Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690

June 7, 1981

Mr. A. Schwencer, Chief
Licensing Branch 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: LaSalle County Station Units 1 and 2
Dynamic Qualification Review Program -
Supplemental Response
NRC Docket Nos. 50-373/374

References (1): J. S. Abel letter to A. Schwencer dated June 23, 1981

(2): J. S. Abel letter to A. Schwencer dated June 4, 1981

Dear Mr. Schwencer:

Attached for your information are supplemental materials provided in a telephone conference of June 19, 1981 which respond to questions raised by the consultant to your Staff (Mr. J. Singh, EG&E - Idaho) relative to:

1. Standby Gas Treatment System (Reference 1, Item 9)

2. Impedance Test Results (Reference 2, Item 13)

This submittal documents that conference. One (1) copy of these materials is being submitted for your use, and one (1) copy will be forwarded directly to the consultant involved.

If you have any further questions, please direct them to this office.

Very truly yours,

L. O. DelGeorge

L. O. DelGeorge
Director of Nuclear Licensing

Attachment

cc: Messrs. A. Bournia - w/att.
J. Singh (EG&G - Idaho) - w/att.
NRC Resident Inspector - w/o att.

2260N

A048
S1/1

SARGENT & LUNDY

MEMORANDUM OF

TELEPHONE CONVERSATION

Conference Call on Impedence Test Results made by T.Y. Chang of NRC. The following persons took part.

J. Singh of EGG, Idahofall
I. T. Kisisel
Y. A. Patel
N. I. Munir
T. Korman
J. Sinnappan
of S&L

Date: 6-19-81

Time: 9:30 A.M.

Person Called: _____ (Name) of _____ (Company)

Person Calling: _____ (Name) of _____ (Company)

Project: LaSalle County Project No. 4266-00/4267-00/6093-00

Subject Discussed: Impedance Test Results

S&L Submittal # dated 6-1-81.

Summary of Discussion, Decisions and Commitments:

1. SGTS Equipment Train: - NRC & EGG wanted to know about nozzle stress analysis. S&L explained that this was included in our transmittal on 3-10-81, EMD No. 028847. (Vol. 5)

2. S&L clarified to NRC & EGG about the SGTS Control Panel, which model is for Impedance Test and which is the qualification test. We also assured them that we witnessed the impedance test and did not see any concern in vertical direction as we did not see any resonances in vertical direction.

3. NRC & EGG questioned the three natural frequencies found in the vertical direction in Impedance Test namely 32·5 H_z, 46 H_z, & 49 H_z for SGTS fan.

We explained to them that they do not fall in any peak zone of the response spectrum curve and the response spectrum curve itself is

cc:

J. Sinnappan by Y. A. Patel
Signature

File:

SARGENT & LUNDY

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S&L Submittal # dated 6-1-81.

Summary of Discussion, Decisions and Commitments:

starting to go down to ZPA levels. We also explained to them that we have used 1.3g in analysis even though the g level at 32.6 H_z is 1.05g and showed them that we still have good margin in stresses.

We also agreed to write our reasoning in a submittal to them next week.

Finally, we discussed the present transmittal due 6-23-81 and explained to them how it should answer all of their concerns raised during SQRT audit.

Action;

JS:me
cc: G. R. Crane - CECo
D. C. Haan/G. C. jones - 21
EBB/AEM/JS - 30
All attendees - 30

J. Sinnappan by Y. A. Patel
Signature
J. Sinnappan

File:

I. OBJECTIVES

The objectives of this study are:

(i) To compare and draw conclusions on equipment adequacy based on the impedance test result and the existing qualification report.

(ii) To determine equipment adequacy for the additional hydrodynamic loads. This is of additional concern in view of the high frequency resonances reported in the impedance test reports, (1).

II. ANALYTICAL MODEL (Qualification Report Ref. 1)

Simplified frequency estimates are obtained by considering 1 d. o. f and 2 d. o. f modelling of the SBGTS fan. The following frequencies are obtained:

Equipment Component	Frequency, Hz
Fan Shaft	165
Motor Base	85
Power Side Bracing Longitudinally	126
Power Side Bracing Laterally	34

The equipment was considered rigid since equipment frequencies were found to be greater than 33 Hz. The equipment is qualified for $\pm$ .65g in the horizontal direction and $\pm$ 1.3g in the vertical direction (1). The motor can withstand an acceleration of 7.2g (1). The anchor bolts have a margin of safety of at least 5.0 (1).

III. IMPEDENCE TEST MODEL (2)

The wire grid diagram of the fan showing the locations of the accelerometers is shown on page N8. The fan was tested by the impulse technique. The fan is bolted to the ground through a solid grout pad.

IV. LIST OF EXPERIMENTALLY & ANALYTICALLY OBTAINED FREQUENCIES

Experimentally Obtained Frequencies (2)

The following frequencies were obtained from the impedance test.

	Equipment Frequency Hz.	Axis	Remarks
1.	59.0	X	In ZPA Range*
2.	49.0 Horizontal	X	In ZPA Range*
3.	46.0	X	In ZPA Range*
4.	49.0	Y	In ZPA Range*
5.	46.0 Vertical	Y	In ZPA Range*
6.	32.5	Y	Vertical Motion of Motor
7.	58.0	Z	In ZPA Range*
8.	36.5	Z	In ZPA Range*
9.	28.0 Horizontal	Z	In ZPA Range*
10.	76.0	Z	In ZPA Range*
11.	95.0	Z	In ZPA Range*

* See pages N10 thru N13

Comparison of Experimental & Analytical Frequencies.

The global equipment modes shown in the impedance test report are not identifiable in the analytical effort. In the analytical effort [1] discrete components of the equipment are analyzed and the associated frequencies computed. In the analytical effort equipment frequencies computed fall in the ZPA range of both the seismic spectra as well as the current spectra that includes hydrodynamic loads. Since in the impedance test frequencies of specific components of the equipment were not determined, the experimentally

obtained frequencies cannot be compared to the analytically determined frequencies.

Frequency #6 p. N6 indicating vertical vibratory motion of the motor base lies in a non ZPA range [p.N10-13]. All other frequencies determined by test, lie in the ZPA range. The importance of this frequency is assessed in the next section.

Discussion of Experimentally Obtained Frequencies & Mode Shapes.

Equipment frequency #6 indicates vertical vibratory motion of the motor base both at the ground (where it is restrained by bolts) as well as at the top of the motor base. The apparent ground motion of the motor base p. N6 is attributed to bending motion of the motor base mounting element. Since only four edge monitoring stations describe the motion of the base of the motor support, this motion is spuriously shown as vertical translational motion. This frequency corresponds to an acceleration of 1.05g. For frequencies greater than 32.5 Hz, the response spectra curve is monotonically decreasing until the ZPA plateau is reached [p.N10-13].

The remainder of the experimentally determined frequencies fall in the ZPA range [p.N10-13]and are not addressed here.

V. QUALIFICATION FOR HYDRODYNAMIC LOADS

In the analytical determination of the equipment-frequencies, the equipment was considered rigid. In the impedance test a 32.5 Hz frequency in the vertical direction was observed. This frequency falls close to the ZPA range, see pages N10-13. All other frequencies are higher and fall in the ZPA range.

An acceleration of 1.05g corresponding to a frequency of 32.5Hz is shown in the response spectra curves pages N10-13. To account for the effect of the two higher frequencies (#4 and #5) an amplifacation factor of 1.5 is conservatively used. This results in an effective acceleration of 1.55g, this value is higher than the 1.3g value for which the equipment is qualified (though the motor is qualified for 7.2g). To determine equipment stress and displacement adequacy for the higher g value (1.55g) equipment maximum stresses in the vertical direction are scaled by the ratio of the required acceleration level (1.55g) to the acceleration level for which the equipment was qualified (1.3g), if these stresses are within allowable levels the equipment is qualified for the higher g-value. Shown below are maximum stresses and displacements corresponding to an effective acceleration of 1.55g in the vertical direction, equipment qualification along horizontal axes remains unchanged. (The original maximum stress/displacement table is given on page N6 which is reproduced from EMD File No. 014360 and was transmi-ted at an earlier date with the Requalification Certificate.

AW Fan	Equipment Stress for 1.55g. (PSI) Tensile/Shear	Equip. Allowable Stress Tensile/Shear
Motor Shaft	4760/2419	16100psi/9660psi
Attachment-Motor Base To Housing	1449/1300	25200psi/15120psi
Power Side Bracing	3145/1501	22400psi/13440psi
Foundation Bolts	12819/6541	25200psi/15120psi
Motor Bolts	12819/6541	25200psi/15120psi
Inlet Stand	18160	22400psi/13440psi
Inlet Stand Bottom Flange	12618	25200psi
Motor Base Assembly	3053/1561	25200psi/15120psi
Motor Base Angle	1241	25200psi
Wheel Clearance	.0172"	.1406"

The revised stresses and displacement are will within allowable values. Equipment integrity under the higher acceleration level is thus assured.

SUMMARY TABLE OF CALCULATED AND ALLOWABLE STRESSES

Calc No EMD-030469
Rev 01 Date 6-23-81
Ref No 4266/4267/6093
EMD
N6 N16

AW Fan	MAX. CALCULATED STRESS tensile/shear	MAX. ALLOWABLE STRESS tensile/shear
Motor Shaft	4378psi/2232psi	16100psi/9660psi
Attachment-Motor Base To Housing	1439psi/1295psi	25200psi/15120psi
Power Side Bracing	2859psi/1501psi	22400psi/13440psi
Foundation Bolts	6380psi/3250psi	25200psi/15120psi
Motor Bolts	11110psi/5669psi	25200psi/15120psi
Inlet Stand	17341psi/8726psi	22400psi/13440psi
Inlet Stand Bottom Flange	12518psi	25200psi
Motor Base Assembly	3053psi/1561psi	25200psi/15120psi
Motor Base Angle	12411psi	25200psi
Wheel Clearance	.0144"	.1406"

Natural Frequencies of the Fans

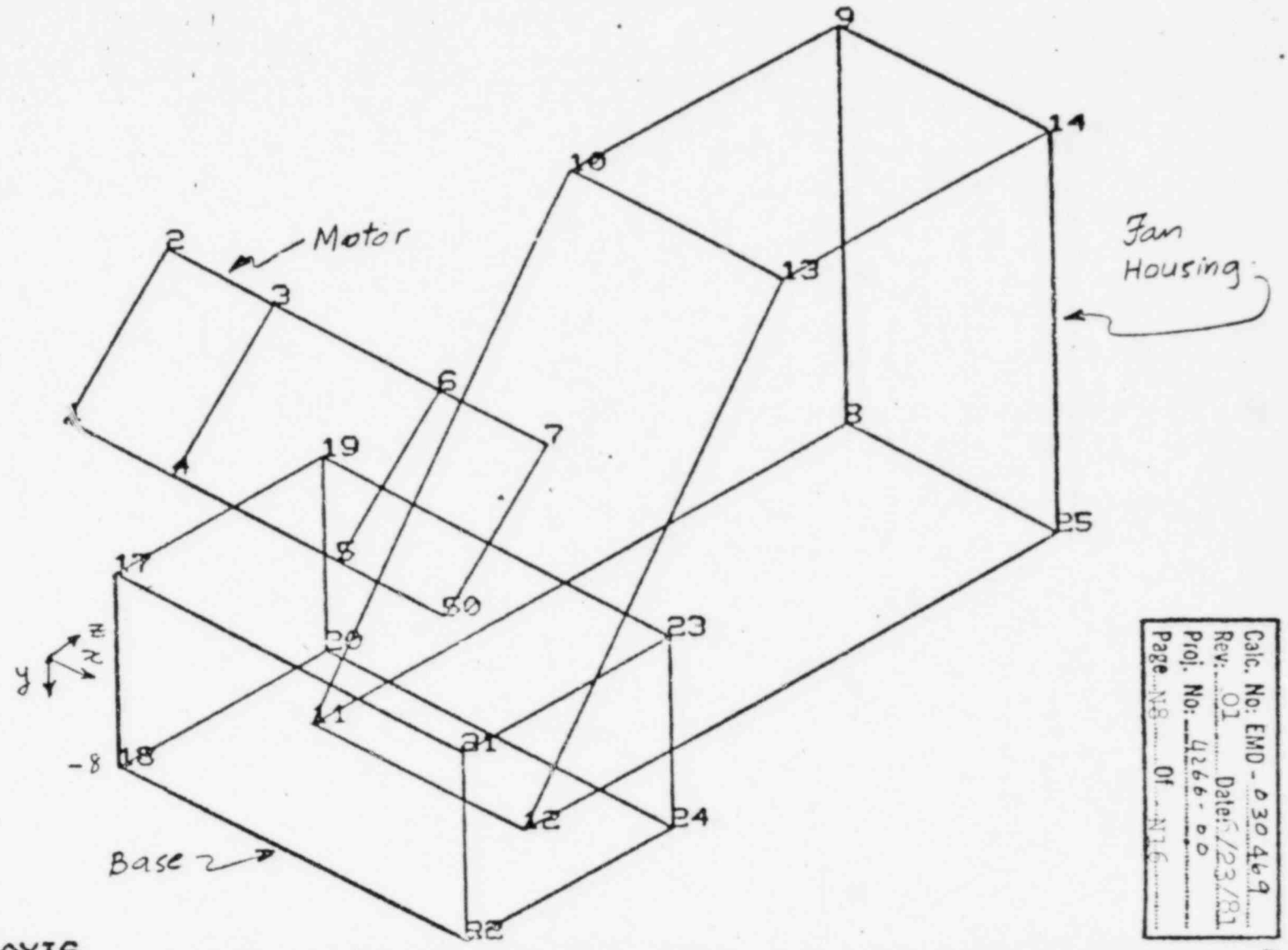
Motor Shaft - 56.34Hz
Motor Base - 50.15Hz
Combined Freq. - 44.6Hz
Fan Wheel Freq. - 163Hz

VI. CONCLUDING REMARKS

Equipment frequencies in the horizontal directions fall in the Z.P.A. range. In the vertical direction the lowest equipment frequency (#6) corresponds to an acceleration of 1.05g. The effect of this and higher frequencies were assesed and equipment stresses were found to be well within allowable levels. The equipment therefore is qualified for the combined seismic and hydrodynamic loads.

VII. REFERENCES

1. Qualification Documents for SBGTS Primary Fan EMD File No. 014360.
2. SBGTS Primary Fan, Transitek, Inc. EMD File No. 029466.



LSBGF FAN Z-AXIS
5: 1Z+ COMP,F= 95.000 HZ (1.0, 1.0, 1.0, 0.0)-VIEW

Calc. No: EMD - 030469
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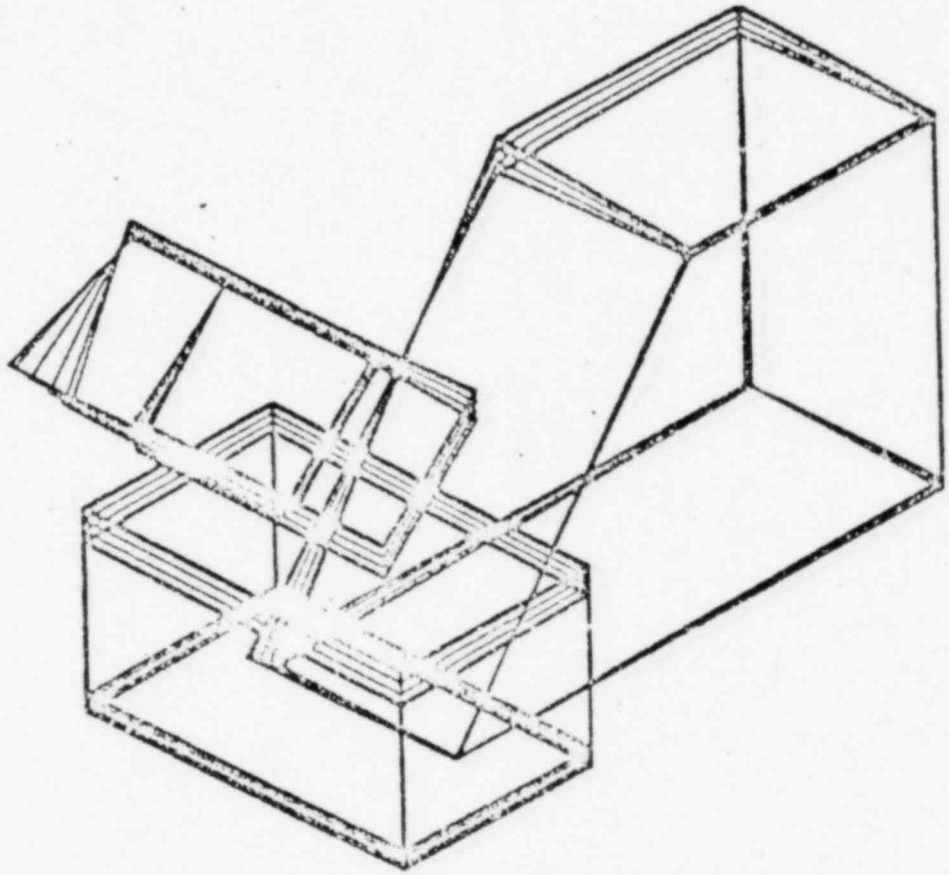
N5

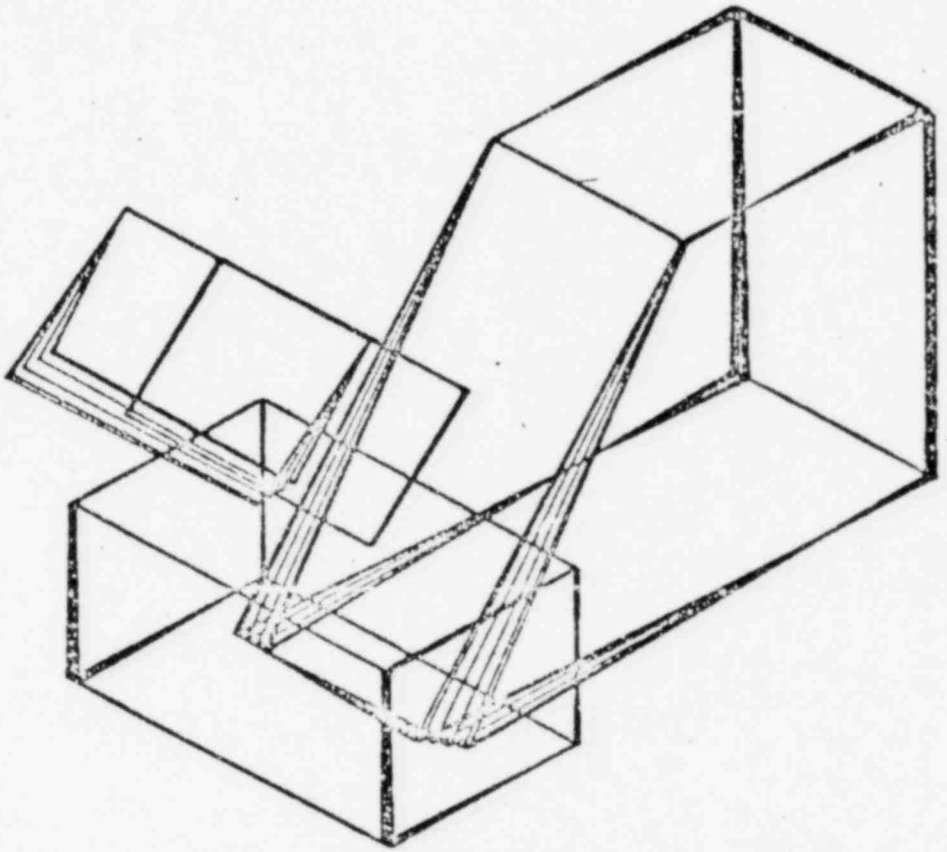
SBGTS PRIMARY FAN - TEST MODEL - SCHEMATIC REPRESENTATION



LSBGF FAN Y-AXIS
1: 2Y+ COMP,F= 32.500 HZ (1.0, 1.0, 1.0, 0.0)=VIEW

EQUIPMENT FREQUENCY #6 INDICATING VERTICAL VIBRATORY MOTION OF THE MOTOR BASE.

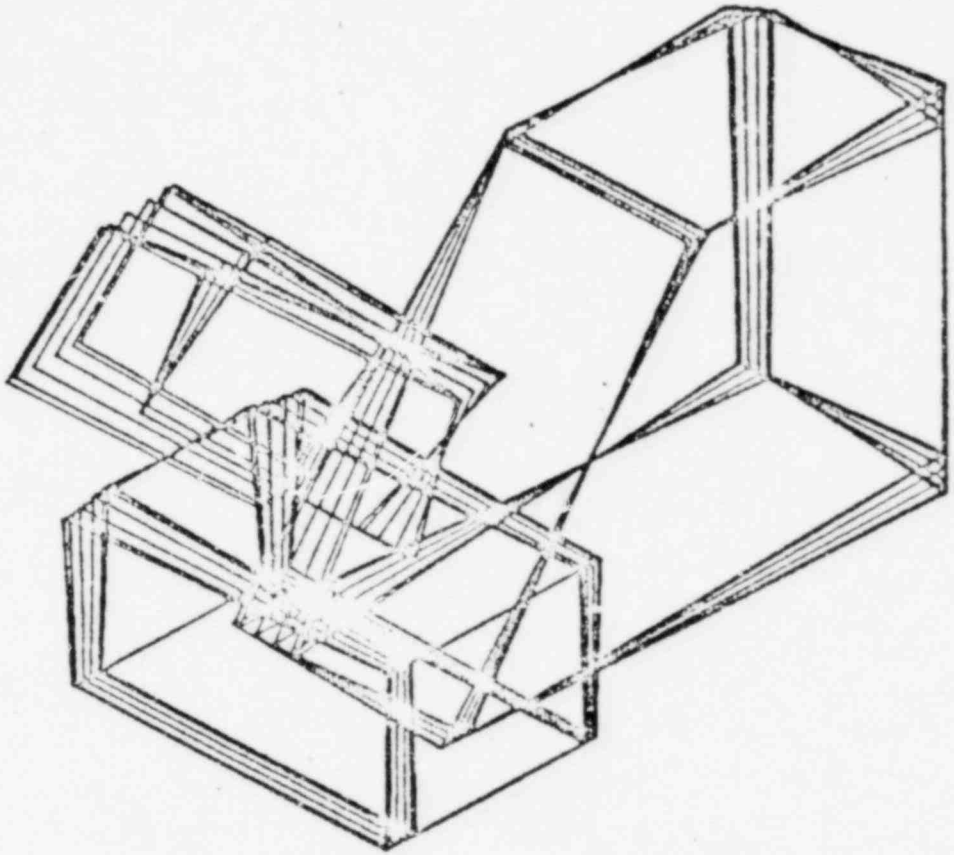
N6



Calc. No: EMD - 030469
Rev: 01 Date: 7/23/93
Proj. No: 4266-00
Page N10 Of N16

LSBGF FAN X-AXIS
6: 16X- COMP,F= 59.000 HZ (1.0, 1.0, 1.0, 0.0)-VIEW

HIGH FREQUENCY RESONANCE - X AXIS



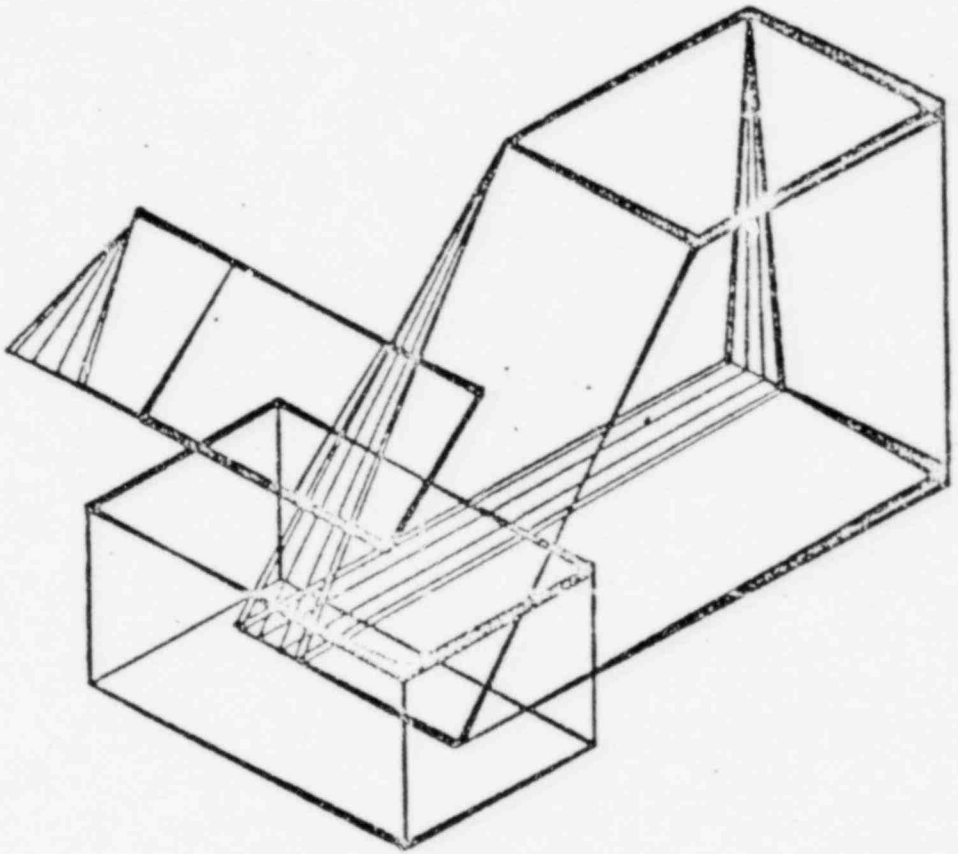
LSBGF FAN Z-AXIS

3: 1Z+ COMP,F= 58.000 HZ (1.0, 1.0, 1.0, 0.0)-VI

HIGH FREQUENCY RESONANCE - Z AXIS

Calc. No: EMD-030469
Rev: 01 Date: 6/23/8
Proj. No: 4266-00
Page NII Of NIC

N6



LSBGF FAN Y-AXIS
2: 2Y+ COMP,F= 46.000 HZ (1.0, 1.0, 1.0, 0.0)-VIEW

TYPICAL HIGH FREQUENCY RESONANCE - Y AXIS

Calc. No: EMD - 020469
Rev: 01 Date: 6/23/81
Proj. No: 4266-00
Page N13 Of N16

REQUIRED RESPONSE SPECTRUM CURVE

(EMERGENCY CONDITION)

FOR

1VG01C

SGTS PRIMARY FAN

LOCATED IN

REACTOR BUILDING El. 820'0"

SARGENT & LUNDY ENGINEERS

CLIENT COMMONWEALTH EDISON COMPANY
PROJECT LA SALLE COUNTY - 1 & 2 JOB NO. 4266-08
DESIGN BY [illegible] DATE 1-26-80
CHECKED BY [illegible] DATE 1-28-80 SHEET 22 OF 27

Calc. No: EMD - 030469
Rev: 01 Date: 6/23/81
Proj. No: 4266 - 08
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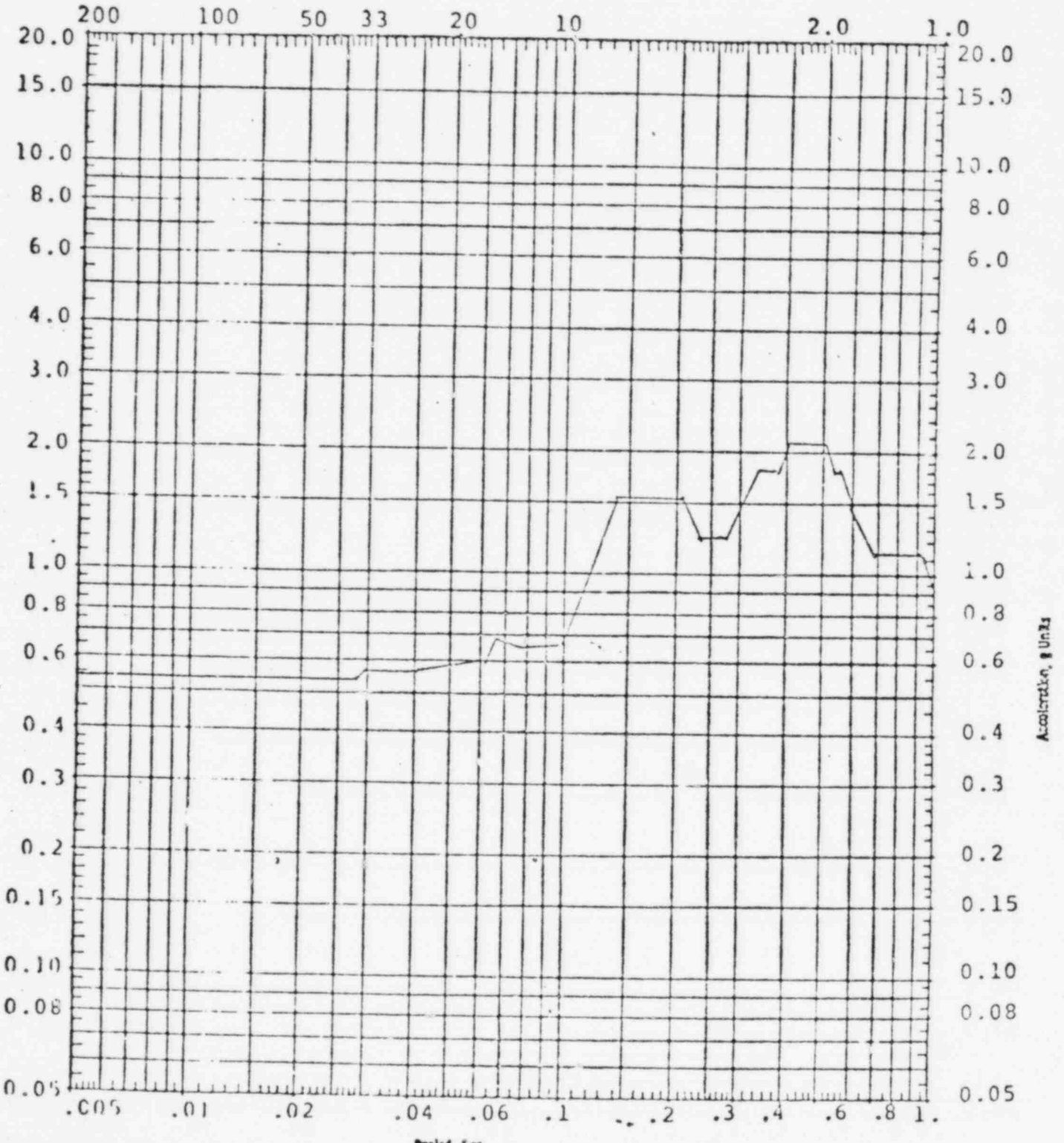
DATE	1-22-80						
INITIALS	RC						



REACTOR BUILDING-ELEVATION: 820'-6" 2% Damping Horizontal Slab NS-EW
Envelop of a) SSE + CO_{LEVY-1}
b) SSE + CO_{LEVY-2} + Envelop of (SRV_{ALL} + SRV_{ASY})

Calc. No: EMD - E 30469
Rev: 01 Date: 6/23/8
Proj. No: 4266-00
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DATE	1-22-91						
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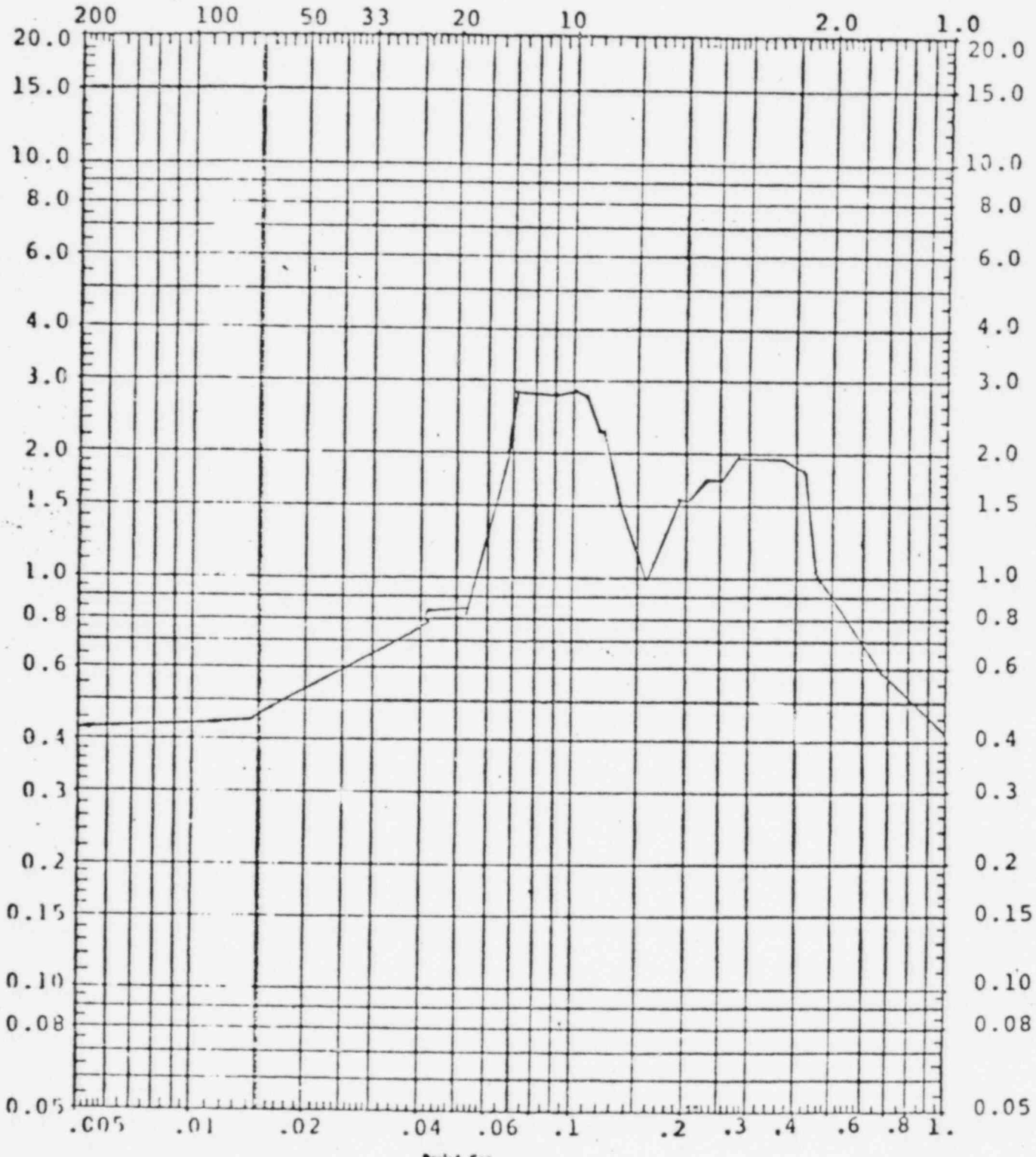

REACTOR BUILDING-ELEVATION: 820'-6" 2% Damping Vertical/Wall
Envelop of a) SSE + CO_{LEVY-1}

b) SSE + CO_{LEVY-2} + Envelop of (SRV_{ALL} + SRV_{ASY})

c) SSE & CHUG + Envelop of (SRV_{ALL} + SRV_{ASY})

SARGENT & LUNDY ENGINEERS

CLIENT COMMONWEALTH EDISON COMPANY N13
PROJECT LA SALLE COUNTY - 1 & 2 JOB NO. 22R7E-18
DESIGN BY [illegible] DATE 1-22-82
CHECKED BY [illegible] DATE 1-22-82 SHEET 23 OF 27

Calc. No: EMD-0350469
Rev: 01 Date: 5/23/81
Proj. No: 4-66-00
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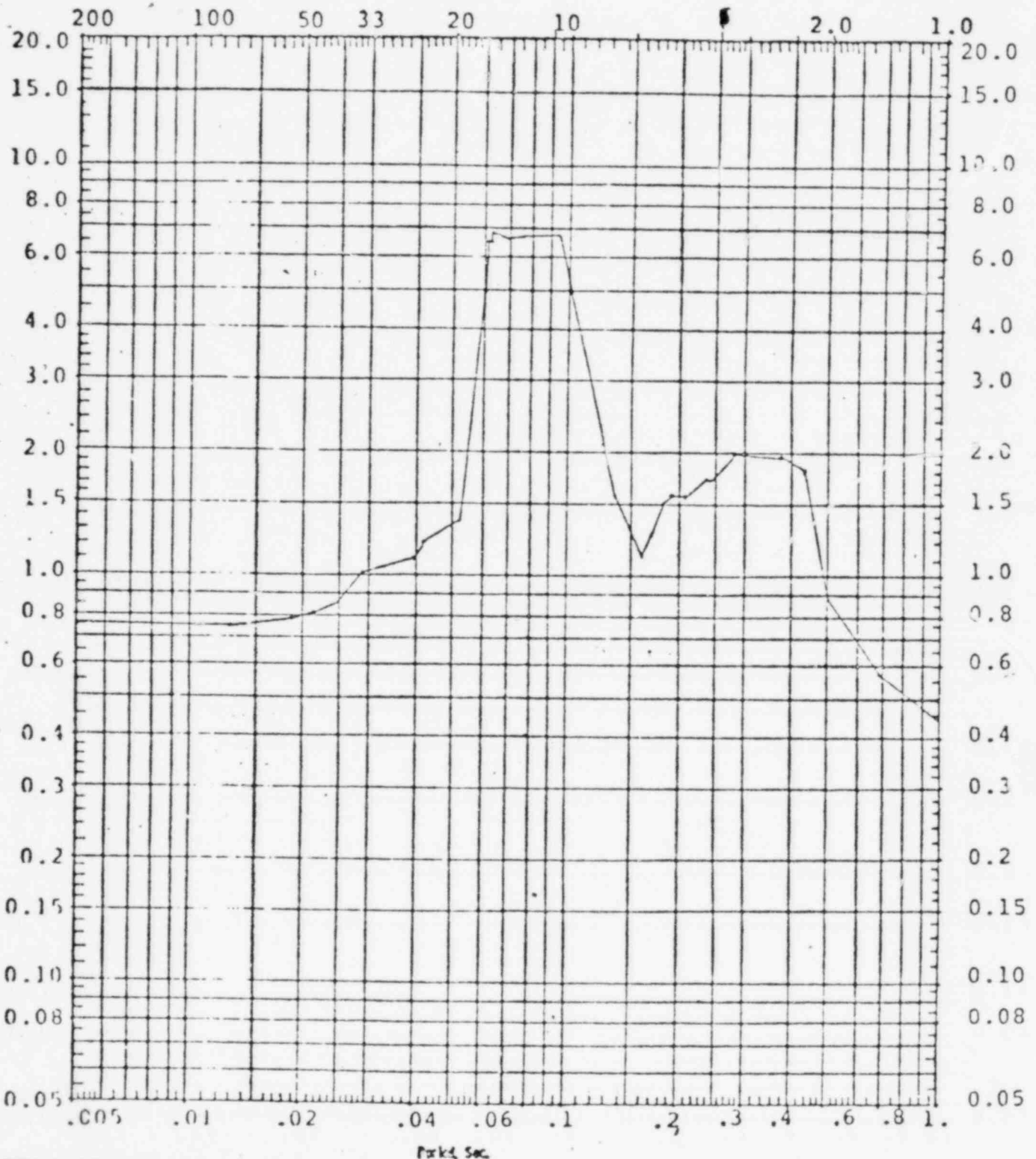

REACTOR BUILDING-ELEVATION: 820'-6" 2% Damping Vertical/Slab
Envelop of a) $SSE + CO_{LEVY-1}$
b) $SSE + CO_{LEVY-2}$ + Envelop of $(SRV_{ALL} + SRV_{ASY})$