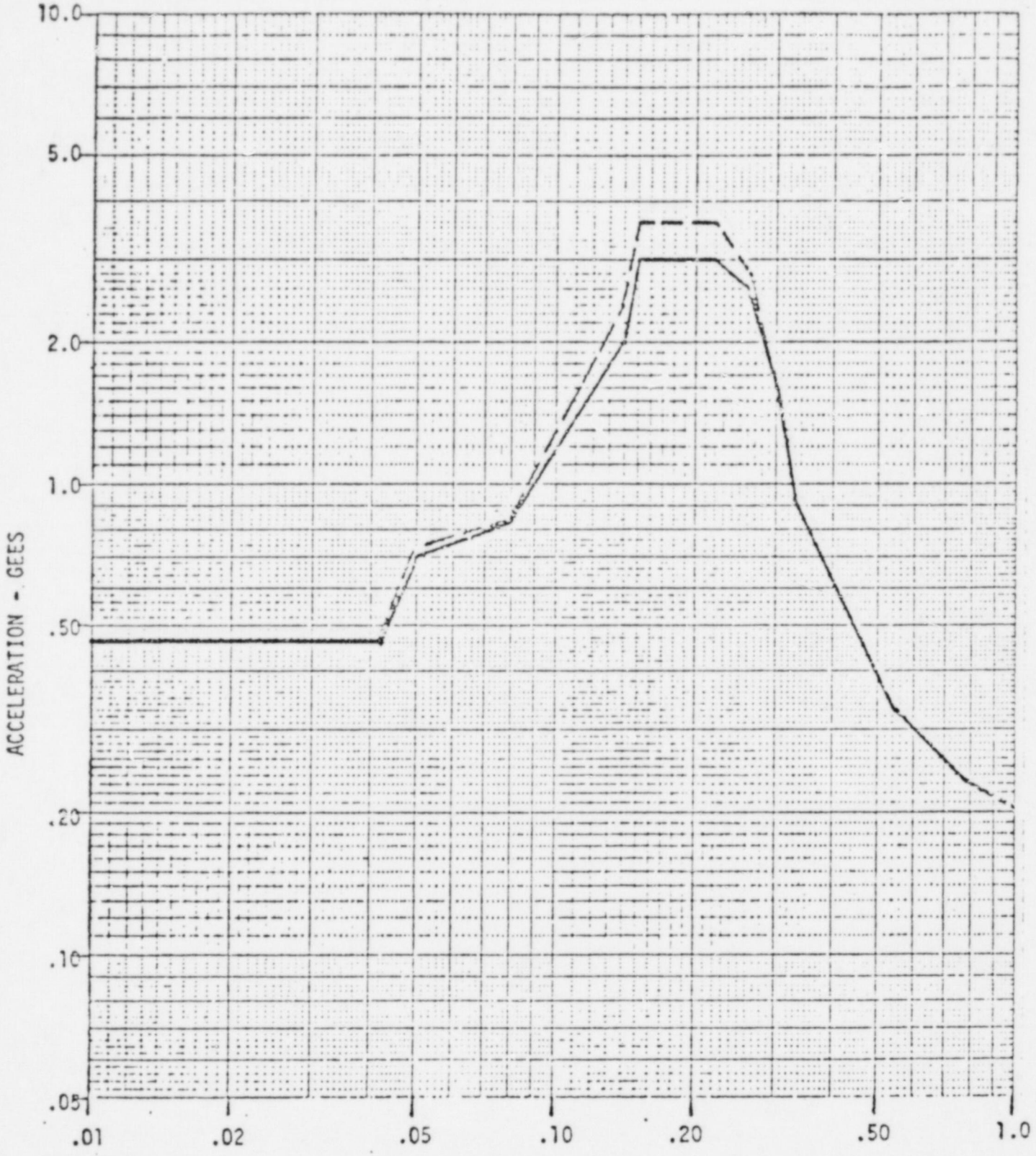
HOPPER AND ASSOCIATES
ENGINEERS



EQUIPMENT RESPONSE SPECTRUM

NS REACTOR/AUXILIARY BUILDING

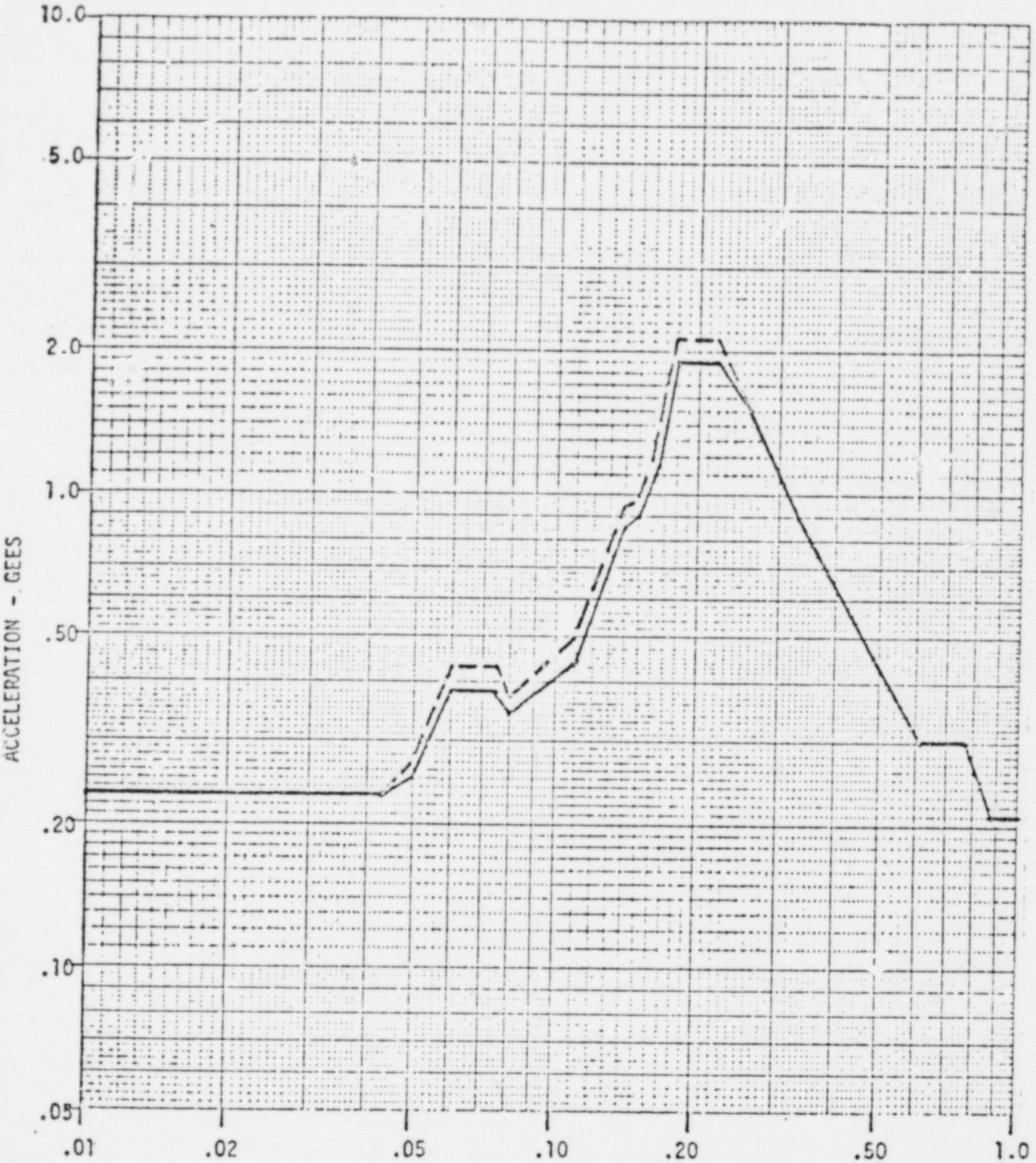
SLAB 684' - 6"



EQUIPMENT RESPONSE SPECTRUM

EW REACTOR/AUXILIARY BUILDING

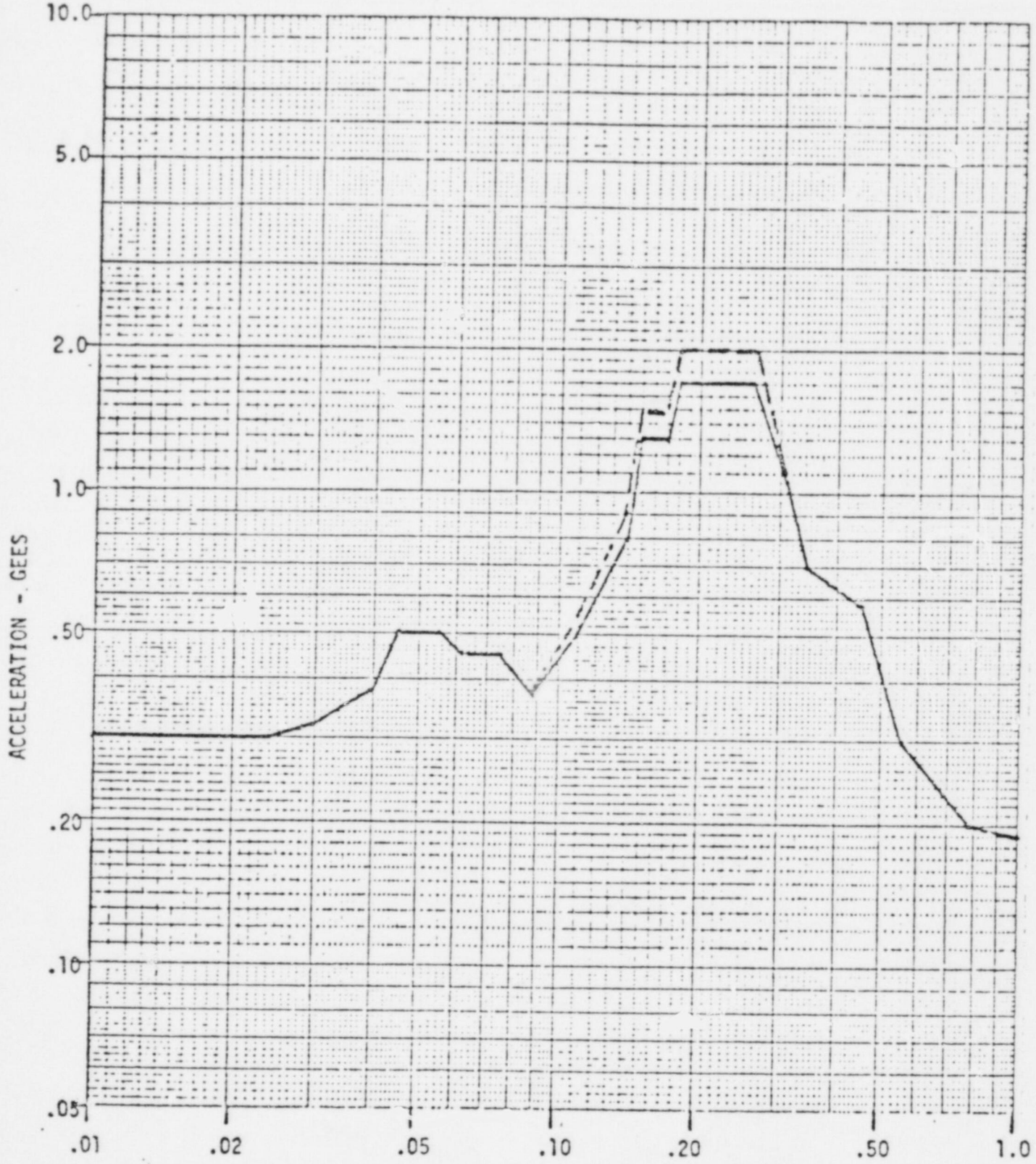
SLAB 684' - 6"



EQUIPMENT RESPONSE SPECTRUM

NS REACTOR CONTAINMENT

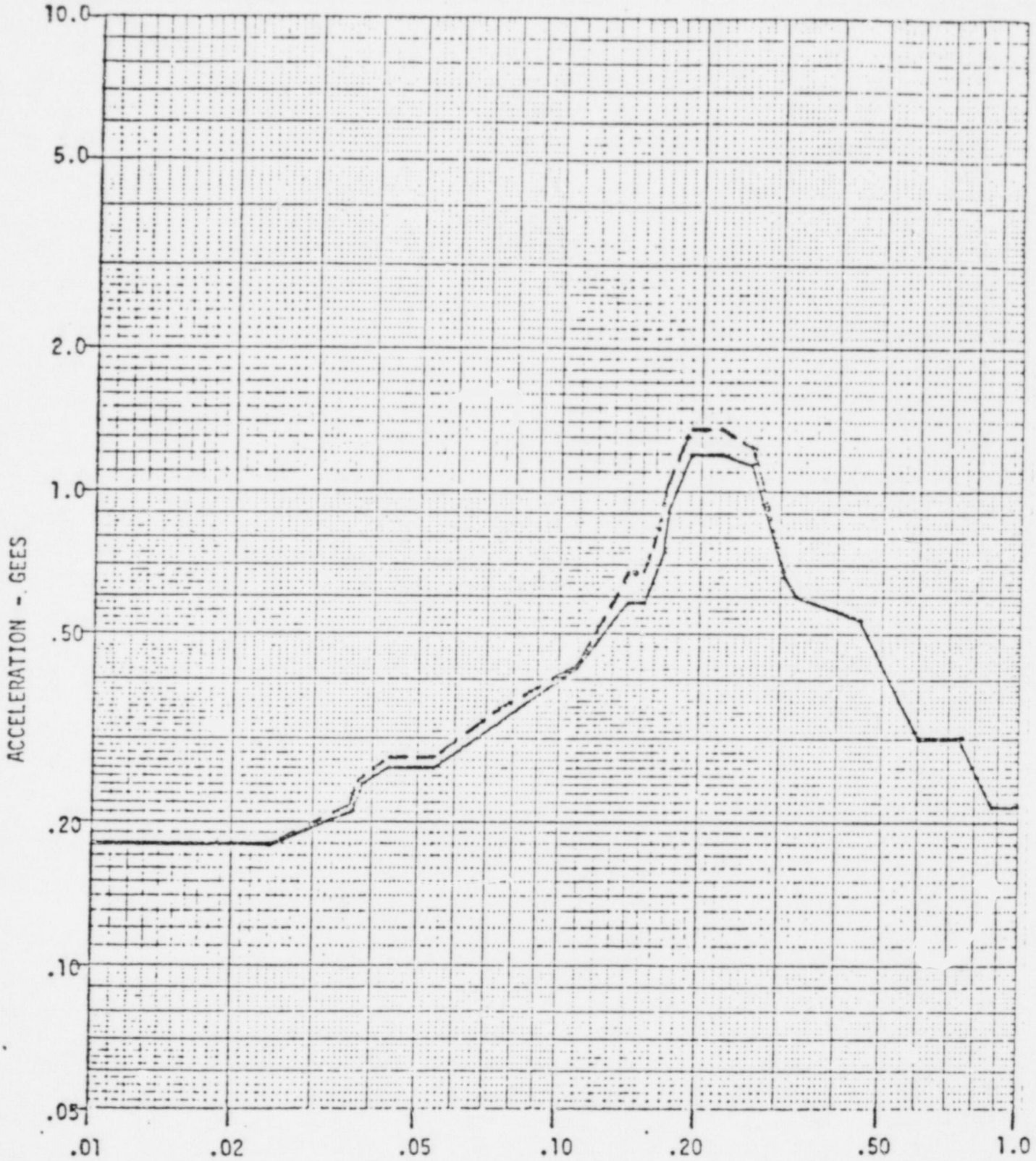
8' - 0" BELOW INVERT



EQUIPMENT RESPONSE SPECTRUM

EW REACTOR CONTAINMENT

8' - 0" BELOW INVERT

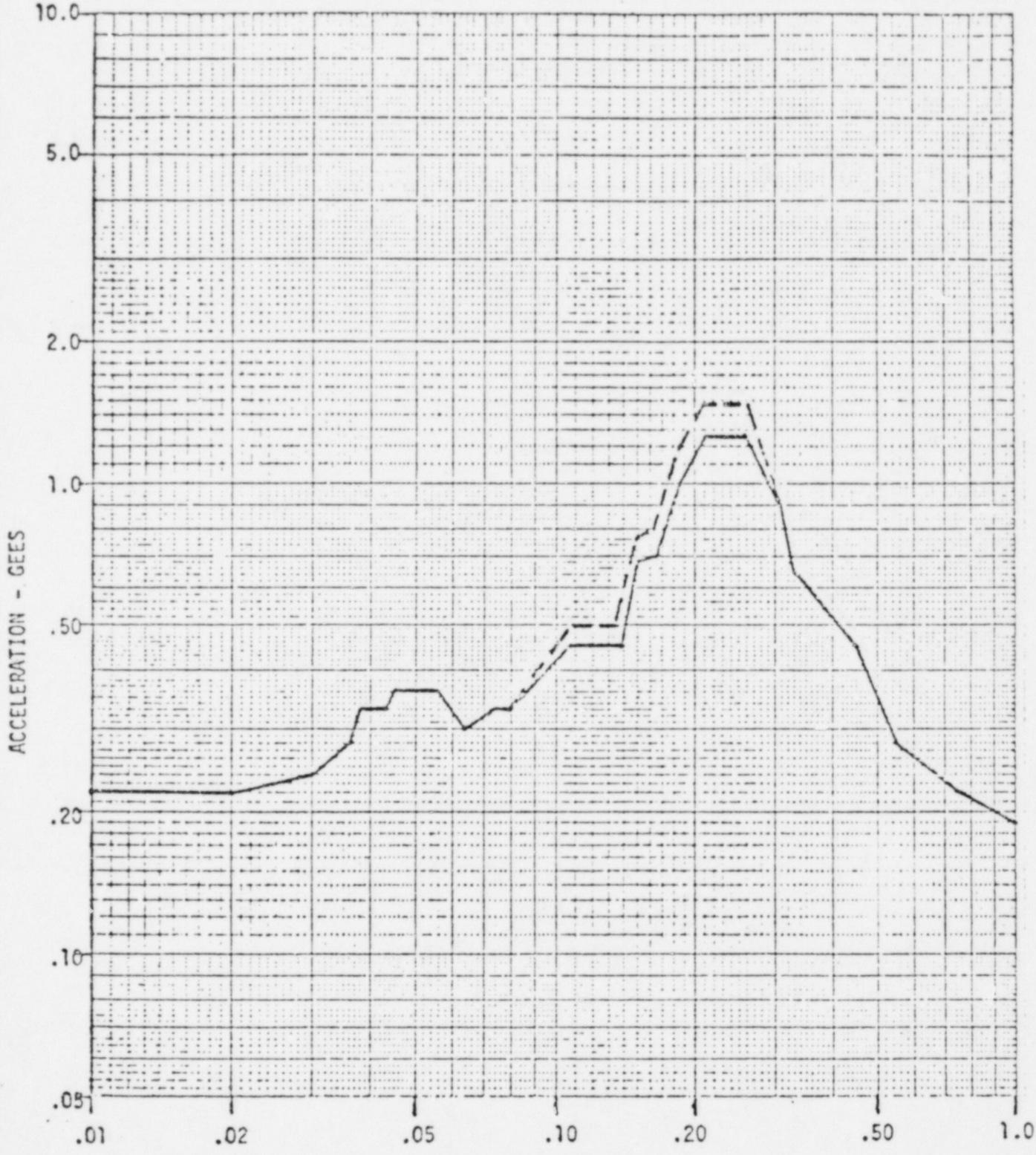


EQUIPMENT RESPONSE SPECTRUM

NS REACTOR BUILDING

TOP OF PEDESTAL

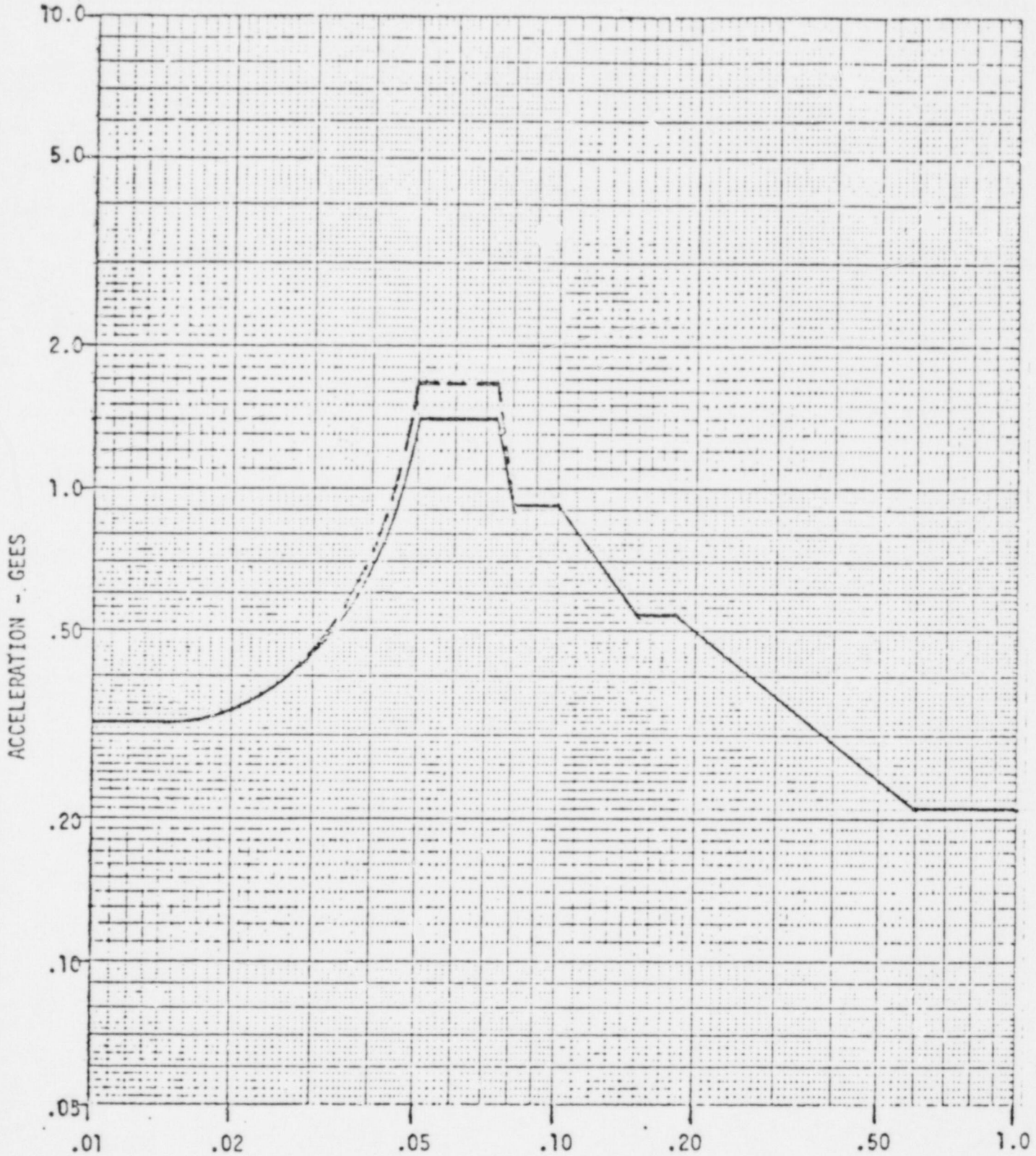
HOPPER AND ASSOCIATES
ENGINEERS



EQUIPMENT RESPONSE SPECTRUM

EW REACTOR BUILDING

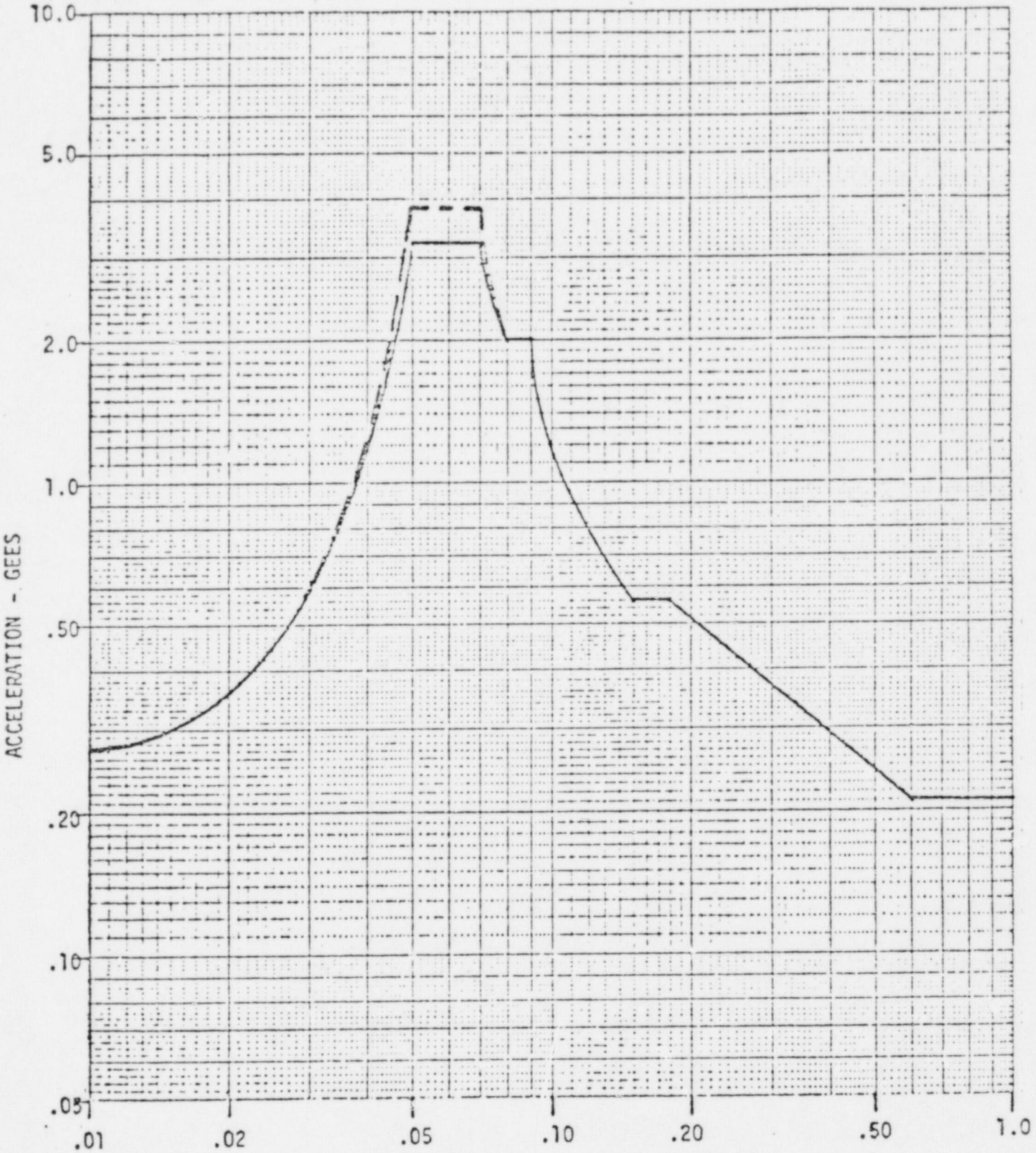
TOP OF PEDESTAL



EQUIPMENT RESPONSE SPECTRUM

VERTICAL REACTOR CONTAINMENT

SHIELD 643'-6" ,659'-6" & 689'-6"

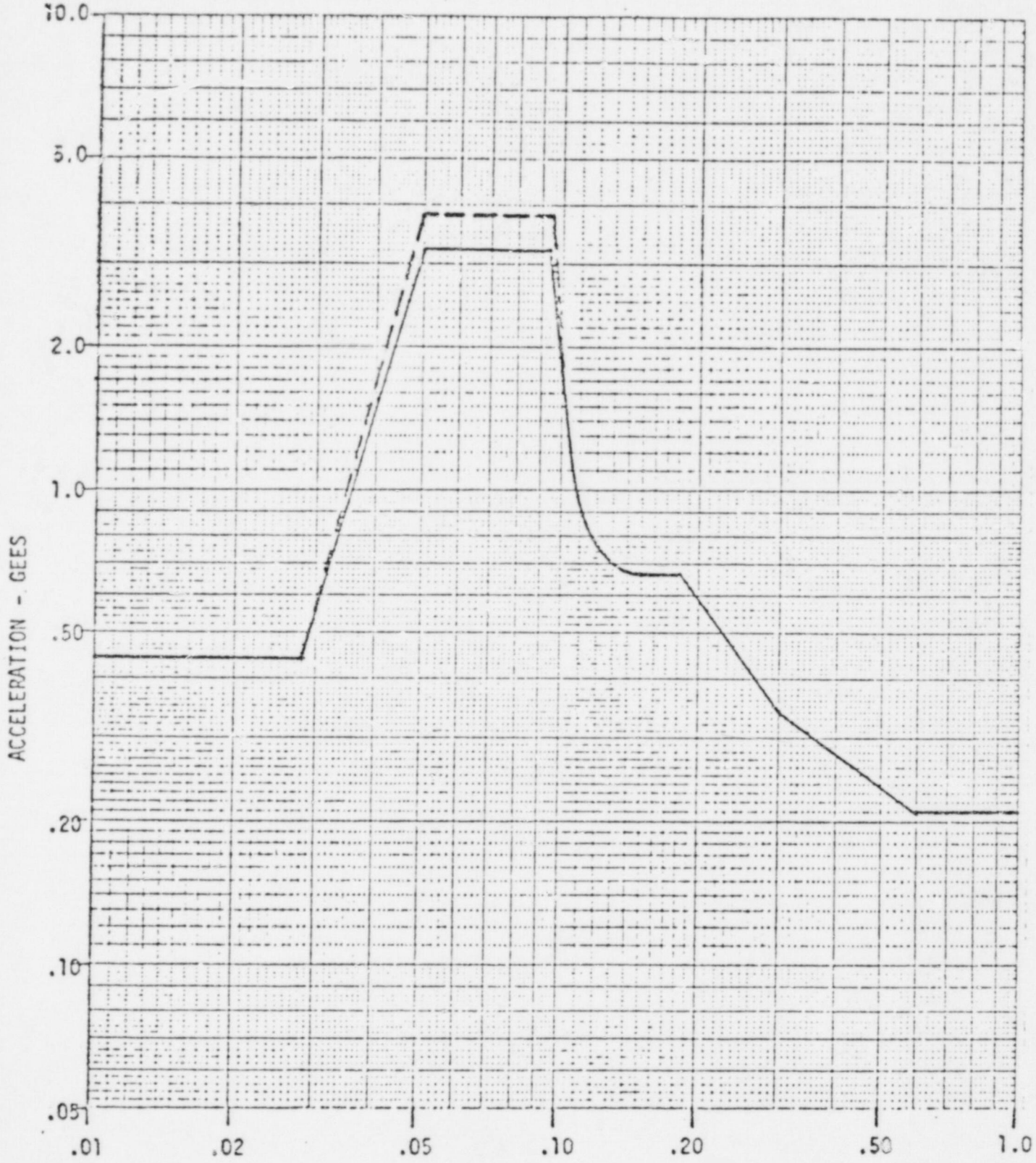


EQUIPMENT RESPONSE SPECTRUM

VERTICAL REACTOR BUILDING

SLAB 583'-[illegible], 613'-6"

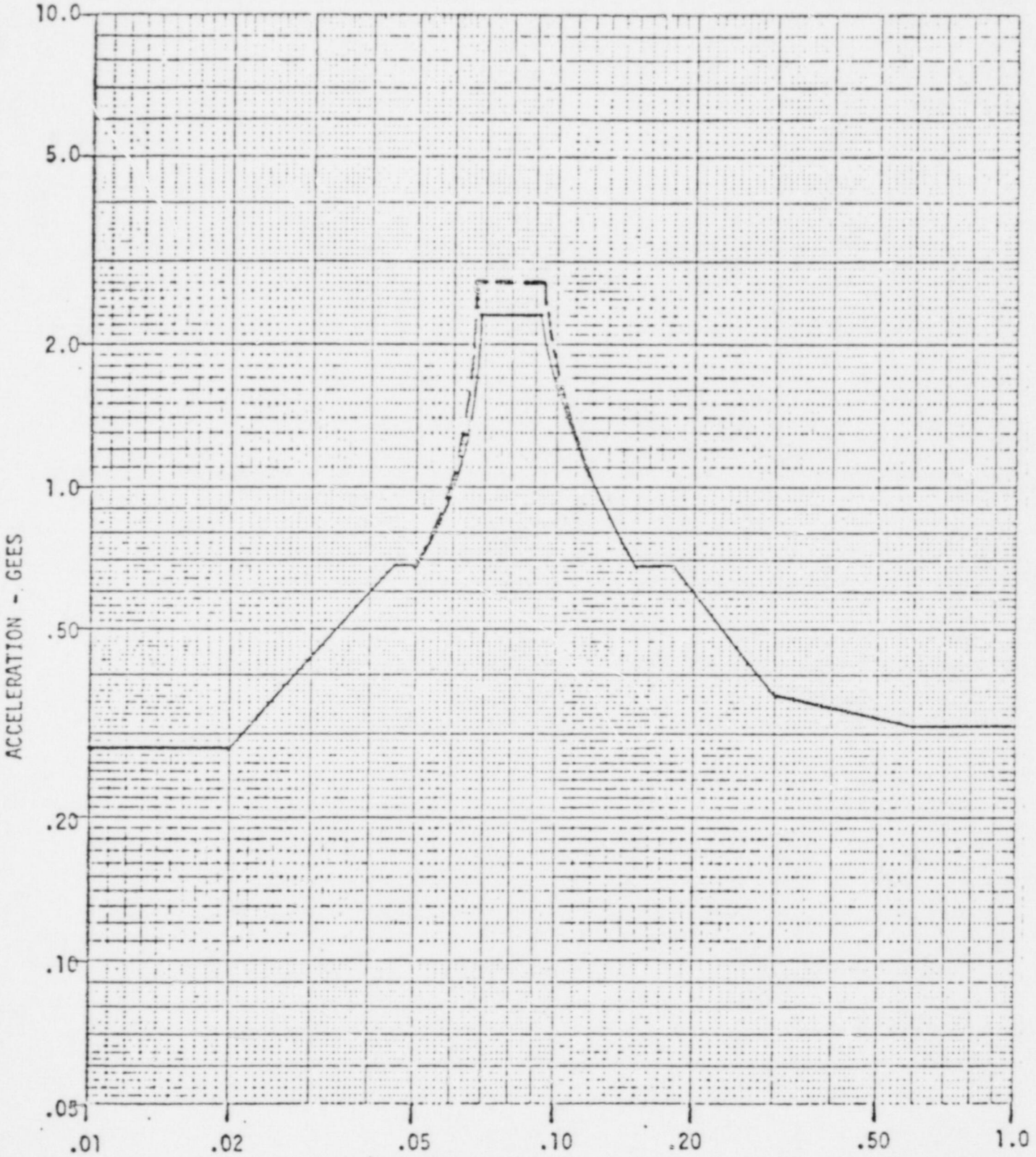
HOPPER AND ASSOCIATES
ENGINEERS



EQUIPMENT RESPONSE SPECTRUM

VERTICAL REACTOR BUILDING

SLAB 641'-6", 659'-6" & 684'- 6"

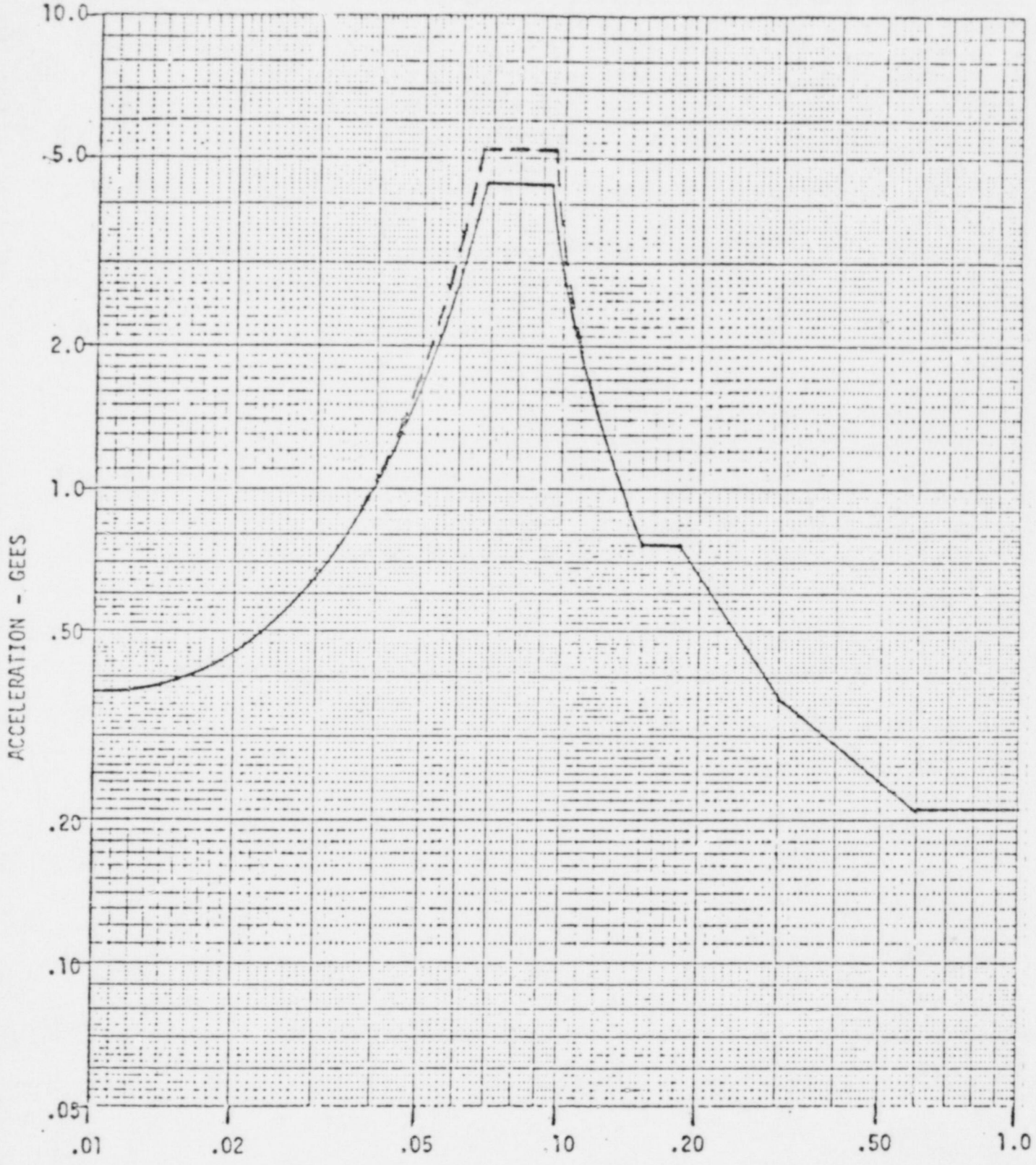


EQUIPMENT RESPONSE SPECTRUM

VERTICAL AUXILIARY BUILDING

SLAB 583'-6", 613'-6" & 659'-6"

HOPPER AND ASSOCIATES
ENGINEERS

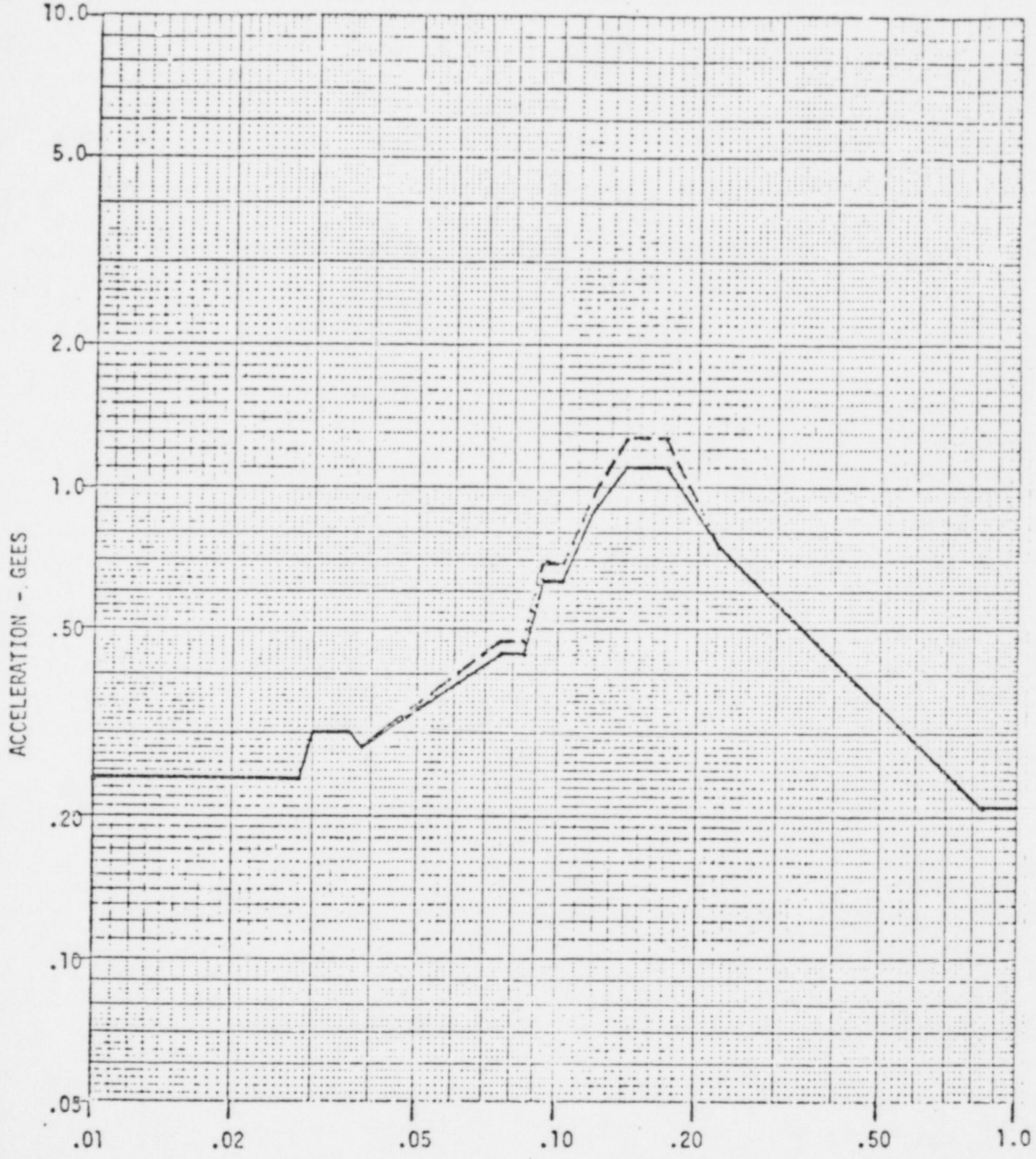


EQUIPMENT RESPONSE SPECTRUM

VERTICAL AUXILIARY BUILDING

SLAB 643'-6" & 677'-6"

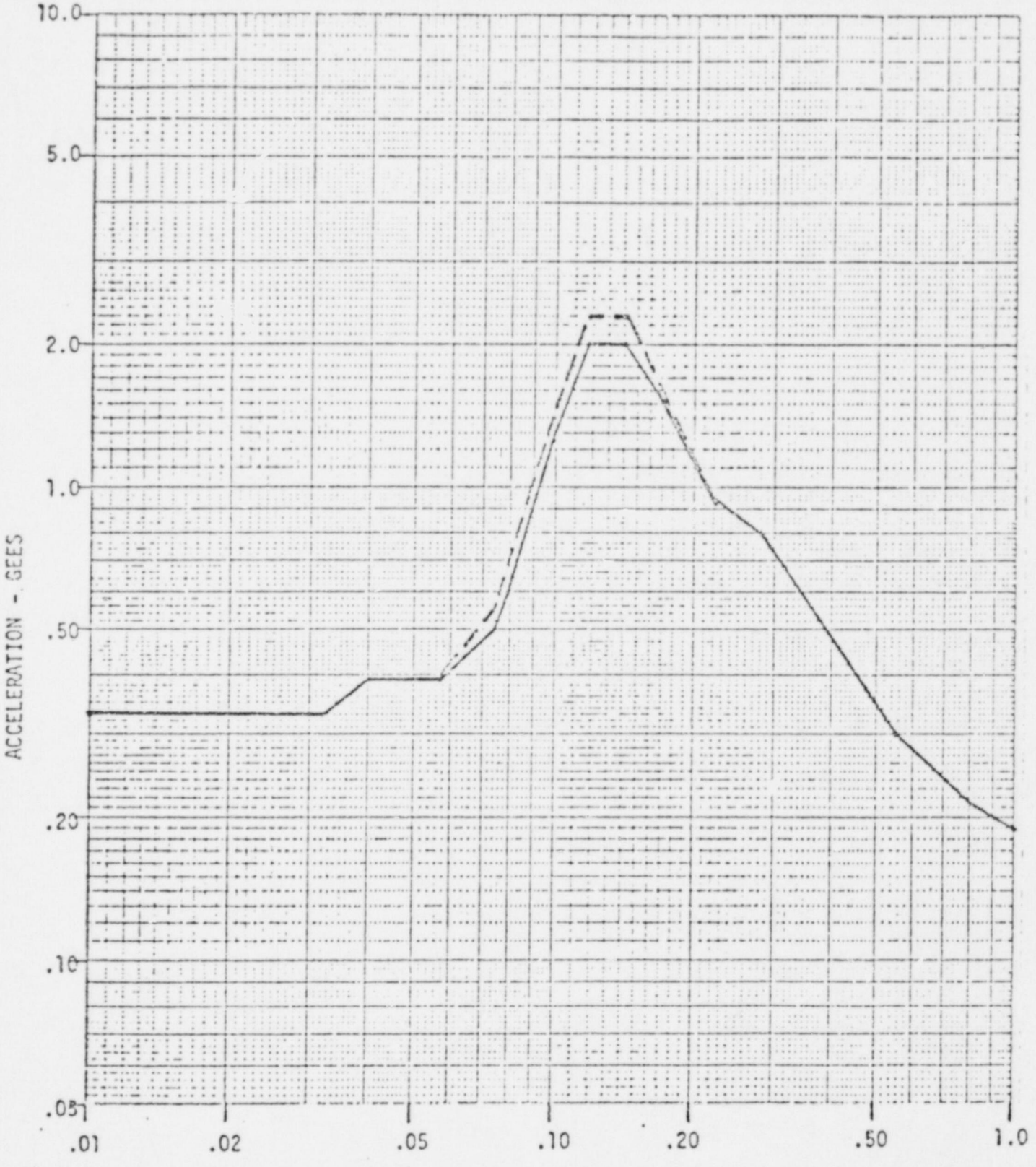
HOPPER AND ASSOCIATES
ENGINEERS



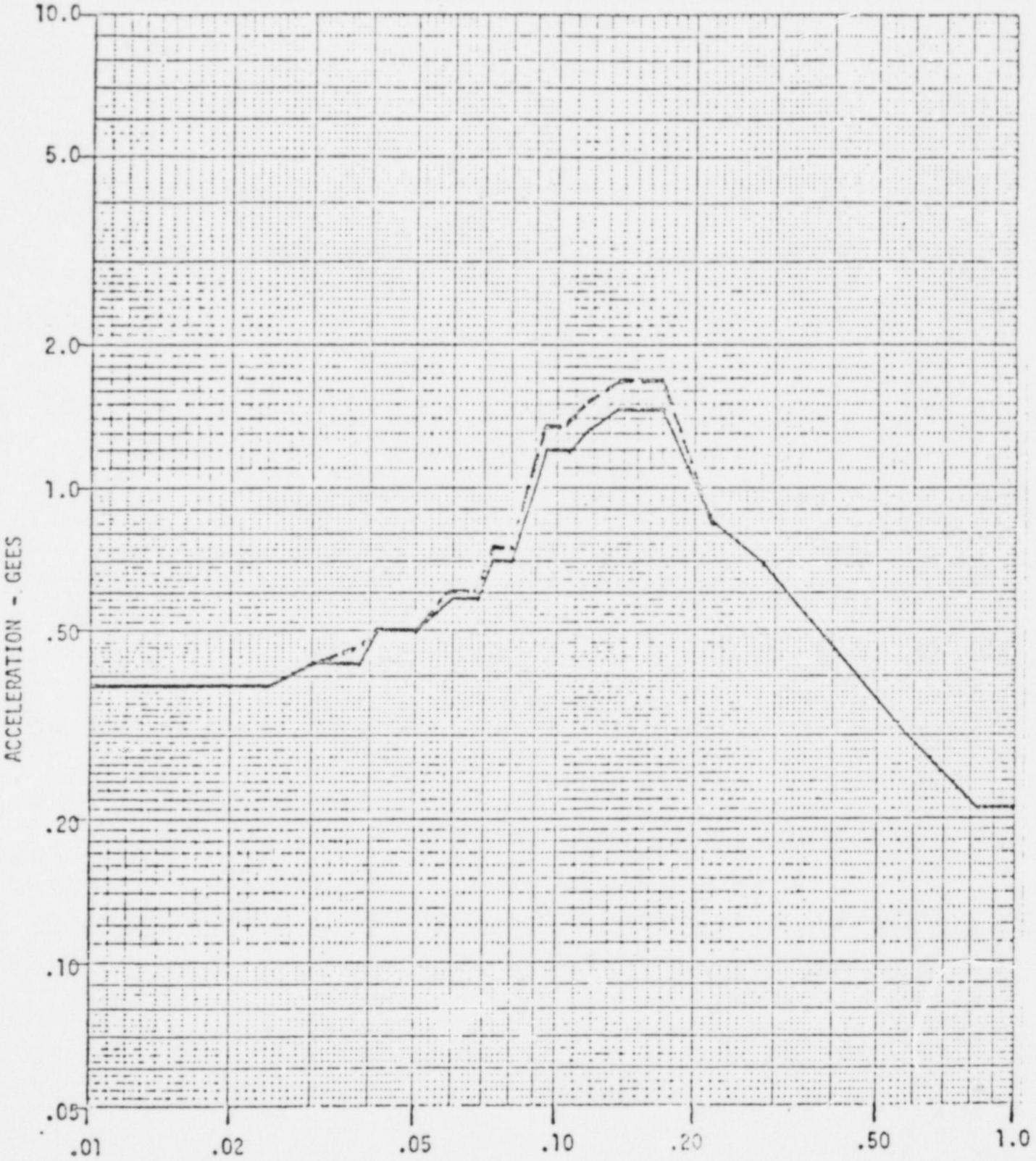
EQUIPMENT RESPONSE SPECTRUM

NS RHR COMPLEX

SLAB 590'-0"



EQUIPMENT RESPONSE SPECTRUM
EW RHR COMPLEX
SLAB 590'-0"

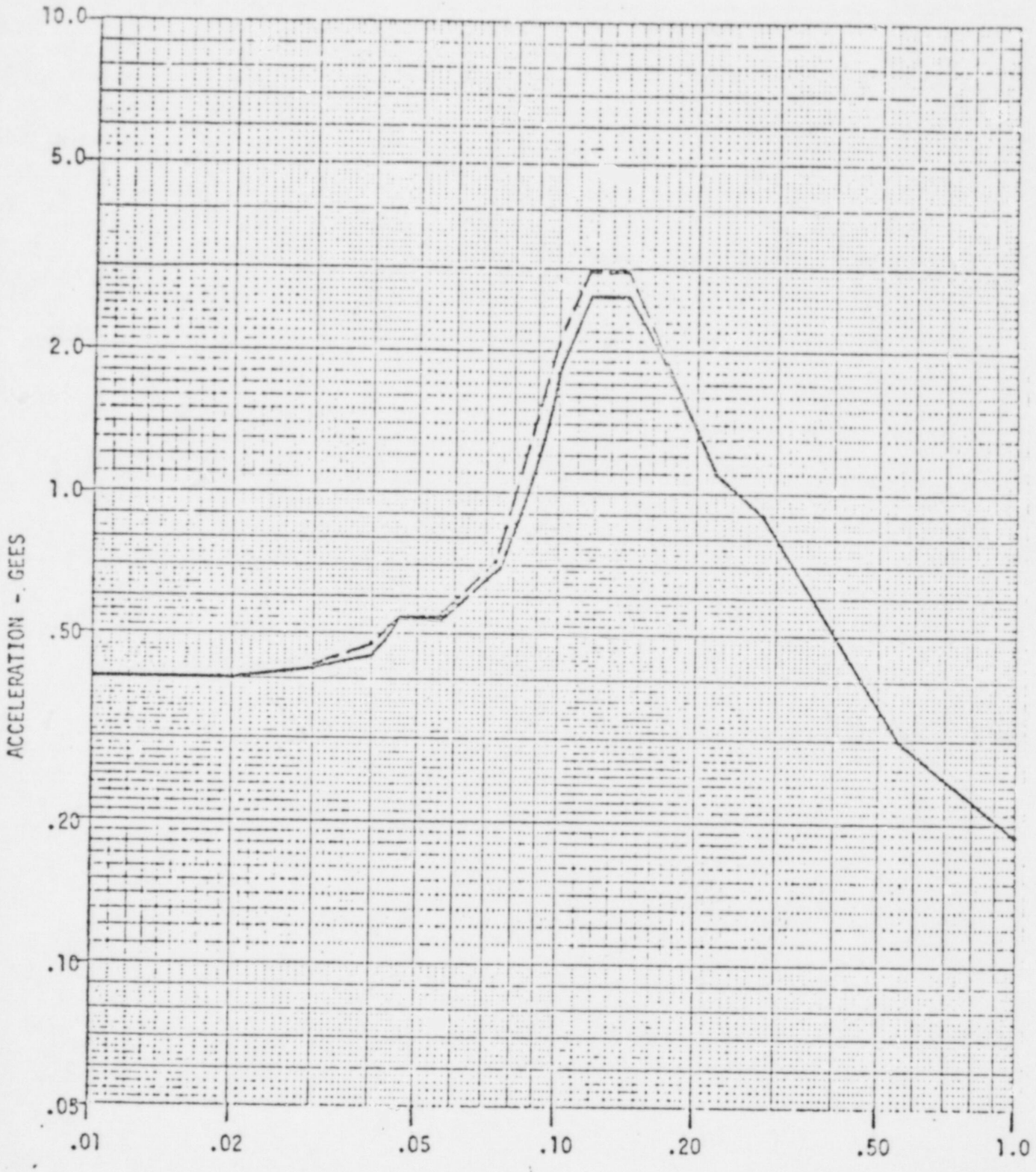


EQUIPMENT RESPONSE SPECTRUM

NS RHR COMPLEX

SLAB 617'-0"

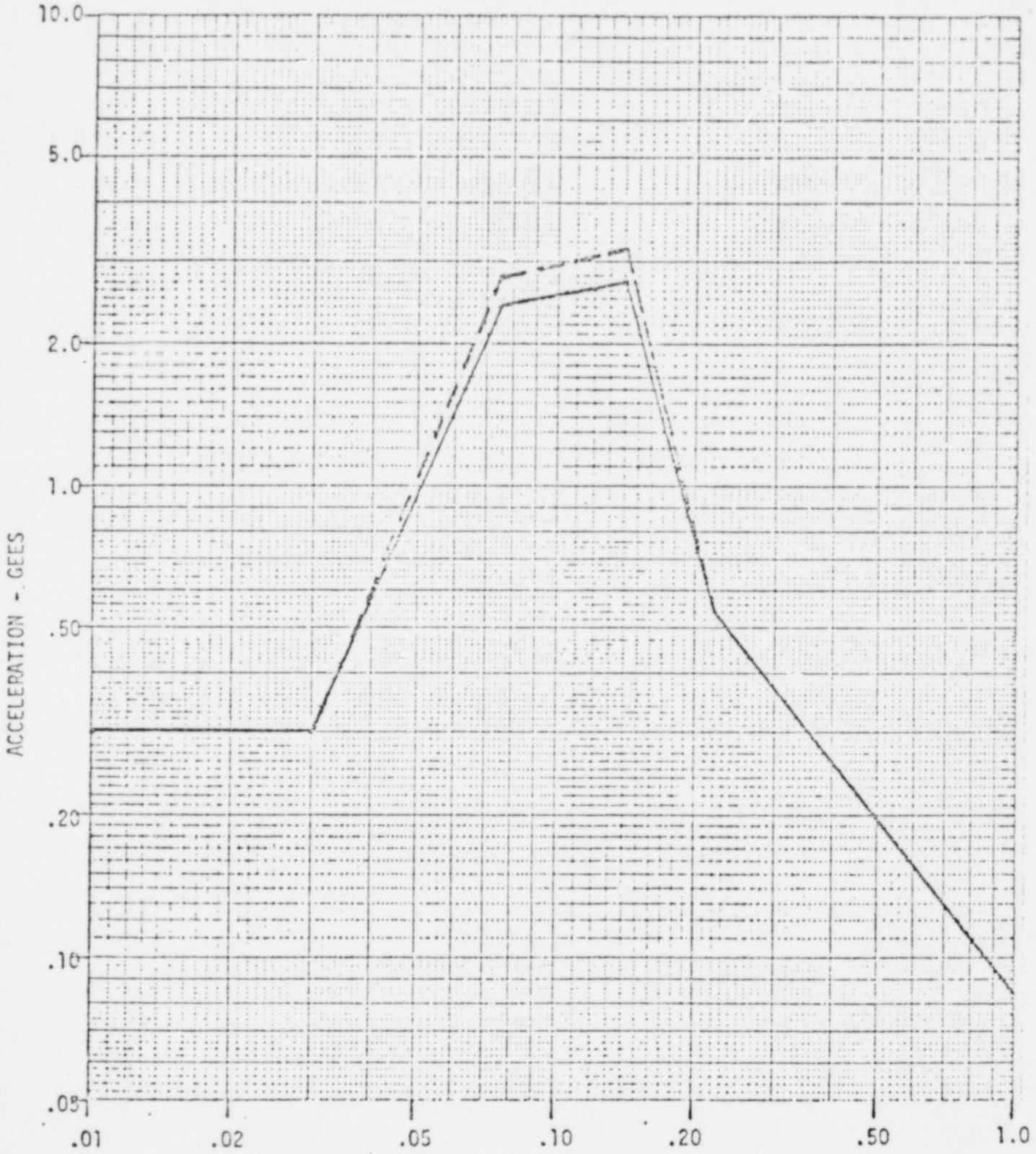
HOPPER AND ASSOCIATES
ENGINEERS



EQUIPMENT RESPONSE SPECTRUM

EW RHR COMPLEX

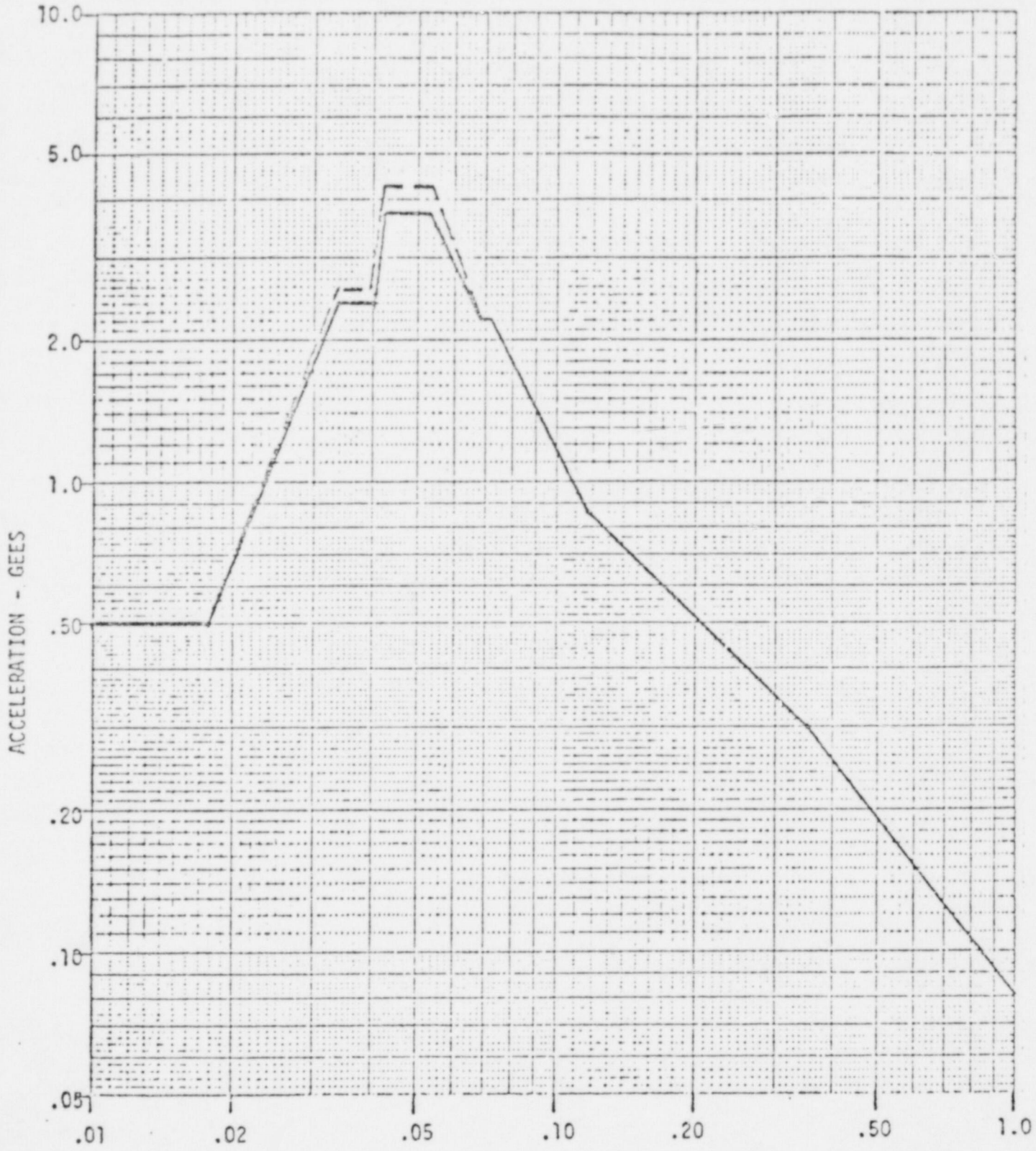
SLAB 617'-0"



EQUIPMENT RESPONSE SPECTRUM

VERTICAL RHR COMPLEX

SLAB 590'-6"



EQUIPMENT RESPONSE SPECTRUM

VERTICAL RHR COMPLEX

SLAB 617' - 6"

HOPPER AND ASSOCIATES
ENGINEERS

ATTACHMENT III
EF2 - 54,625

ENRICO FERMI ATOMIC POWER PLAN
UNIT 2

Re-evaluation of Equipment Qualified to the 7% Structural Damping Reassessment Earthquake when Subjected to a 5% Structural Damping Reassessment Earthquake

Prepared for: Detroit Edison Company
2000 Second Avenue
Detroit, Michigan 48226

Prepared by: Hopper and Associates
1840 S. Elena Avenue, Suite 208
Redondo Beach, CA 90277

August 27, 1981

1.0 INTRODUCTION

An exhaustive seismic reassessment evaluation was undertaken by the Detroit Edison Fermi Design Team to evaluate the acceptability of critical equipment relative to a newly postulated earthquake larger than that established as the design basis for the Fermi site. In this reassessment, it was assumed that structural and mechanical items would be experiencing cycles of relatively large stress reversals and appropriate damping values were selected for analytical purposes based upon this assumption. In this regard it was assumed that the primary structures would respond at the 7% damping level.

Upon completion of the seismic reassessment activities and evaluation of the structural analysis results it was observed that anticipated stress levels were not achieved and the structural response was shown to be quite acceptable relative to the reassessment earthquake input excitation.

However, internal equipment design spectra generated from the afore described building analysis response data are not necessarily conservative in nature. If the building responds with a lower effective damping then it would be anticipated that internal equipment response spectra would be greater than those associated with higher values of structural damping. For this reason, equipment response spectra were also generated assuming that the structure would respond at the 5% damping level. These 5% structural damping spectra were plotted along with the 7% structural damping spectra for comparative purposes.

At the completion of the SQRT audit the Nuclear Regulatory Commission requested that Detroit Edison provide to them a summary of the results of the equipment seismic qualification reassessment based on the use of 5% structural damping instead of 7% structural damping. Additional items identified as critical in this evaluation were to be summarized in a table similar to table 5.4-1 existing in the current seismic reassessment report for components requiring requalification or replacement. In addition, Edison was requested to provide the Commission with floor response spectra associated with 5% structural damping.

This report addresses the re-evaluation of equipment previously qualified to a 7% structural damping reassessment earthquake when now subjected to a 5% structural damping reassessment earthquake.

This report is structured to described the methodology by which this re-evaluation was undertaken and to present a summary of the results obtained from the evaluation. Detailed evaluation information is included as a part of this report.

The detailed evaluation is summarized on the equipment evaluation summary sheets taken from the original supplementary seismic evaluation report EF2-53332 dated July 15, 1981.

2.0 METHODOLOGY

2.1 Five percent structural damping response spectra were generated by an approximate method and are included as part of the reference 1 report. These spectra indicate a maximum amplification in the resonate frequency region of 21% over the 7% values. This maximum resonate amplification changes as a function of building location and ranges to a low peak value of 13%. Amplification is not observed in regions of the spectra away from building resonate frequencies. Both the zero period accelerations and the low frequency accelerations duplicate the 7% curves.

2.2 Existing reassessment results are included as a part of reference 2. This report thus establishes a baseline of equipment adequacy for the 7% structural damping input excitation. As an integral part of the calculation summary tabulation, safety margins existing relative to the 7% excitation have been established for most items. Safety margins existing for other items exist in calculation form in earlier revisions of the reference 2 report.

2.3 The evaluation approach for 5% structural damping input excitation was straight forward. Results of this evaluation have been included on a copy of the 7% damping damping equipment summary report in existence and are included as a part of this basic report.

All items with a safety margin greater than 21% were immediately considered to be acceptable relative to the 5% earthquake excitation input. The actual safety

margin for these items might be larger in light of the fact that the 21% amplification occurs only in narrow frequency regions on the design spectra but need for further refinement seems unnecessary at this time.

If the safety margin for a given item of equipment was less than 21% than the spectra for the actual equipment location were evaluated to determine if a lower peak amplification value would be in order. If so, the item was considered acceptable. If not, further investigation ensued considering the actual item frequency response and the portion of the total stress assignable to seismic excitation phenomena.

Anticipated maximum stress levels have been determined for all critical equipment items. These stress levels have been compared with yield point stresses for ultimate acceptability justification purposes.

2.4 Ductility was established as allowable in consideration of the evaluation of any Fermi equipment items. The limited pieces of equipment postulated to exceed yield point stress limits have been evaluated relative to an artificial stress bound established 20% above the yield point limit to correspond to an arbitrary but small amount of allowable ductile response in the inelastic region during the reassessment earthquake excitation.

Equipment items that may exhibit ductility phenomena have been specifically delineated on the detailed evaluation sheets with this report.

3.0 SUMMARY OF RESULTS

The detailed evaluation of the Fermi Seismic Reassessment items to 5% rather than 7% structural damping identified no additional items requiring re-evaluation or replacement. With the exception of those items identified as requiring further evaluation for 7% structural excitation and three items identified with a potential inelastic response, all Fermi reassessment equipment items remain below yield point stress levels when subjected to a 5% structural damping excitation.

The three items identified as having a potential for inelastic response due to the higher reassessment earthquake are the RPV top guide, HVAC PD 300 fire damper, and the Plenum for HVAC multi-zone unit.

A reference tabulation and our detailed evaluation summary information are included as the following items in this report.

REFERENCES

1. Enrico Fermi Atomic Power Plant, Unit 2, Constructed Equipment Response Spectra for 5% and 7% Structural Damping and 2% Equipment Damping, Hopper and Associates, Aug. 27, 1981

2. Enrico Fermi Atomic Power Plant, Unit 2, Supplementary Seismic Evaluation Report, EF2-53332 Rev. 0 and Rev. 1, Detroit Edison Company, July 15, 1981.

TABLE 5.3-1

LOADS FOR CERTAIN RPV AND INTERNAL COMPONENTS

	Horizontal	Vertical	Allowable
Top Guide (Shear)	350	31.7	687 kip (1)
Core Plate (Shear)	347	361	687 kip (1)
Stabilizer (Load)	513	0	2,765 kip (2)
RPV Support (Moment)	221,000	N/A	1,152,000 in-kip (1)
RPV Support (Shear)	679	1,191	2,600 kip (1)
CRD Housing (Moment)	507	N/A	18,870 in-kip (2)
CRD Housing (Shear)	14	Negligible	4,400 kip (1)
CRD Restraint Beam (Load)	14	N/A	266 kip (2)
Shroud Support (Moment)	276,000	N/A	347,900 in-kip (2)
Shroud Support (Shear)	1,176	1,031	1,434 kip (2)
Fuel Assembly (Moment)	12,024	See Section 5.3.1	32,200 in-kip
Fuel Assembly (Shear)	250	See Section 5.3.1	687 kip

(1) From Fermi 2 mathematical model 761E774, Revision 4

(2) From equipment design spec. or analysis

Minimum safety margin in shroud support

$= \frac{1434}{1176} = 1.22 \;\&\; 1.21 =$ Maximum amplification going from 7% structural damping to 5% structural damping.

TABLE 5.3-1 (Continued)

LOADS FOR CERTAIN RPV AND INTERNAL COMPONENTS

	Plant	Load Combination	Vertical Force (kips)	Horizontal Force (kips)
Core Plate	LaSalle 1	E1	423	471
	Fermi 2	New Seismic	361	347
Top Guide	LaSalle 1	B2	40.8	332
	Fermi 2	New Seismic	31.7	350

Load Combinations

E1 = NL + (U - Delta P) + SRV + SSE

B2 = NL + (A - Delta P) + Chg. + SRV - 1 + SSE

Minimum safety margin in top guide horizontally $= \frac{332}{350} = .95$.
Attached calculations establish RPV system frequency at 6.06 cps. At RPV frequency maximum horizontal amplification from 7% to 5% damping $= \frac{2.68}{2.40} = 1.12$

potential overstress $= \frac{1.12(.9)^{*}}{.95} = 1.06 < 1.20$ limit established for ductile response. O.K.

Ductility possible.

* [illegible] design factor

RPV

Determine system freqency per GE 22A1300BC: Appendix A

For the original dynamic analysis SC-2EE the pedestal runs between node points 12 and 29 and is designated as member 17 and 18.

$I_{18} = 27741\ ft^4$, $A_{18} = 364\ ft^2$

$I_{17} = 25421\ ft^4$, $A_{17} = 315\ ft^2$

$E = 552{,}000\ ksf$

$L_{18} = (597'-11") - (584'-4") = 13'-7" = 13.583'$

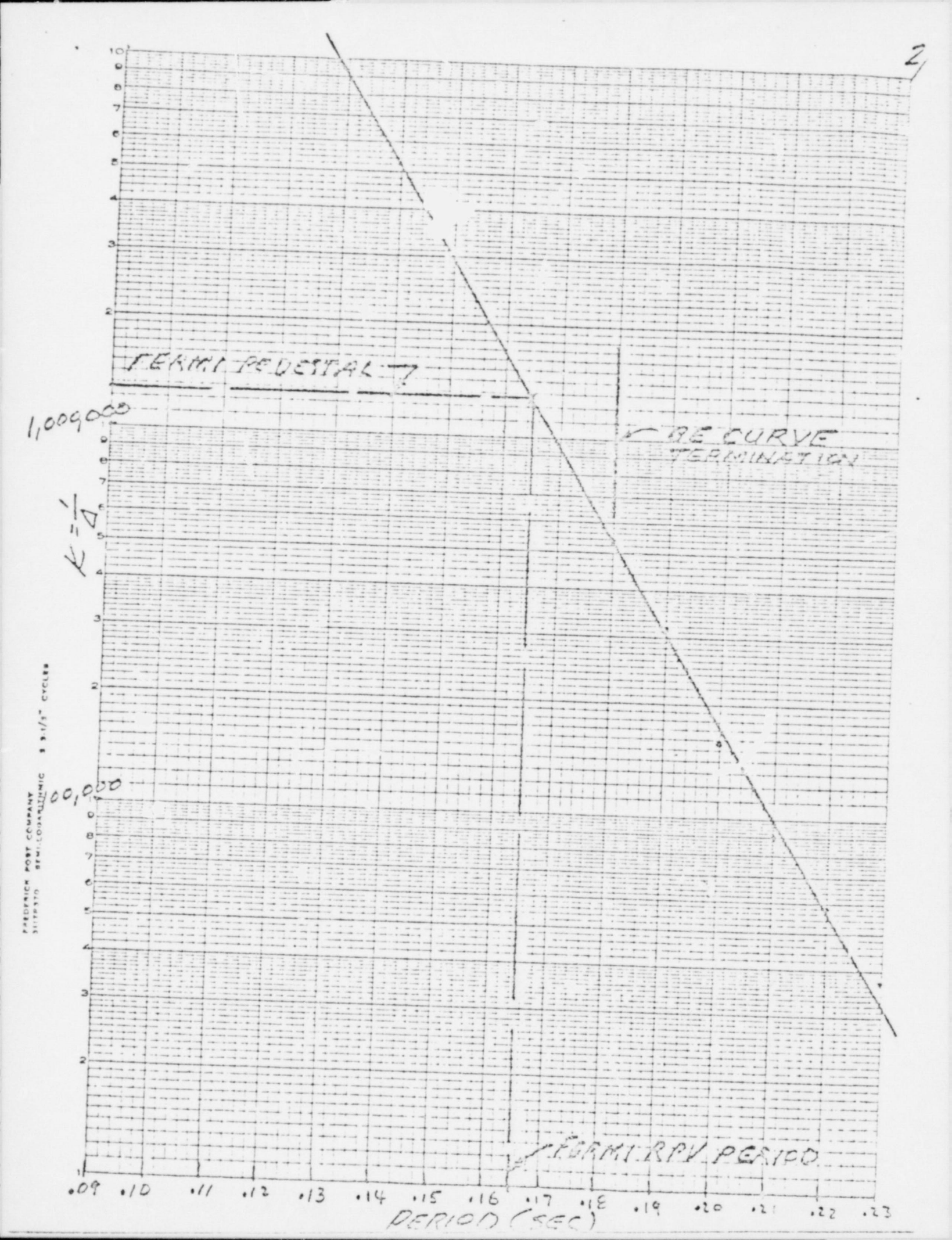
$L_{17} = (584'-4") - (572'-1") = 12'-3" = 12.25'$

Following G.E.

$$\Delta = \frac{1}{552{,}000}\left\{\frac{\overline{13.583}^3}{3(27741)} + \frac{5}{364}(13.583) + \frac{\overline{12.25}^3}{3(25421)} + \frac{5}{315}(12.25)\right\}$$

$$= 7.88 \times 10^{-7}$$

$$k = \frac{1}{\Delta} = 1{,}268{,}264.$$


FERMI RESIDUAL ?
1,000,000
RE CURVE TERMINATION
$K = \frac{1}{\Delta}$
100,000
FERMI RPV PERIOD
.09 .10 .11 .12 .13 .14 .15 .16 .17 .18 .19 .20 .21 .22 .23
PERIOD (SEC)
FREDERICK POST COMPANY
SEMI-LOGARITHMIC 5 X 1/2" CYCLES

From the chart

$T = .165$ sec

$f = 6.06$ cps

TABLE 5.3-2

HYDRAULIC CONTROL UNIT

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Hydraulic Control Unit, MPL C11D001	X		DRF 147-C11D001-N*5-5	B5 B6 B29 B30 C6 C16 All dated 4/18/72	C16 dated 4/18/72 Vertical B29 & B30 dated 4/17/81 Horizontal	1300% Horizontal 500% Vertical	DRF 147-C11D001-N*5-5A	1300% Horizontal 500% Vertical	The new peak response spectra curves were 1.05 g's horizontal capability of the HCU is 13 g's = 1300% margin by test, horizontal Vertical was 2.8 g's peak vs 14 g's capability by test = 500% margin, therefore the HCUs are acceptable.

All safety margins greater than maximum load amplifications.

TABLE 5.3-3

RHR PUMP ANCHORS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
RHR Pump Anchor Bolts		X	Edison Design Calculation	.15 g horz. .10 g vert.	S & L report SDD-DECo -003 Figures 3 C-11	14158 on yield		N/A	The Anchor bolt stresses were recalculated by applying the new site-specific seismic loads, the equipment nozzle loads from the attached piping, and the equipment dead weight loads. The shear and tension stresses were combined and shown to be less than the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.

Safety margin greater than maximum load amplification.

5130

TABLE 5.3-3A

RHR HEAT EXCHANGER AND ANCHORS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
RHR Heat Exchanger and anchor bolts		X	See G.E. Letter TDEC-4002 dated 6/22/81	1.5 g horiz. 0.14 g vert.	0.4 G horiz. 0.36 G vert.	5% on yield		N/A	The stresses resulting from the site specific SSE were obtained by multiplying the OBE allowable stresses (based on .75 G horiz, .07 G vertical) by the vertical acceleration ratio and comparing with SSE allowables (yield). The stresses due to nozzle loads and deadweight were also increased even though they didn't change. The calculated stresses are less than the new allowable values; therefore, the equipment is qualified to the site specific SSE.

Vendor qualified to 1.5g's in any direction.

As approximation

$\sqrt{.4^2 + .4^2 + .36^2} = .67$

$\frac{1.5}{.67} = 2.24 > 1.21.$

Safety margin greater than maximum load amplification.

TABLE 5.3-3B

RCIC PUMP ANCHOR BOLTS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
RCIC Pump anchor bolts		X	Edison Design calculation DC-369 item 2	.15 G horiz. .10 G vert.	S & L report SDD-DECo -003 figures 3 C-11	609% based on yield		N/A	The anchor bolt stresses were recalculated by applying the new site-specific seismic loads, the equipment nozzle loads from the attached piping, and the equipment dead weight loads. The shear and tension stresses were combined and shown to be less than the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.

Safety margin greater than maximum load application.

5152

TABLE 5.3-4

RCIC TURBINE ANCHOR BOLTS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
RCIC Turbine anchor bolts		X	Edison file No. DC-369 Item 2	1.5 g Horz .14 g vert.	S & L report SDD-DECo -003 Fig's 3 C-11	25.6%		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values therefore, the equipment is requalified to the new site-specific earthquake.

Safety margin greater than maximum load application

5.3-3

TABLE 5.3-5

RCIC PUMP SUCTION STRAINER

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
RCIC Pump suction strainers (Leslie) PIS # E5101D011		X	Edison File No. PI-2416	5 g horz. 3 g vert.	S & L Report SOD-DECo -003 Fig's. 3 C-11	N/A		N/A	The new site-specific earthquake accelerations are less severe than the acceleration loadings that were used in the original seismic qualification; therefore, this equipment is requalified.

* minimum safety margin = 3.8 due to vertical excitation. This margin is greater than the maximum load amplification.

TABLE 3.3-6

RHR SERVICE WATER

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
RHR Cooling Tower Equip. No. E11560001A, B, 2A, B Location RHR Elevation 617		X	Marley Co. dated 2-8-74 S & L EMD-011785				S&L EMD-029950	11% on tornado loads	Beams were found to be flexible and the resultant acceleration is above ZPA. The piping was found to be close to rigid. Fill stresses are very low. Eliminator stresses are very low. Fill retainers & eliminator retainers are analyzed based on tornado loads (higher loads). Stresses on the following mechanical equipment and parts are: Motor Support Branch Arm Pipe Support Anchor Bolts Embedment Tornado loads are governing loads. Stresses are within allowables.
RHR Service Water Pump and Motor Equip. No. E11S1C001A, C & D Location RHR Elevation 590'		X	McDonald Eng. Analysis dated 2-4-74 Goulds Pump Inc. dated 9-23-75 (motor)				S&L EMD-029950	>100% *	Stresses are below yielding limits. Water pump and motor qualified to new response spectra.

* For flange based on yield.

Safety margins greater than maximum load amplifications.

TABLE 3.3-7

DIESEL GENERATOR COMPONENTS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Diesel Generator Skid Assembly Equip. No. R10015001-4 Location RHR Elevation 590' Elevation 590'		X	Colt Ind. Report dated 4-4-75 S&L EMD-001659				S&L EMD-029950	51% *	Stresses are well within allowables. Skid assembly qualifies to new response spectra.
Heat Exchanger Stack Assembly Equip. No. R10015001-4 Location RHR Elevation 590'		X	Colt Ind. Report dated 4-4-75 S&L EMD-001659				S&L EMD-029950	>100% **	The equipment qualifies to new response spectra. Stresses very low.

Safety margins greater than maximum load amplifications.

* Turbocharger mounting bolts based on allowables

** For attachment plate based on allowables

TABLE 5.3-8

DIESEL GENERATOR COMPONENTS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Diesel Generator Skid Piping Equip No. RE0015001-4 Location RHR Elevation 590'		X	Colt Ind. Report dated 4-4-75 S&L EMD-001659	Calculations show acceptability.			S&L EMD-029950	17% *	The equipment qualifies to new response spectra. Stresses are within allowables.
Jacket Water Expansion Tanks Equip. No. RE000A005-8 Location RHR Elevation 604' -2"		X	Colt Ind. Report dated 4-4-75 S&L EMD-001659	Safety margins greater than maximum load amplifications.			S&L EMD-029950	31%**	The equipment qualifies to new response spectra. Stresses very low.
Air Receiver Tank Equip. No. RE000A009-16 Location RHR Elevation 590'		X	Colt Ind. Report dated 4-4-75 S&L EMD-001659				S&L EMD-029950	100%***	The equipment qualifies to new response spectra. Stresses very small.

* In piping based on allowables

** For mounting flange based on allowables

*** In bolts based on allowables

D.G. Skid Piping

Governing situation - intercooler water-cooler to engine. (Ref. Colt Stress Report)

21.5 cps mode → .25 g's input - 3 directions

Maximum stress = 2057 psi

Allowable stress = 27,000 psi

Maximum accelerations from 5% spectra at 21.5 cps:

NS = .32 g's

EW = .39 g's

Vert = .86 g's

$$\frac{.86}{.25}(2057) = 7076 \text{ psi} < 27{,}000 \text{ psi}$$

TABLE 5.3-9

DIESEL GENERATOR FUEL OIL

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Fuel Oil Day Tanks Equip. No. B1000A017-20 Location RHR Elevation 590'		X	Colt Ind. Report dated 4-17-74 S&L EMD-001659	Calculations show acceptability.			S&L EMD-22250	184*	Stress levels due to revised response spectra, are within allowable values. This component is requalified.

* For tank holddown bolts based on allowables.

D.G. Fuel Oil Day Tanks

Governing situation - shell bending stress
(Ref. Colt Stress Report)

Maximum stress = 8856 psi

Direct.	Freq	Accel.	New Accel 5% Spectra
Vert	15.5	.27 —	1.9 —
EW	12.7	.28	.49
NS	13.9	.3	.45

$$\frac{1+1.9}{1+.27}(8856) = 20\text{KSI}$$ Acceptable

TABLE 5.3-10

DIESEL GENERATOR LUBE OIL

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Lube Oil Strainer Equip. No. [illegible] Location RHR Elevation 590'		X	Colt Ind. Report dated 4-4-75 S&L EMD-001659	Calculations show acceptability.			S&L EMD-029950	1.0%*	Stress levels due to revised response spectra are within allowable values. This component is requalified.

* For shell based on allowables.

D.G. Lube Oil Strainer

Governing situation - shell stress (Ref. Colt Stress Report)

Maximum stress = 9814 psi

Minimum frequency = 29 cps

Vert. Accel = .09 g's .36 g's Max g's 5

Lateral Accel = .24 g's .33 g's Max g's 5

$\frac{1.36}{1.09}(9814) = 12$ KSI Acceptable

$\frac{.33}{.24}(9814) = 13$ KSI Acceptable

TABLE 5.-11

DIESEL GENERATOR LUBE OIL

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Lube Oil Filter Equip. no. 8300150001-4 Location B08 Elevation 590'		X	Colt Ind. Report dated 4-4-75 S&L EMD-001659				S&L EMD-029950	>100% *	Stress levels due to revised response spectra are within allowable values. This component is requalified.

Safety margin greater than maximum load amplification.

* For shell based on allowables.

S-140

TABLE 5.3-12

DIESEL GENERATOR FUEL OIL

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Fuel Oil Storage Tanks Equip. No. R300A001-4 Location RHR Elevation 590'		X	Graver Tank & Mfg. Co, dated 6-5-74 S&L EMD-008913				S&L EMD-029950	-97% *	Additional bolts are required at the foundation support. All other calculated stresses are below allowables. See Section 5.4

Item on existing requalification list.

* For foundation bolts based on yield.

5.4-21

TABLE 5.1-11

EMERGENCY EQUIPMENT COOLING WATER

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	Margin of Safety	
EECW Pump and Motor (Includes Anchors) PIS # P4400C001A		X	Edison File No. S24-116	1.4) horz. .5 vert.	S&L Report SDD-DECo -003) Figures b-31 A-32 C-16	91 (Based on original allowables except for pump outboard bearing) See remarks		N/A	For the equipment's critical components the original qualification used the vector sum of the vertical and horizontal accelerations as the equipment's seismic loading. The vector sum of the NS, EW, & vertical accelerations obtained from the new site-specific response spectra was divided by the acceleration value used in the original qualification to determine the "acceleration increase". The new stresses were conservatively estimated by multiplying the original stresses by this "acceleration increase". These new stresses are below the new allowable values; however, the pump outboard bearing radial load (8726#) is 40% greater than its original allowable load rating of 6215# at 100 hours of operation. When a bearing is subjected to a constant load greater than its rated load, the bearing life is reduced. For a constant bearing load of 8726#, it is estimated that the bearing life would be reduced from 100 hrs. to 10 hours.

Our SQRT calculations show the following capability when evaluated for seismic safety margin considering the actual portion of total stresses assignable to earthquake excitation:

$$\frac{1.35}{1.05} = 1.3 > 1.21.$$

Safety margin greater than maximum load amplification.

S1.1-2

TABLE 3.3-13 (continued)

EMERGENCY EQUIPMENT COOLING WATER

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
EECW Pump and Motor (Includes anchors) PIS #P4400C001A									however, the seismic loading is clearly not constant but occurs for a maximum duration of 30 seconds, therefore, The equipment is requalified to the new site-specific earthquake.

TABLE 3.3-14

EMERGENCY EQUIPMENT COOLING WATER

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
EECW Make-up tank (including anchor bolts) PIS #P4400A001		X	Edison File No. S20-24	S&L Report SL-2682 Figures B-31 B-32 B-16	S&L Report SDD-DECo -003 Figures B-31 B-32 C-16	13% Based on yield		N/A	The original seismic stresses were separated out of the original qualification, increased for the new site-specific earthquake, and then added to the original normal operating and deadweight loads. The new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.

Calculations show acceptability.

3.3-43

EECW Make Up Tanks

2nd Flr. R.B. location

Max Horiz Amp = 1.13

Max Vert Amp = 1.12

$g_{vert} = 1.12(1.36) + 2.23 \times 1 = 3.66$

$g_{NS} = 1.15(1.36) + .38 = .67$

$g_{EW} = 1.13(1.46) + .38 = .92$

Stress summary

$3.66(3E4) + .67(5E4) + .92(6E4) + 9650 = 33.2 < 37.7$ KSI

Acceptable

TABLE 5.3-15

EMERGENCY EQUIPMENT COOLING WATER

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
EECW Heat exchanger (including anchor bolts) PIS #P4400H001		X	Edison File No. S21-7	S&L Report SL-2682 Figures B-31 B-32 C-16	S&L report SDD-DECo -003 Figures B-31 B-32 C-16	20-33 Based on yield		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site specific earthquake.

Safety margin greater than maximum load amplification at this location. (13%)

TABLE 5.3-16

DIESEL GENERATOR SERVICE WATER

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Motor for Diesel Generator Service Water pumps and emergency equipment Equip. No. R300C005-B Location RHR Elevation 590'		X	Allis Chalmers dated 5-13-76 S&L EMD-003791				S&L EMD-0029950	20%*	Stresses are within the allowable limits. Motor qualifies to new response spectra.
Diesel Generator Service Water Pump *		X							See Section 5.4

* For anchorage bolts based on allowables.

Safety margin greater than maximum load amplification at this location. (13%)

* Item on existing requalification list.

TABLE 5.3-17

EMERGENCY EQUIPMENT SERVICE WATER

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Emergency Equipment Service Water Pumps Equip. No. P450C002A, B location RHR Elevation 590'		X	McDonald Eng. Rep. ME-229 dated 6-21-75 S&L EMD-001554	Safety margin greater than maximum load amplification.			S&L EMD-029950	43%*	Stresses and deflections are below allowables. Pump qualifies to new response spectrum.
Motor for Diesel Generator Service water pumps and emergency equipment Equip. No. R100C005-8 location RHR Elevation 590'		X	Allis Chalmers dated 5-13-76 S&L EMD-003791	Safety margin greater than maximum load amplification at this location. CAN			S&L EMD-029950	20%**	Stresses are within the allowable limits. Motor qualifies to new response spectra.

* In shaft deflection based on allowable.

** For anchorage bolts based on allowables.

TABLE 5.3-18

CONTROL AIR

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Control air compressor and motor (including anchor bolts) PIS # P5002D001		X	Edison File No. B11-179 B11-506	S&L report SL-2682 Figures B-29 B-30 C-16	S&L report SDD-DECo -003 Figures 3 C-11	189% margin on yield		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.

Safety margin greater than maximum load amplification.

5.3-8

TABLE 3.3-19

CONTROL AIR AFTER COOLER

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Control air after-cooler (including anchors) PIS #P50028004		X	Edison File No. 811-405	2.4 g horz 1.9 g vert	S&L report SDD-DECo -003 Figures B-29 B-30 C-11	N/A		N/A	The new site-specific earthquake accelerations are less severe than the acceleration loadings that were used in the original seismic qualification; therefore, this equipment is requalified

Safety Margins to 3 to excitation.

Horiz = $\frac{2.4}{2.03}$ = 1.18

Vert = $\frac{1.9}{.73}$ = 2.4%

Items satisfactorily qualified.

TABLE 5.3-20

CONTROL AIR

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Control Air Receiver PISAP5002A001		X	Edison File No.	S&L Report SL-2682 Figures B-5 B-6 B-29 B-30 C-6 C-16	S&L Report SDD-DECo-003 Figures B-29 B-30 C-11	N/A		N/A	The new site-specific earthquake accelerations are less severe than the acceleration loadings that were used in the original seismic qualification; therefore, this equipment is requalified.

Safety margins to 5% excitation.

Horiz = $\frac{2.1}{2.03}$ = 1.03

Vert. = $\frac{2.2}{.78}$ = 2.82

Items satisfactorily qualified.

5150

TAB. 5.3-21

HVAC DUCTS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
HVAC Ducts		X							A summary of maximum duct accelerations due to seismic and dead weight loads indicates that values are within allowable limits. This component is requalified to the site-specific SSE.

Safety margin in initial reassessment was 3.0 minimum which is greater than maximum load amplification.

5151-1

TAB.... 5.3-23

ESSENTIAL HVAC DAMPERS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
			Edison File No.	S&L Report SL-2682 Figures	S&L Report SDD-DECo-003 Figures				
PD 300 Fire Damper		X	B9-2175	B-37 C-19	B-37 C-19	7% based on yield *		N/A	The original seismic stresses were separated out of the original qualification, increased for the site-specific SSE, and added to the normal operating loads (in cases where stresses were low, the combined normal operating and seismic stresses were increased by the worst acceleration ratio). Calculated stresses are below the new allowable values; therefore the equipment is requalified to the site-specific SSE.
Backdraft Damper (Pacific Air Products Company)		X	B9-2175	B-37 C-19	B-37 C-19	180% based on original allowable *		N/A	
Air Damper (Pacific Air Products Company)		X	B9-2175	B-37 C-19	B-37 C-19	10% based on original allowable *		N/A	
Flexible Hose		X	B9-2175	B-37 C-19	B-37 C-19	large **		N/A	

* $\frac{1.21}{1.07} = 1.13 < 1.20$ limit established for ductile response. O.K.
Ductility possible.

** Safety margins greater than maximum load amplifications.

TABLE 5. (Continued)

ESSENTIAL HVAC DAMPERS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	Margin	Analysis Report #	Margin of Safety	
Fire Dampers and Air Control Damper (Air Balance Inc.)	X		B9-2131 or B9-2175 TAB IV	Test input acceleration of 5 g minimum	B-37 C-19	28% *		N/A	The original test response spectra envelops the new site-specific reponse spectra; therefore, this equipment is requalified.
Damper Motor Mountings for T4100F157A & B thru F163A & B		X	Edison File No. B9-2174	S&L Report SL-2682 Figures B-37 C-19	S&L Report SDD-DECo-003 Figures B-37 C-19	46% * based on yield		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.
Damper Motor Mountings for T4100F070 thru F073		X	Edison File No. B9-2150	S&L Report SL-2682 Figures B-37 B-38 C-9	S&L Report SDD-DECo-003 Figures B-37 B-38 C-19	4.1% * based on yield		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.

* Safety margins greater than maximum load amplification

** At 4.33 cps frequency and 677'-6" location following are accelerations:

	Used	5% Value
EW	4.16	3.60
NS	4.16	3.10
Vert	3.69	.50

1 of 1

TABLE 5..) (Continued)

ESSENTIAL HVAC DAMPERS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	Margin of Safety	
Fire Dampers T4100F099 & F102 T4100F111 & F112 T4100F086		X	Edison File No. B9-2184	S&L Report SL-2682 Figures B-37 C-9	S&L Report SDD-DECo-003 Figures B-37 B-38 C-19	21% based on yield		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.
Butterfly Dampers (Valves) Type 4340 Damper Sizes 8", 10", 14", 18", & 48"		X	Edison File No. B9-1119	5 g (N-S) 5 g (E-W) 3 g (Vert)	S&L Report SDD-DECo-003 Figures B-37 B-38 C-19	13.2% based on yield		N/A	(as above)
Manual Air Dampers Sizes 32 x 30 96 x 24 48 x 48 36 x 36		X	Edison File No. B9-2176	S&L Report SL 2682 Figures B-37 B-38 C-19	S&L Report SDD-DECo-003 Figures B-37 B-38 C-19	16% based on yield		N/A	The original seismic stresses were separated out of the original qualification, increased for the new site-specific earthquake, and then added to the original normal operating and deadweight loads. The new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.

* Safety margins greater than maximum load amplification.

** Computed stress for 5% excitation:

25.5(1.21) = 30.9 < Yield

Thus satisfactory

TABLE 5.. -23 (Continued)

ESSENTIAL HVAC DAMPERS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Type CDJI Dampers 75" x 52" thru 16" x 16"		X	Edison File No. 69-761	S&L Report SL-2682 Figures B-37 B-38 C-19	S&L Report SDD-DECo-003 Figures B-37 B-38 C-19	45% based on allowable buck- ling load		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.
112" x 33" Control Room Dampers		X	Edison File No. 69-761	1.1 g (N-S) 1.5 g (E-W) 1.5 g (Vert)	S&L Report SDD-DECo-003 Figures B-37 B-38 C-19	162% based on yield		N/A	(as above)
Fire Dampers FISIT4100F		X	Edison File No. 69-2090	0.6 g (NS) 0.6 g (EW) 1.0 g (Vert)	S&L Report SDD-DECo-003 Figures B-37 B-38 C-15	N/A		N/A	The new site-specific earthquake accelerations are less severe than the acceleration loadings that were used in the original seismic qualification; therefore, this equipment is requalified.

all safety margins greater than maximum load amplifications.

TABL. 3.3-24

HVAC RETURN AIR FANS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Return Air Fan (Including Anchor Bolts) PSI#T4100C031		X	Edison File No. B9-365	S&L Report SL-2682 Figures B-37 B-38 C-19	S&L Report SDD-DECo-003 Figures B-37 B-38 C-19	weakest component has a 0% margin based on yield		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.

Calculations show acceptability.

Return Air Fan

5th Flr Ann. Bldg. 69'-6"

$f_{Hor.} = 17.6$ cps , $f_{Vert} = 21.2$ cps

	Used
NS = .74 g's	.63
EW = .92 g's	.62
Vert = 1.55 g's	1.7

$$\frac{.92}{.63}(21.7) = 31.7 \text{ KSI} < \text{Yield}$$

Acceptable

TA 5.3-25

HVAC CENTRIFUGAL CHILLING UNITS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Centrifugal Chilling Units (Includes Anchors) P1SHT41000008 & 9		X	Edison File No. 89-651	S&L Report SL-2682 Figures B-37 B-38 C-19	S&L Report SDD-DECo-003 Figures B-37 B-38 C-19	29.1% based on original allowable		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.
Rupture Disc for Centrifugal Chilling Units	X		Edison File No. 89-684	10 g input	S&L Report SDD-DECo-003 Figures B-37 B-38 C-19	2100%		N/A	The original qualification indicates that the disc was subjected to a 10 g input. This acceleration is well above the new site-specific response spectra; therefore, the equipment is requalified to the new site-specific earthquake.

all safety margins greater than maximum load amplifications.

TABLE 5.3-26

HVAC EMERGENCY MAKE-UP MOTORS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Emergency Make-up Motors for Fans with PIS #'s T41000047 & 16		X	Edison File No. B9-1196	S & L Report SL-2682 Fig's B-37 B-38 C-19	S & L Report SDD-DECo-003 Fig's B-37 B-38 C-19	N/A	"	N/A	The new site-specific earthquake accelerations are less severe than the acceleration loadings that were used in the original seismic qualification; therefore, this equipment is requalified.

Existing safety margin (8.8) greater than maximum load amplification.

TABLE 3-27

HVAC EMERGENCY MAKE-UP AIR RECIRCULATION AIR FILTERS UNITS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Emergency Make-up Fans PIS # T41000047 & 16		X	Edison File No. 89-1387	S & L Report SL-2682 Fig's B-37 B-38 C-19	S & L Report SDD-DECo-003 Fig's B-37 B-38 C-19	214% Based on Yield		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.
Emergency Make-up Filters PIS # T41000011		X	Edison File No. 89-762	Fig's B-13 B-14 C-9 of S & L Report SL-2682	Fig's B-37 B-38 C-19 of S & L Report SDD-DECO-003	78.4% Based on Yield		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.

All safety margins are after-
from maximum load amplifications.

HVAC MULTI-ZONE CLIMATE CHANGER

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	Margin of Safety	
Multi-Zone Climate Changer P&S # T4100B007		X	Edison File No. B9-544 B9-674	S & L Report SL-2682 Fig's B-37 B-38 C-19	S & L Report SDD-DECO-003 Fig's B-37 B-38 C-19	Weak-est Com-ponent has 0% Margin Based on Yield *		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.
Plenum for HVAC Multi-Zone Unit		X	Edison File No. B9-2203	S & L Report SL-2682 Fig's B-37 B-38 C-15	S & L Report SDD-DECO-003 Fig's B-37 B-38 C-15	Weak-est Com-ponent has a 0% Margin Based on Yield *		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.
Plenum Casing Access Door for HVAC Multi-Zone Unit		X	Edison File No. B9-2202	S & L Report SL-2682 Fig's B-37 B-38 C-9	S & L Report SDD-DECO-003 Fig's B-37 B-38 C-19	N/A * **		N/A	The new site-specific earthquake accelerations are less severe than the acceleration loadings that were used in the original seismic qualification; therefore, this equipment is requalified.

* See attached calculations

** High frequency item. No amplification anticipated.

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Kaiser - Fort Calhoun Project

Aux. Bldg El 977'-6"

For worst case (E.Q. + D.L.) amplification = 1.09

1.09 (28.9) = 31.5 ksi < Yield

Acceptable

Plenum

El 982'-6" R.B.

Highest stress = 36.8 ksi

Maximum amplification = 1.18

36.8 (1.18) = 43.4 ksi > Yield

$\frac{43.4}{30.0} = 1.20$ Limit of acceptability

Ductility problem

TABLE 5.3-29

HVAC CHILLED WATER PUMP AND MOTOR

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Chilled Water Pump and Motor P1S # E4100C040 & 41		X	Edison File No. B9-651 B9-1875	Pumps 1 g N-S 1 g E-W 2 g Vert MTR's 3.6 g N-S 4.25 g E-W 3.6 g Vert	S & L Report SDD-DECo-003 Fig's B-37 B-38 C-19	N/A		N/A	The new site-specific earthquake accelerations are less severe than the acceleration loadings that were used in the original seismic qualification; therefore, this equipment is requalified.

Safety margin (44.5%) greater than maximum load amplification.

5.3-15

TABLE 3-31

HVAC COOLERS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Switchgear room Coolers ECCW Pump Room Coolers Control Air Compressor Cooler (T41-00b001 &) T41-00b014 T41-00b029 Respectively)		X	Edison File No. B9-643	B33, B34, C19 SL-2682 (Vertical Times 2.0)	B33, B34, C-19 S & L Report SDD-DECo-003	20% ~~30%~~ Based on Yield		N/A	The original seismic stresses were separated out of the original qualification, increased for the site-specific SSE, and added to the normal operating loads. Calculated stresses are below allowables; therefore, the equipment is requalified to the site specific SSE.

Safety margin greater than maximum load amplification at this location.

TABLE 5.3-32

RHR ROOM COOLERS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
RHR Room Cooler (Including Anchor Bolts) PIS#T41000018		X	Edison File No. 89-554	S&L Report SL-2682 Figures B-29 B-30 C-14	S&L Report SDD-DECo-003 Figures B-29 B-30 C-14	N/A		N/A	The new site-specific earthquake accelerations are less severe than the acceleration loadings that were used in the original seismic qualification; therefore, this equipment is requalified.

Safety margin (1.36) greater than maximum load amplification.

TABLE 5.3-33

HVAC Equipment Room Fan-Coil Unit

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Equipment Room Fan-Coil Unit P1S1T41000B028		X	Edison File No. B9-554	S&L Report SL-2682 Figures B-37 B-38 C-19	S&L Report SDD-DECo-003 Figures B-37 B-38 C-19	51% based on yield		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.

Safety margin greater than maximum load amplification.

6915

TABLE 5.3-14

HVAC RCIC PUMP ROOM COOLER

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
RCIC Pump Room Cooler PIS#T41000B021		X	Edison File No. B9-554	S&L Report SL-2682 Exhibit 2 and Fig. C-11	S&L Report SDD-DECo-003 Figures B-29 B-30 C-11	23.4% ~~based~~ on yield		N/A	The new stresses were conservatively estimated by multiplying the original stresses by the largest acceleration increase comparing all three directions. These new stresses are below the new allowable values; therefore, the equipment is requalified to the new site-specific earthquake.

Safety margin greater than maximum load amplification.

TABLE 5.3-35

HVAC CABLE TRAY COOLING FAN

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Cable Tray Cooling Fan PISIT4100C053	Item on existing requalification list.								See Section 5.4

TA 5.3-35A

HVAC EQUIPMENT ANCHORS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Anchor Bolts for the following equipment:			Edison File No.	S&L Report SL-2682 Figures	S&L Report SDD-DECo-003 Figures				
EECW Pump Room Cooler		X	DC-575	B-31 B-32 C-16	B-31 B-32 C-16	257% based on yield		N/A	The anchor bolt stresses were recalculated by applying the new site-specific seismic loads. The resulting shear & tension stresses are below the new allowable stresses; therefore, the anchors will safely sustain the effect of the new site-specific earthquake.
Control Air Compressor Cooler		X	DC-577	B-29 B-30 C-18	B-29 B-30 C-18	376% based on yield		N/A	Same as above
Equipment Room Fan-coil Unit		X	DC-582	B-37 B-38 C-19	B-37 B-38 C-19	571% based on original allowable		N/A	Same as above
Chilled Water Pump and Motor		X	DC-585	B-13 B-14 C-9	B-37 B-38 C-19	119% based on original allowable		N/A	Same as above

All safety margins greater than maximum load amplification

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TABLE 3.3-35A (cont.)

HVAC EQUIPMENT ANCHORS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	Margin of Safety	
Emergency Make-up Filter Unit		X	DC-593 B9-762	B-13 B-14 C-9	B-37 B-38 C-19	95.3% based on yield		N/A	Same as above
Multi-zone Climate Changer		X	DC-589	B-37 B-38 C-19	B-37 B-38 C-19	23% based on yield		N/A	Same as above
Switchgear Room Coolers		X	DC-572	B-33 B-34 C-19	B-33 B-34 C-19	N/A		N/A	The new site-specific earthquake accelerations are less severe than the acceleration loadings that were used in the original seismic anchor bolt calculations; therefore, the anchors are requalified.
RCIC Pump Room Cooler		X	DC-579	B-29 B-30 C-18	B-29 B-30 C-18	N/A		N/A	Same as above

All safety margins greater than maximum load amplifications.

3.7-73

TABLE 3.3-35B

DRYWELL COOLING SYSTEM

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	Margin of Safety	
Drywell Cooling Fans PISHT4700C001 & 2		X	Edison File No. B9-1106 B9-1107	S&L Report SL-2682 Figures B-43 B-44 B-62	S&L Report SDD-DECo-003 Figures B-59 B-57 B-62	N/A *		N/A	The new site-specific earthquake accelerations are less severe than the acceleration loadings that were used in the original seismic qualification; therefore, this equipment is requalified.
Drywell Coolers & Anchors T4700B001 & 2		X	B9-637	B43, B44, B62	B59, B57, B62	-31 **			The cooler mounting feet show considerable margin with regard to yield stress. The cooling coil frame and anchor bolts are also adequate and are considered requalified.

* Safety margin greater than maximum load amplification at this location.

** Our SQRT evaluation of this item indicated a safety margin relative to failure of 4.0 which is greater than maximum load amplification.

TABLE 5.3-36

RHR COMPLEX HVAC

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
RHR Complex Pump Room Ventilation, Switchgear exhaust Ventilation A, B, Diesel Generator Ventilation Div. I & II Location RHR Elevations 590' - 617'		x	S&L EMD-029030				S&L EMD-029950 & EMD-029830	20% - * for angle attached to base plate	Reevaluation was based on a dynamic analysis of linear elastic structural model utilizing the method of response spectrum analysis. A continuous, uninterupted operation and structural integrity of the subject systems during and following an earthquake was demonstrated in the above mentioned analysis. Stresses are within AISC allowables.
Control Dampers, type CD31-PB and OB Isolation Dampers, type CD 82-92 Location RHR		x	Ruskin Mfg. Co. CDRI-92 1/29/79 S&L EMD-017492 3/20/79 EMD-017187 2/14/79 2/27/79				S&L EMD-029950	1.27%*	Stresses are within the allowable limits. Control dampers qualify to new response spectra.

* For top blade based on allowables

* Safety margin greater than maximum load amplification at this location.

** This item was assessed to be rigid. No amplification is observed for rigid items going from 7% to 5% damping.

TABLE 5.3-36 (cont.)

RHR COMPLEX HVAC

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
RHR Comp[illegible] Fans Equip[illegible]. X-41-03-C01, 02, 03, [illegible]5, 06, 07, 08 Lo[illegible]on RHR [illegible]ation 617'		X	Buffalo Forge Co. 77K-25508-23; 9/78 S&L EMD-016338	* Safety margin greater than maximum load application at this location (13%).			S&L EMD-029950	15.8%*	Stresses are below yielding on foundation bolts and within allowables on the other sections. This equipment is requalified.
RHR Complex Fans Equip. No. X-41-03-C021, 22, 23, 24 Location RHR Elevation 617'		X	Buffalo Forge Co. 77K-25526-31; 9/78 S&L EMD-016338	** Item on existing requalification list.			S&L EMD-029950	-13.7%**	Based on a more sophisticated analysis the fans should quality. Reanalysis is underway. See Section 5.4
RHR Complex Fans Equip. No. X-41-03-017, 018, 019, 020 Location RHR Elevation 590'		X	Buffalo Forge Co. 77K-25-524-27; 9/78 S&L EMD-016338	*** Safety margin greater than maximum load application.			S&L EMD-029950	>100%***	Based on a very conservative evaluation, the stresses in the same components are higher than allowables. However, when analyzed in detail, the fans may qualify with little or no modification. Reanalysis is underway. See Section 5.4

* For foundation bolts based on yield

** For inlet stand based on yield

*** For shaft over yield

TABLE 5 36 (cont.)

RHR COMPLEX HVAC

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
RHR Complex Fans Equip. No. X-41-03, C009, 010, 011, 012, 013, 014, 015, 016 Location RHR Elevation 617'		X	Buffalo Forge Co. 77K-25516-23 S&L EMD-016338	safety margin greater than section on load amplification at this location (13%)			S&L EMD-029950	16.7% *	Stresses are below yielding limits

* For inlet stand based on yield

TABLE 5.3-37

INSTRUMENTATION AND CONTROL--PRINCIPAL SYSTEMS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
CONTROL ROOM PANELS *									
H11-P601	X	X						20%	Panel meets seismic requirements by comparison with H11-P602 test
H11-P602	X		SPE Memo 107-78-110					48%	Panel meets seismic requirements based on original test
H11-P603	X	X	SPE MEMO 994-78-138					26%	Panel meets seismic requirements by comparison with H11-P602 test
H11-P612*	X		262A7242					21%	Panel meets seismic requirements based on original test
H11-P613*			SPE Memo 994-78-131					7.5%	Panel meets seismic requirements by comparison with H11-P612 test
H11-P617/P618*								28%	Panel meets seismic requirements by comparison with H11-P612 test
H11-P621*								15%	Panel meets seismic requirements by comparison with H11-P612 test
H11-P622/623*			SPE MEMO 994-78-132					37%	Panel meets seismic requirements based on tests of similar panels for Zimmer and Laguna Verde
H11-P628*								28%	Panel meets seismic requirements by comparison with H11-P612 test

*Relay from

* All panels are designed to have mid 50's amplification plateau should be observed going from 7% to 5% structural damping.

TABLE 3.3-37 (Continued)

INSTRUMENTATION AND CONTROL--PRINCIPAL SYSTEMS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
H11-P809			SPE MEMO 994-78-118					12%	Panel meets seismic requirements based on original test
H11-P807								--	Panel meets seismic requirements by comparison with H11-P809 test
H11-P808								--	Panel meets seismic requirements by comparison with H11-P809 test
H11-P817								49	Panel meets seismic requirements by comparison with original H11-P809 test
Local Racks & Panels									
H21-P004	X						DRF A00794-22	48%	This equipment is requalified to the new site specific earthquake
P005	X								
P006	X								
P017	X								
P021	X								
P022	X								
H21-P037							DRF A00794-22	74%	This equipment is requalified to the new site-specific earthquake
H21-P080	X		OPE-33-1078				DRF A00794-22	68%	(as above)
P081	X								
P082	X								
P083	X								
P084	X								
P085	X								
P086	X								
P087	X								

TABLE 5.1 (Continued)

INSTRUMENTATION AND CONTROL--PRINCIPAL SYSTEMS

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	Margin of Safety	
H21-P296 A & B		X	H21-00 P296A & B					—	This equipment is requalified to the new site specific earthquake
H21-P296 E & F		X	R-30-01-S-900-RA-009					—	(as above)

TABLE 5.3-38

INSTRUMENTATION AND CONTROL--EECW

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
H11-P857 (relay cab)		X	262A7245				DRF A00794-22	41% *	his equipment is requali-fied to the new site specific earthquake
H11-P868 (termination cab)								* *	See Section 5.4-1
H11-P891 (termination cab)								* *	See Section 5.4-1
H11-P601 (insert B514)								* *	See Table 5.3-37
H11-P808 (insert A500)								* *	See Table 5.3-37

* Safety margin greater than maximum load amplification

** Item on existing equalification list

*** Rigid items experience no load amplification

TABLE 5.3-39

INSTRUMENTATION AND CONTROL--CONTROL AIR

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
P50 - North Control Air Compressor Control Panel								[illegible]	See Section 5.4
P50-P001 including PSE-P50-N021A and E/V-P50-F008A								[illegible]	See Section 5.4
PSE-P50-N020A								[illegible]	See Section 5.4
North Dehydration Unit - P50 020003, 5, 7	X		B11-436					[illegible]	See Section 5.4
H11-P914 (relay rm cab.) H11-P915		X	Nuclear Structures					4%**	The 4% margin is based upon the minimum yield strength. This component is requalified.
H11-P898A (relay rm cab.)								[illegible]	See Section 5.4
H11-P601 (B514)								[illegible]	See Table 5.3-37
H11-P868 (termination cab.)								[illegible]	See Section 5.4

*Items on existing requalification list.

**Rigid items experience 1.3 load amplification.

TABLE 5.3-40

INSTRUMENTATION AND CONTROL--ESSENTIAL HVAC

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
H21-P296A DIV I HVAC control panel with all internal controls: solenoids, relays 5th floor aux. building			York 77113-2					*	Seismic Test Report "Edison File No. B9-1838" submitted to W. Street $q_{reass} < q_{qualif}$ ∴ ok
H21-P296E HVAC control panel with internal controls: solenoids, relays 5th floor aux. building			York 77113-2					*	This equipment is requalified to the new site specific earthquake
H21-P285A chiller compressor control panel			T41-00 B-008-RA-004 Trane B9-1018					*	(as above)
H21-P572 York Seismic Rack			York 77113-2					*	Seismic Test Report "York Final Report 77113-2" submitted to W. Street $q_{reass} < q_{qualif}$ ∴ ok
TSP-T41-N061A, -N062A, N063A, N065A, N066A, N067A (local)								* *	See Section 5.4
TSE-T41-N374A, N374C, N374E, N374G, N375A, N375C, N375E, N375G, N327A, N222A								* *	See Section 5.4
TE-T41-N119A, N314A									
PDS-T41-N059A, N121A, N324A								* *	See Section 5.4

* Rigid items experience no load amplification.
** Items on existing requalification list.
All other safety margins predicted maximum load amplification

TABLE 5.3-40 (Continued)

INSTRUMENTATION AND CONTROL- ESSENTIAL HVAC

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
PDS-T41-N060A, N325A								[illegible]	See Section 5.4
PSE-T41-N326A									See Section 5.4
Seismic Design Calculations for HVAC duct mtd. Instruments: pressure sw & temp. sensing elements		X	T41-00-G-900-LB-010 B9-1811					43%	Fluor Report RICO-8901-3 (DECo file No. 1811). Margin based upon yield stress. This component is requalified.
T41 components Damper Motor Mountings for T-4100 F157A & B thru F163 A & B			Fluor Pioneer Rico 8901-4 B9-2174					89%	(Same as Above)
Powers Motor with positioning relay 332-2799 NAMCO Limit Switch EA-700	X		T41-00-0-000-QX-016						This equipment is requalified to the new site specific earthquake
H11-P888 (termination cab.)								[illegible]	See Section 5.4
H11-889 (termination cab.)								[illegible]	See Section 5.4
H11-P808B511								[illegible]	See Table 5.3-37

TABLE 5.3-41

INSTRUMENTATION AND CONTROL--DRYWELL COOLING

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	Margin of Safety	
H21-P328A Local Panel			EA&T 1001-12-7 B9-1933					*	This equipment is requalified to the new site specific earthquake
H11-P808 Insert A502								*	See Table 5.3-37
H11-P889 (termination cabinet)								* **	See Section 5.4
H11-P898A (relay room cab.)								* **	See Section 5.4

* Rigid items experience no load amplification.
** Items on existing requalification test.

INSTRUMENTATION AND CONTROL--RHR COMPLEX

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
COP INSERTS									
H11-P601A501 RHR SW								*	See Table 5.3-37
H11-P601B514 EESW								*	See Table 5.3-37
H11-P807B510 RHR SW								*	See Table 5.3-37
H11-P809A501 Diesel Fuel & Lube H11-P809A502								*	See Table 5.3-37 See Table 5.3-37
H11-P602B510 EDGSW								*	See Table 5.3-37
TERMINATION CABINETS									
H11-P823 RHR SW H11-P868 RHR SW EESW H11-P869 Diesel Fuel & Lube								*	See Section 5.4
H21-P350 (Local HVAC Control Panel) - Diesel Generator Ventilation								*	See Section 5.4
H21-P351 (Local HVAC Control Panel) - Diesel Generator Ventilation								*	See Section 5.4
Skid Terminal and Relay Box Equip. No. R30015001-4 Location RHR Elevation 593'	X	ITE Imperial dated 12-19-72 S&L EMD-0093971 EMD-011980					S&L EMD-029950	>100%*	Qualifies to the new response spectra. TRS envelopes the new FRS.

* For vertical and horizontal direction.

* Rigid items experience no load amplification
** Items requiring requalification list.
All other safety margins greater than indicated

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TABLE 5. 2 (Continued)

INSTRUMENTATION AND CONTROL--RHR COMPLEX

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Engine Panel Instrumentation Location RHR Elevation 590'	X		Wyle Labs dated 5/1/78 S&L EMD-013860 EMD-001659				S&L EMD-029950	>100%*	Instruments qualify to new response spectra. TRS envelopes the new RRS.
Diesel Generator Control Console Equip. No. R30OS002, 004, 005, & 007 Location RHR Elevation 617'	X		Colt Ind. R30-Do-S-900-BA-022 (205981) 7/2/75				S&L EMD-029950	N/A	See Section 5.4
H21-P517 Auto Temp Control Panel - DG Ventilation									See Section 5.4
DG Load Sequencer	X								See Section 5.4
Engine Overspeed Governor Equp. No. R30015001-4 Location RHR Elevation 590'		X	Colt Ind. Report dated 1/24/73 S&L EMD-001659				S&L EMD-029950	>100% to trip	Qualifies to the new response spectra.

* For vertical & horizontal direction

TABLE 3.2-42 (Continued)

INSTRUMENTATION AND CONTROL--RHR COMPLEX

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
TEW-X41-N056A (EDG #11) TEW-X41-N056B (EDG #12) Switchgear Room HVAC									See Section 5.4
TEW-X41-N057A TEW-X41-N057C EDG Room HVAC									See Section 5.4
TEW-X41-N058A Pump Room HVAC									See Section 5.4
Operators (ITT) For Ruskin Dampers									See Section 5.4

TABLE 5.3-45

480 V AC & 260 V DC MOTOR CONTROL CENTERS (ITE)

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Supplement Seismic with Standability Test Report MCC-Devices Oct. 8, 1973 R-STS-20 Supplement	X		R1600S-900-RA-003 (E4-468)					*	See Section 5.4
Seismic Withstandability Test Report Oct. 18, 1973 R-STS-16 Wyle Lab Report #43472-1	X		R1600S-900-RA-003 (E5-468)					*	See Section 5.4
Seismic Simulation Test Report to Qualify the Structure Welds, July 31, 1979 R-STS-20 Rev. 1 Wyle Lab. Report #43801-2	X		R1600S-900-RA-010 (E5-594) R1600S-900-RA-012 (E5-607)					*	See Section 5.4
Seismic Mounting for MCC		X	R1600S-900-RA-007	N/A				**	This component is requalified to the new site specific earthquake since $g_{reass} < g_{qualif}$
Seismic Mounting of Relays in the MCC		X	New	N/A					

* Item on existing requalification list

** Minimum safety margin is $\frac{1.8}{1.5} = 1.2$ which is greater than the maximum load amplification at this location.

TABLE 5.3-46

480 V SWITCHGEAR (ITE)

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	Margin of Safety	
Seismic Certification Report for Class 1E Swgr Electrical Equipment ITE Report R-09322	X		R1400S-900-RA-010 (ES-439)				$\frac{5.0}{2.3}$ = 2.17		Ok: TRS envelopes the RRS.
Test Report Seismic Shock - 600 V Metal Enclosed Switchboard and Component A.D. Report No. R-8792	X		R1400S-900-QL-001				$\frac{5.0}{2.3}$ = 2.17		Ok: TRS envelopes the RRS.
Seismic Certification Test Report for 750 KVA Voltage Regulators Wyle Lab Report 43169-1	X		R1400S-038-RA-001					*	See Section 5.4
Seismic Simulation Test Report Voltage Regulators Wyle Lab Report No. 42949-1	X		R1400S-900-QL-031 (ES-429)			Min. from TRS/RRS = 3.0			Ok: TRS envelopes the RRS.
Seismic Certification Voltage Regulators ITE	X		R1400S-900-LB-096				$\frac{1}{.7}$ = 1.43		Seismic certification only. No attachments.
Electrical Equipment Class 1 Seismic Shock Certification - 1500 KVA Transformer Wyle Report No. R-09402	X		R1400S-900-QL-027 (ES-427)			Min. from TRS/RRS = 2.5			Ok: TRS envelopes the RRS.
Addendum to Test Report R-09402			R1400S-900-RA-007 R1400S-000-LB-030						

* Items on existing requalification list. All other safety margins greater than maximum load qualifications

TABLE 5.3-46 (Continued)

480 V SWITCHGEAR (ITE)

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Seismic Certification and Analysis Type VII-9 Dry Type Transform. (ITE)	X		R1400S-900-RA-009		Min. from TR/RAS = 2.5				Ok: $q_{reass} < q_{qualif.}$
Switchgear Seismic Mounting by Giffels		X	R1400S-900-RA-013	N/A				**	This equipment is requalified to the new site specific earthquake
Switchgear Seismic Mounting by Giffels		X	R1400S-900-RA-014	N/A				**	This equipment is requalified to the new site specific earthquake

** Mounting designed to allowable but may go to yield in this scenario.

$\frac{36}{20}$ = 1.8 7 1.21

Minimum existing margin

Mounting will not reach yield.

TABLE 5.. .7

4160 V SWITCHGEAR (ITE IMPERIAL)

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Seismic Certification for Class 1E Electrical Equipment (Buses 64B, 64C, 65E, 65F, 64T, 65T, 11 FA, 12 EB, ITE #33-4^196)	X		R14000-000-SC-009-E4-333					*	See Section 5.4
Test Report Seismic Shock 5kV Metal Clad Switchboard and Components. Wyle Lab R-09321	X		R14000-000-RA-003					*	See Section 5.4
Seismic Withstandability Auxiliary Relay GE 12HFA51A42F Report R-09161-BE	X		R1400S-000-RA-011					*	See Section 5.4
Seismic Withstandability Over-Under Voltage Relay GE 12IAV53L1A Report R-09160F	X						$\frac{5}{2.8} = 1.79$		This equipment is requalified to the new site specific earthquake.
Seismic Withstandability Overcurrent Relay GE 1AC53B104A (Per ITE TD-7629 Procedure) Report R-09161-AT	X							*	See Section 5.4
Seismic Withstandability Overcurrent Relay GE 12PJC11AV1A (Per ITE TD-7629 Procedure) Report R-09161-BK)	X		R14000-000-RA-006					*	See Section 5.4

* Items on existing requalification list.

all other safety margins greater than maximum load amplifications

TABLE 3.3 / (Continued)

4160 V SWITCHGEAR (ITE IMPERIAL)

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	Margin of Safety	
Seismic Withstandability Lockout Relay Electro Switch Type LOR Cat. 78030 (Per ITE TD-7629 Procedure) Report No. R-09161-BC	X		R14000-000-RA-007				$\frac{5}{2.5} = 2$		This equipment is requalified to the new site specific earthquake
Seismic Withstandability Overcurrent Relay GE 12IAC66C1A (Per ITE TD-7629 Procedure) Report No. R-09161-AV	X		R14000-000-RA-008					*	See Section 5.4
Seismic Withstandability J10 & J13 Relay ITE-STD-1-35/36/37	X		R14000-000-BA-002 (E4-402)					*	See Section 5.4
Switchgear Mounting Seismic Report by Giffels		X	R1400S-900-RA-013	Ratio of yield to allowable $= \frac{36}{20} = 1.8 > 1.21$					This equipment is requalified to the new site specific earthquake
Switchgear Seismic Mounting by Giffels		X	R1400S 900-RA-013						This equipment is requalified to the new site specific earthquake

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TAb. - 5.J-48

BATTERY MAIN DC FUSE CABINETS VDP NO. EP2-39, 120B

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Main DC Fuse Cabinet Seismic Report		X	R3200S-900-BA-011	N/A	Safety margin is the ratio of the maximum load applied			20.9%	O.K. A mathematical analysis has been made based on material and fabrication as per Dwg. 8721-2297-2 which indicates that this component is requalified to the revised response spectra.

TABLE 5.3-49

BATTERIES & BATTERY RACKS & THEIR MOUNTING (C&D)

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% in.	Analysis Report #	Margin of Safety	
24 V DC Battery--Report of seismic test on 2 (3DCU-9) batteries for C&D. ETL Report #4807 and report for seismic test on two (3-DCU-3) batteries and one ABB 130 AC 3 charger for C&D. ETL Report #5263	X		R3200S-900-BA-008 (E11-84)				$\frac{1.5}{.665}$ = 2.26		$g_{reass} < g_{qualif}$ ok. Most critical slab is slab #5 bldg. aux. 0.665 g 1.5 g.
130 V DC Battery--Seismic simulation test program on two KC-11 battery cells & one ABB 130 HK100 battery charger Wyle Report #42954-1	X		R3200S-900-BA-004 (E11-80)			Min. from TABS/RNS = 1.3			Ok. Test response spectra envelopes the required response spectra (aux. bldg. 643'-6)
Battery racks for 24 V DC batteries--seismic analysis of C&D battery support racks for the C&D No. 3 DCU-7 battery		X	R3200S-900-BA-007 (E11-85)	N/A			$\frac{.59}{.465}$ = 1.27		$g_{reass} < g_{qualif}$ ok. (3rd Floor aux. bldg.)
Battery racks for 130 V DC batteries--seismic analysis report of KCU-17 single tier battery rack CCL Report #A-119-77		X	R3200S-900-PA-003 (E11-81)	N/A		(Yield/All)	$\frac{.599}{.553}$ > 1.21		$g_{reass} < g_{qualif}$ ok.
Seismic Report of 24/48 V battery rack mounting CAI-001-EF2-159-156 (78-CAI-0364)		X	R32-00S-900-BA-011 R32-00S-900-LC-182	N/A N/A		$\left(\frac{Yield}{All}\right)$ x	468 61	17.31% > 1.21	This equipment is requalified to the new site specific earthquake

All safety margins greater than or Minimum load qualification

5.3-130

TABLE 5.3-50

BATTERY CHARGERS AND THEIR MOUNTING (C&D BATTERIES)

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
130 V dc battery charger report of seismic test on two (3-DCH-3) batteries and one APR13AC3 charger and C&D batteries ETL Lab Report #5263	X		R32-00S-900-RA-005 (E11-84)				1.5/.665 = 2.26		$g_{reass} < g_{qualif}$ = ok
130 V dc battery charger seismic simulation test program on two KC-13 battery cell and one APR13HK100 battery charger Wyle Lab Report #42954-1	X		R3200S-900RA-006 (E11-80)						This equipment is requalified to the new site specific earthquake
Seismic Class I attachment for 130 V battery charger 24 V battery charger and voltmeter -GAI-0016)	X		R3200S-900RA-013 R3200S 900LC-075 (E11-105)	N/A				48%	This equipment is requalified to the new site specific earthquake

All safety margins greater than maximum load amplification

TABLE 5.3-51

DC FUSED DISTRIBUTION CABINETS (SQUARE D) VDP NO. EF2-30,121C

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Seismic Qualification for a 250 V DC QMB Panel Board Square D 8998-10-09-L16R	X		R3200S-900-RA-015 (EG-87)					*	See Section 5.4
Seismic Class I DC Distribution Panel Installation at the Reactor Building		X	T51000000-RA-001 (E11-128)	N/A			52%	→	This equipment is requalified to the new site specific earthquake
Seismic Class I DC Distribution Panel Installation at the F/R Complex		X	R3200S-063	N/A			43%	→	This equipment is requalified to the new site specific earthquake

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* Item on existing requalification list, all other safety margins greater than unity based on modifications.

TABLE 5.3-52

120 V AC MODULAR POWER SUPPLY UNITS (MPUs)

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Seismic analysis Report of I&C power supply panel structure #74021-1		X	R3101S-001-00-00	N/A				34.02%	This equipment is requalified to the new site specific earthquake
Seismic vibration tests of I&C power supply panel components--ASCO transfer switch solation voltage regulator & GE fusible disconnect Report 74021-1	X		R3101AS-900-RA-002 (E5-443)		0.636 g		$\frac{1.5}{.636} = 2.36$		$g_{reass} < g_{qualif}$ ok
Analysis of seismic Class IE mountings for modular power units #1 & 2 CAI-001-EF2-193-118 (78-CAI-271)		X	R1600S-900-RA-009 (E11-.30)	N/A				20.42%	This equipment is requalified to the new site specific earthquake
Seismic Qualification of the SBM test switch mounting for MPUs 1 & 2. CAI-001-EF2-228-269 (79-CAI-352)		A	R3101S-001- (E11-140)	N/A			$\frac{6.75}{6.265} = 1.08$	8% *	$g_{reass} < g_{qualif}$ ok

* High frequency item does not experience amplifications all other safety margins greater than maximum load amplifications.

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TABLE 5.3-53

DRYWELL PENETRATIONS (CONAX CORP.) VDP NO. EP2-39,115C

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Seismic analysis of electrical penetration assemblies & addenda. (Conax Corp.) IPS-88		X	T23-01-X900-BA-009 (ES-335)	N/A			36101 6128	6.0	This equipment is requalified to the new site specific earthquake $q_{reass} < q_{qualif}$ ok
Stress analysis nuclear penetration, canister assembly and addenda. (Conax Corp.) IPS-87		X	T2301X-900-BA-008 (ES-284)	N/A					

Safety margin greater than requalification.

5.1-115

TABLE 5.3-54

TERMINAL BOXES AND TERMINAL BOXES ATTACHED TO DRYWELL PENETRATIONS (HOFFMAN)

SEISMIC RE-EVALUATION

SUMMARY TABLE

System, Structure, Component Description	Method of Original Qualification				Re-Evaluation Results				Conclusion and Remarks
	Test	Analysis	Report #	Spectra #	Spectra Comparison Fig. #	% Margin	Analysis Report #	% Margin of Safety	
Terminal boxes seismic qualification report Hoffman Type A-1210 CHNF A-1008 CHNF and A-606 CHNF		X	GASI (EII-109)	N/A				73.1%	This equipment is requalified to the new site specific earthquake
Terminal box attachment to drywell penetrations, Reactor Bldg.		X	GASI T23 01X 102A RA-001 (EII-136)	N/A				43.4%	This equipment is requalified to the new site specific earthquake

Safety margins greater than seismic load amplifications