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Dalwyn R. Davidson
VICE PRESIDENT
SYSTEM ENGINEERING AND CONSTRUCTION

April 19, 1982

Mr. A. Schwencer
Chief, Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Perry Nuclear Power Plant
Docket Nos. 50-440; 50-441
Structural Engineering Branch

Dear Mr. Schwencer:

In a meeting with the Structural Engineering Branch from December 1-4, 1981, several action items were identified. This letter forwards responses for two of those action items.

Very Truly Yours,

Dalwyn R. Davidson

Dalwyn R. Davidson
Vice President
System Engineering and Construction

DRD: mlb

cc: Jay Silberg, Esq.
John Stefano
Max Gildner

B001 s 1/1

ITEM 11

Buckling - meeting in Bethesda

With respect to buckling considerations of steel containment provide:

(a) Discuss specific methods of analysis of the containment for buckling.

(b) If buckling analysis given by Div. 1 NE was used solely, give justification why use of such analysis is sufficient.

(c) If other methods are used, describe and justify such usage.

(d) Specifically discuss the impact of opening and discontinuities of the vessel such as the equipment hatch, main steam line penetrations, and personnel access airlock on the applicability of the analysis.

(e) Provide further justification to supplement the response of Question 220.18 on NUREG/CR-0793, and elaborate on the specific issues raised on the question.

In order to expedite the NRC review of these issues, NRC requests that a meeting be set up in timely fashion to discuss these issues.

Response

The responses to items (a) through (e) of this action item were presented at a meeting at the Nuclear Regulatory Commission-Bethesda on February 11, 1982. A brief summary of our responses is provided below.

(a) The Newport News Industrial Corporation, the designer/fabricator/erector of the steel containment vessels, presented a detailed summary of buckling analyses performed on the cylinder and dome buckling. This presentation expanded on the information provided in FSAR Section 3.8.2.4.3.f and concluded that buckling was not a problem.

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(b) ASME Code, Division 1, Subsection NE was not used solely. As described by the discussion of Sub-question (a) above, computer analyses were performed to evaluate the buckling capacity of the dome, and the approach described in Structural Analysis of Shells by E. H. Baker, et. al., was used to evaluate the buckling capacity of the cylinder. This work has subsequently been supplemented by additional analyses described below.

(c) In addition to the buckling evaluations described above, the cylinder portion of the containment vessel above the annulus concrete at El. 598'-4" has been evaluated by the procedure of ASME Code Case N-284 (by formula).

The attached tables provide a summary of the results of this evaluation. The terms at the top of the tables are defined in the code case. Table 3 provides a summary of the results from the interaction equation evaluation of the combined meridional and circumferential stresses. The results obtained from the interaction evaluation are to be less than 1.0 for the vessel to satisfy the buckling requirements of the code case.

All areas of the vessel satisfy the interaction equations of Section 1713.1.1(b) of the code case by considering the seismic loads to be uniform around the circumference of the containment vessel.

(d) According to the discussion in the ASME Code Case N-284, "Studies and experience have shown that penetrations which are fully reinforced according to the Code rules, and which have an inside diameter that is small compared to the vessel diameter, will not reduce the buckling strength of the overall structure." It goes on to emphasize that both the buckling check by formulae or by analysis "may be used without special consideration of properly reinforced penetrations that have an inside diameter not greater than 10% of the vessel diameter." The above conclusions have been confirmed by testing performed at the Los Alamos Scientific Laboratory and are summarized in Reference 2. The buckling

failure of steel cylinders is dominated by fabrication imperfections rather than by small penetrations. NUREG/CR-2165 (Reference 3) states that even for a cutout size as large as $r/\sqrt{Rt} = 3.64$, it is not clear that even the unreinforced cutout significantly changes the buckling load. All of the penetrations in our containment vessel except the equipment hatch have a penetration inside diameter less than 10 percent of the vessel diameter. The personnel airlocks are approximately 8.3 percent of the vessel diameter while the main steam penetrations are only 3.5 percent of the vessel diameter. It is our conclusion, based on the above discussion, that the overall buckling capacity of the containment is not reduced by small penetrations.

The equipment hatch penetration which has an inside diameter of 240 inches does not satisfy the criteria of Code Case N-284. However, penetrations which have a diameter greater than 10 percent of the vessel diameter are addressed by the NUREG/CR-2165. According to the conclusions section of this publication, when a cutout is made in a fabricated steel shell of poor quality (low P/P_{c1} or low value of knockdown factor), the buckling load may be reduced only slightly or not at all by the cutout, and reinforcement will have little or no effect. In this case, the margin to failure is ensured by the conservative knockdown factor required by the ASME Code Case N-284. It goes on to add that reinforcement of cutouts, according to the ASME area replacement method (ARM), should ensure that if the buckling strength of the shell is not governed by initial imperfections, the effect of the cutout will be reduced by the reinforcement and the margin to failure will be increased above the value ensured by the use of a conservative knockdown factor.

(e) As requested by the NRC, NUREG/CR-0793 (Reference 4) was reviewed and compared with the method used here. The major concern raised by

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NUREG/CR-0793 in Section 5 of that report which applies to the Perry containment vessel is restated below:

> "The criteria of part (b) of the current ASME Pressure Vessel Code (3b) are conservative for the loading conditions for which they are defined. As presently defined, however, they are not applicable to combined loading of stiffened structures." (Reference 3b is NE-3222.)

The criteria for the design of the Perry containment vessel, the approach described in Structural Analysis of Shells, is developed for stiffened cylinders. In addition, as described for Subquestion (c) above, the containment vessel also satisfies the interaction equations of Section 1713.1.1(b) of ASME Code Case N-284. This provision of the code case is developed for stiffened cylinders and combined loads, since the equation applies for cases where the meridional stress, $\delta_{\phi s}$ is greater than or equal to one-half of the circumferential stress, $\delta_{\Theta s}$ $(\delta_{\phi s} \geq .5\delta_{\Theta s})$.

Therefore, if the maximum compressive stresses are assumed to be uniformly distributed over the shell, conservative results are obtained from the buckling evaluation. Also, it is important to note that the above uniform compressive stresses are based on a dynamic stress analysis for all dynamic loadings including earthquake, steam relief valve actuation, condensation oscillation, chugging, and pool swell. Section 4.5.1.5 of NUREG/CR-0793 concludes that the use of these dynamic stress results as a static uniform stress in the structure is a conservative approach in evaluating dynamic buckling.

References:

1. Cases of the ASME Boiler and Pressure Vessel Code, Case N-284, "Metal Containment Shell, Buckling Design Methods, Section III, Division 1, Class MC."

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2. "Containment Buckling Program," by Anderson, C.A.; Bennett, J.G.; Los Alamos Scientific Laboratory, as submitted to the Ninth Water Reactor Safety Research Information Meeting, October 26-28, 1981, Washington, D.C.

3. NUREG/CR-2165, "An Investigation of Buckling of Steel Cylinders with Circular Cutouts Reinforced in Accordance with ASME Rules," Los Alamos Scientific Laboratory.

4. NUREG/CR-0793, "Buckling Criteria and Application of Criteria to Design of Steel Containment Shell," Final Report January 1978 - March 1979, by Seide, P.; Weingarten, V.; and Masri, S., International Structural Engineers.

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TABLE 1

LOCAL BUCKLING - AXIAL COMPRESSION

ELEVATION	M_i $1i/\sqrt{rt}$	$\alpha_{\phi L}$	σ_ϕ (PSI)	C_ϕ	$\sigma_{\phi eL}$ (PSI)	σ_{is} $\frac{\sigma_\phi \ FS}{\alpha}$
592'-610'	(219) 6.66	0.265	3290.	0.605	35066.	24830.
610'-655'	(653) 19.86	0.252	2535.	0.605	35066.	20119.
665'-715'	(606) 18.43	0.252	1858.	0.605	35066.	14746.
715'-727'	(140) 4.26	0.346	1016.	0.605	35066.	5873.

TABLE 2

LOCAL BUCKLING - EXTERNAL PRESSURE

ELEVATION	$\alpha\theta L$	σ_θ (PSI)	$C_{\theta r}$	σ_{hel} (PSI)	$\sigma_{\theta s}$ $\frac{\sigma_\theta \ FS}{\alpha}$
592'-610'	0.8	1331.	0.153	8868.	3328.
610'-665'	0.8	384.	0.048	2782.	960.
665'-715'	0.8	415.	0.052	3014.	1038.
715'-727'	0.8	415.	0.254	14722.	1038.

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TABLE 3

INTERACTION EQUATION

ELEVATION	VALUE
592'-610'	0.81
610'-665'	0.68
665'-715'	0.51
715'-727'	*

$$\frac{\sigma_{\phi s} - .5\sigma_{hel}}{\sigma_{\phi es} - .5\sigma_{hel}} + \left(\frac{\sigma_{\theta s}}{\sigma_{hel}}\right)^2 \leq 1.0$$

*No check required if $\sigma_{\phi s} < .5\sigma_{hel}$

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BACKGROUND THE PERRY NUCLEAR STATION OFF-GAS STRUCTURE AND DIESEL GENERATOR BUILDING SEISMIC ANALYSES USED FINITE ELEMENT METHODS OF ANALYSIS. TWO-DIMENSIONAL CROSS-SECTIONS OF THE STRUCTURES AND SURROUNDING SOIL ARE MODELED. THE ANALYSES ARE LINEARLY ELASTIC.

IN JULY, 1981 THE SRPS GUIDING THE APPROACHES TO BE USED IN SEISMIC ANALYSES WERE REVISED, REQUIRING THAT STRUCTURES USING FINITE ELEMENT ANALYSIS METHODS ALSO USE "ELASTIC HALF-SPACE" OR "LUMPED MASS/SPRING" APPROACH, IN ADDITION.

IN ORDER TO COMPARE THE RESPONSE OF THE ELASTIC HALF SPACE APPROACH WITH THE FINITE ELEMENT APPROACH USED IN DESIGN, THE ADDITIONAL FOLLOWING ANALYSES WERE CONDUCTED.

I HALF-SPACE LUMPED MASS/STIFFNES ANALYSIS OF THE OFF-GAS STRUCTURE FOR THE NORTH-SOUTH DIRECTION, SSE CONDITIONS.

II HALF-SPACE LUMPED MASS/STIFFNESS ANALYSIS OF THE DIESEL GENERATOR BUILDING FOR THE VERTICAL DIRECTION, SSE.

FOR EVALUATING COMPARISONS BETWEEN THE METHODS, FLOOR RESPONSE SPECTRA OBTAINED FROM THE ABOVE 2 ANALYSES WILL BE COMPARED WITH THE SPECTRA DEVELOPED FOR DESIGN CRITERIA WHICH USES THE FINITE ELEMENT ANALYSIS APPROACH.

USNRC WORK ITEM # 23

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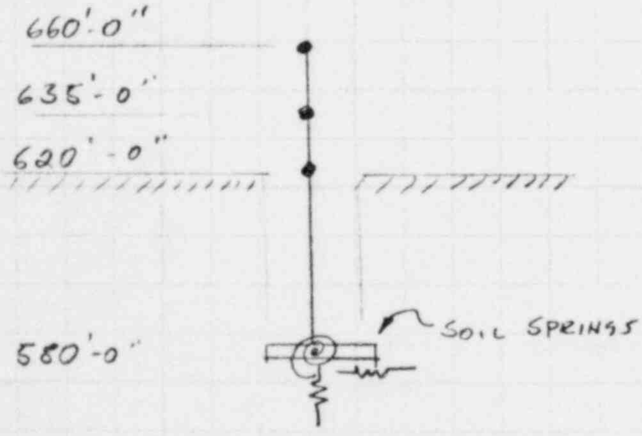
I OFF-GAS STRUCTURE, NORTH-SOUTH DIRECTION, SSE

2 Finite element models were developed, one having soil on both sides and one having soil on one side only. The design floor response spectra envelopes both responses and added 10% to magnitudes to represent effects of earthquakes in other directions.

2 half-space models, representative of both soil conditions are developed, paralleling the finite element analyses. The structural portion of the models, as well as input and structure damping are identical for both. The soils springs are modified to represent embedment on both sides and embedment on one side only.



SKETCH OF HALF SPACE MODEL

CALCULATION OF SOIL SPRINGS

SOIL SPRING STIFFNESS VALUES ARE CALCULATED FOR THE FOLLOWING 3 SITUATIONS

(1.) MODEL WITH BASE ASSUMED TO BE AT GRADE - SOIL SPRINGS ATTACHED AT FOUNDATION BASE ELEVATION ARE CALCULATED USING ROESSET'S EQUATIONS (1)

(2.) MODEL CONSIDERING 40' OF EMBEDMENT ON BOTH SIDES - THE SOIL SPRINGS CALCULATED ABOVE ARE MODIFIED FOR THE EMBEDMENT. THIS IS DONE BY STIFFENING THE SPRINGS USING AN APPROACH BY ELSABEE (2)

(3) MODEL CONSIDERING 40' OF EMBEDMENT ON ONE SIDE ONLY - THIS EFFECT IS CONSIDERED BY USING SOIL SPRING STIFFNESS VALUES THAT ARE THE AVERAGE OF SITUATIONS 1 & 2 DESCRIBED ABOVE.

SUMMARY OF SOIL SPRING STIFFNESSES

		SITUATION (1)	(2)	(3)
	SPRING DIRECTION	NO EMBEDMENT	40' EMBEDMENT	EMBEDMENT ONE SIDE
#/FT	HORIZONTAL K_H	8.82×10^6	14.73×10^6	11.78×10^6
#/FT	VERTICAL K_V	21.09×10^6	31.00×10^6	26.00×10^6
FT·#/RAD	ROCKING K_θ	6.70×10^9	22.50×10^9	14.60×10^9

COMPUTER RUN: RQHVIR7 3-5-82   RQHVIW3 3-5-82

CALCULATION OF SOIL SPRINGS, CONT'D:

IT SHOULD BE NOTED THAT THE HALF-SPACE APPROACH DOES NOT STRICTLY ALLOW USE OF LINEAR SPRINGS ALONG EMBEDMENT DEPTH. THEREFORE, THE MODELS USED HAVE THE APPEARANCE OF BEING "ABOVE GROUND" FOR THE EXTENT OF THE 40' OF EMBEDMENT. THE ROCKING AND TRANSLATION RESPONSE WILL BE OVER PREDICTED, DUE TO THE UNRESTRAINED FLEXIBILITY OF THE UNSUPPORTED PORTION OF THE STRUCTURAL MODEL STIFFNESS REPRESENTING THE UNDERGROUND PORTION OF THE STRUCTURE.

CALCULATION OF SOIL-STRUCTURE INTERACTION DAMPING VALUES.

SSI DAMPING USED IN THE MODELS CONSIDERS BOTH MATERIAL AND RADIATIONAL DAMPING EFFECTS. SINCE AN SSE CONDITION IS CONSIDERED, THE MATERIAL DAMPING FOR SOIL IS CONSERVATIVELY TAKEN AS 7%.

RADIATIONAL DAMPING IS MODE DEPENDANT AND CALCULATED CONSISTENT WITH THE HALF-SPACE APPROACH[1] RADIATIONAL DAMPING IS CALCULATED FOR HORIZONTAL, VERTICAL, AND ROCKING MODES. THE FOLLOWING VALUES ARE FOUND.

MODE	RADIATIONAL DAMPING (THEORETICAL)	USED IN ANALYSIS (F.S = 1.5)
HORIZONTAL	47.2 %	31.5 %
VERTICAL	78.4	52.3 %
ROCKING	6.5	4.3 %

RADIATIONAL DAMPING IS CALCULATED INDEPENDANT OF EMBEDMENT, USING HALF-SPACE METHOD.

USNRC WORK ITEM #23

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TIME HISTORY ANALYSIS

A TIME HISTORY ANALYSIS USING THE PERRY NPP NORT-SOUTH (H2) TIME HISTORY (DEVELOPED FROM R.G. 1.60 DESIGN SPECTRA), NORMALIZED TO 0.15 g (SSE) IS CONDUCTED FOR BOTH OFF-GAS MODELS, ONE INCLUDING EMBEDMENT EFFECTS ON BOTH SIDES, THE OTHER HAVING EFFECTS OF EMBEDMENT ON ONE SIDE ONLY.

FLOOR RESPONSE SPECTRA

FOR EACH ELEVATION OF THE OFF-GAS BUILDING NORTH-SOUTH DIRECTION FLOOR RESPONSE SPECTRA ARE OBTAINED. THE SPECTRA INCLUDE A 10% INCREASE TO ALLOW FOR CONTRIBUTIONS DUE TO EAST-WEST AND VERTICAL COMPONENTS, AS WAS DONE FOR THE ORIGINAL FINITE ELEMENT ANALYSIS. IT SHOULD BE NOTED THAT FOR A 2-D CO-LINEAR STICK MODEL (PARALLELING THE FINITE ELEMENT MODEL) THE ACTUAL CROSS-COMPONENTS CANNOT BE OBTAINED, AND THEIR EFFECT MUST BE ESTIMATED TO BE INCLUDED.

THE FOLLOWING 4 FIGURES, 23-1, 23-2 23-3 AND 23-4 SHOW THE COMPARISONS OF:
1. THE LUMPED PARAMETER MODEL (LPM) HAVING SOIL EFFECTS ON BOTH SIDES CONSIDERED
2. LPM, CONSIDERING SOIL ON ONE SIDE ONLY
3. DESIGN FRS USED FOR PERRY NPP QUALIFICATION

Gilbert Associates, Inc. Reading, Pennsylvania CALCULATION	SUBJECT OFF-GAS BLD. HORIZONTAL SEISMIC (N-S)			CISID	PAGE 14 6 OF PAGES 28
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	ORIGINATOR S. S. HSIEH				
	DATE 3/6/82				

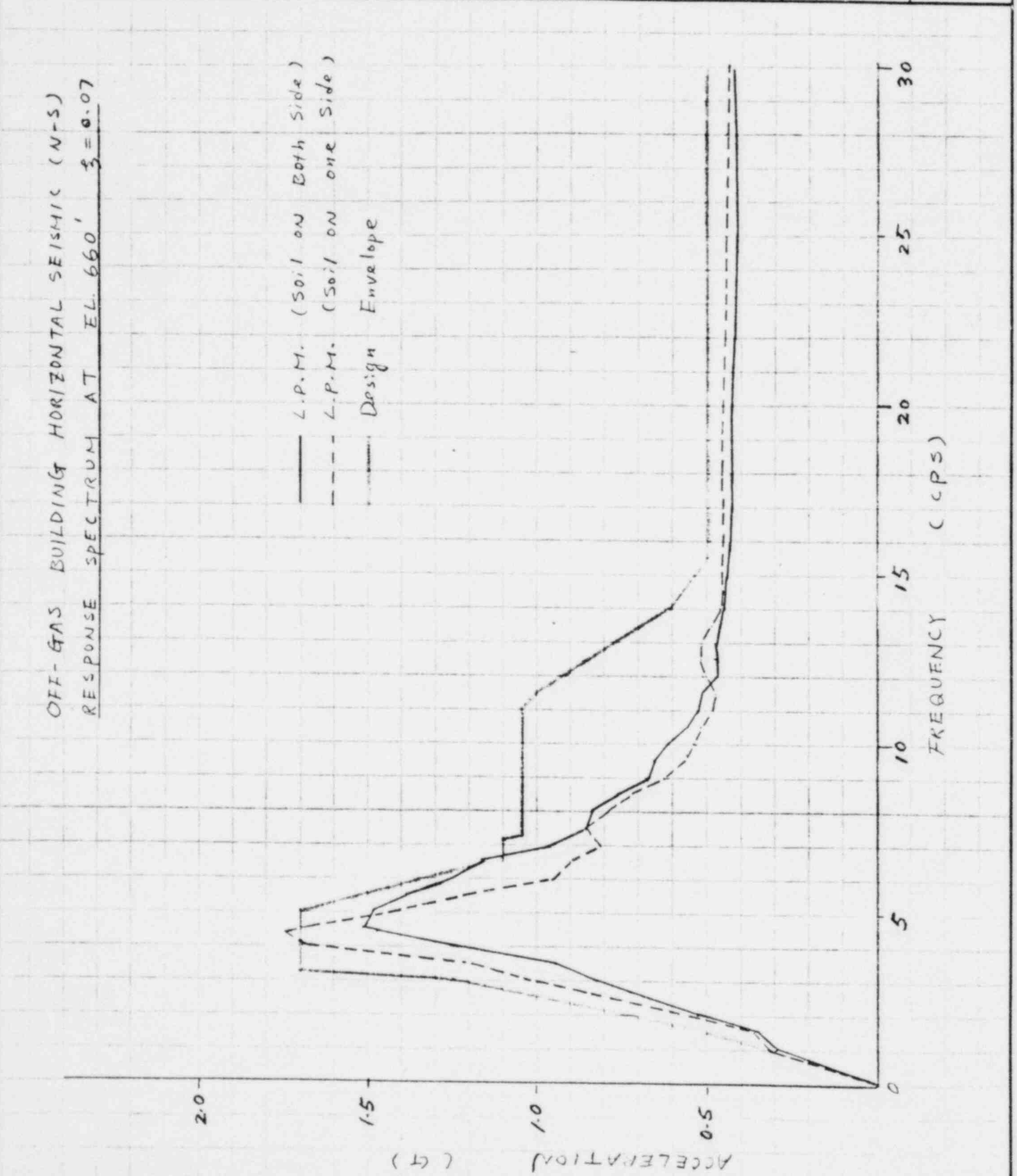

FIGURE 23-1 OFF-GAS BUILDING FRS COMPARISONS ROOF OF STRUCTURE ELEV. 660'-0"

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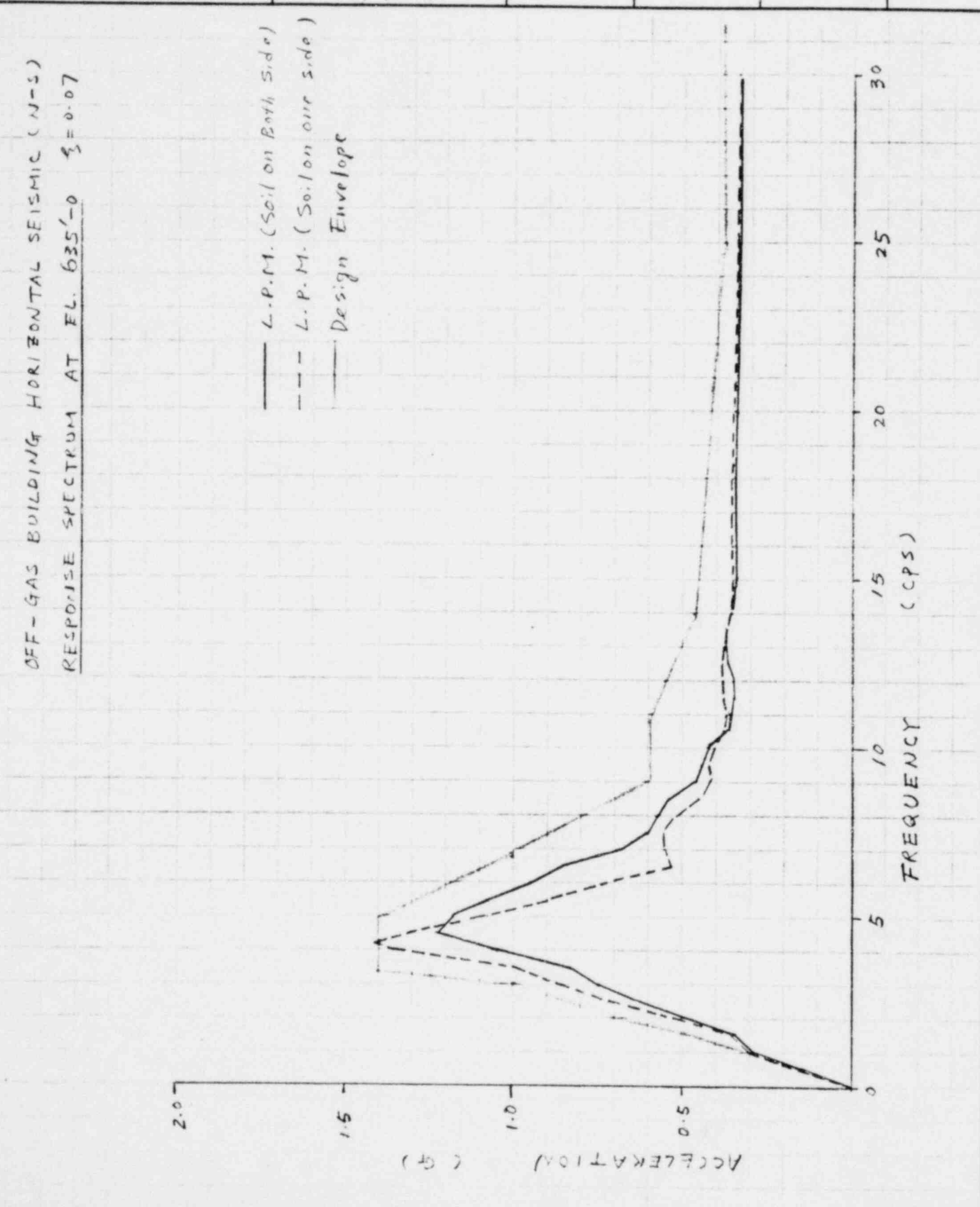

FIGURE 23-2 OFF-GAS BLDNG FRS COMPARISONS
ELEVATION 635'-0"

Gilbert Associates, Inc.
Reading, Pennsylvania

CALCULATION

SUBJECT Perry Diesel Generator Bld. Vertical Seismic		CISID		PAGE 16 8 OF
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DATE 2/18/82				

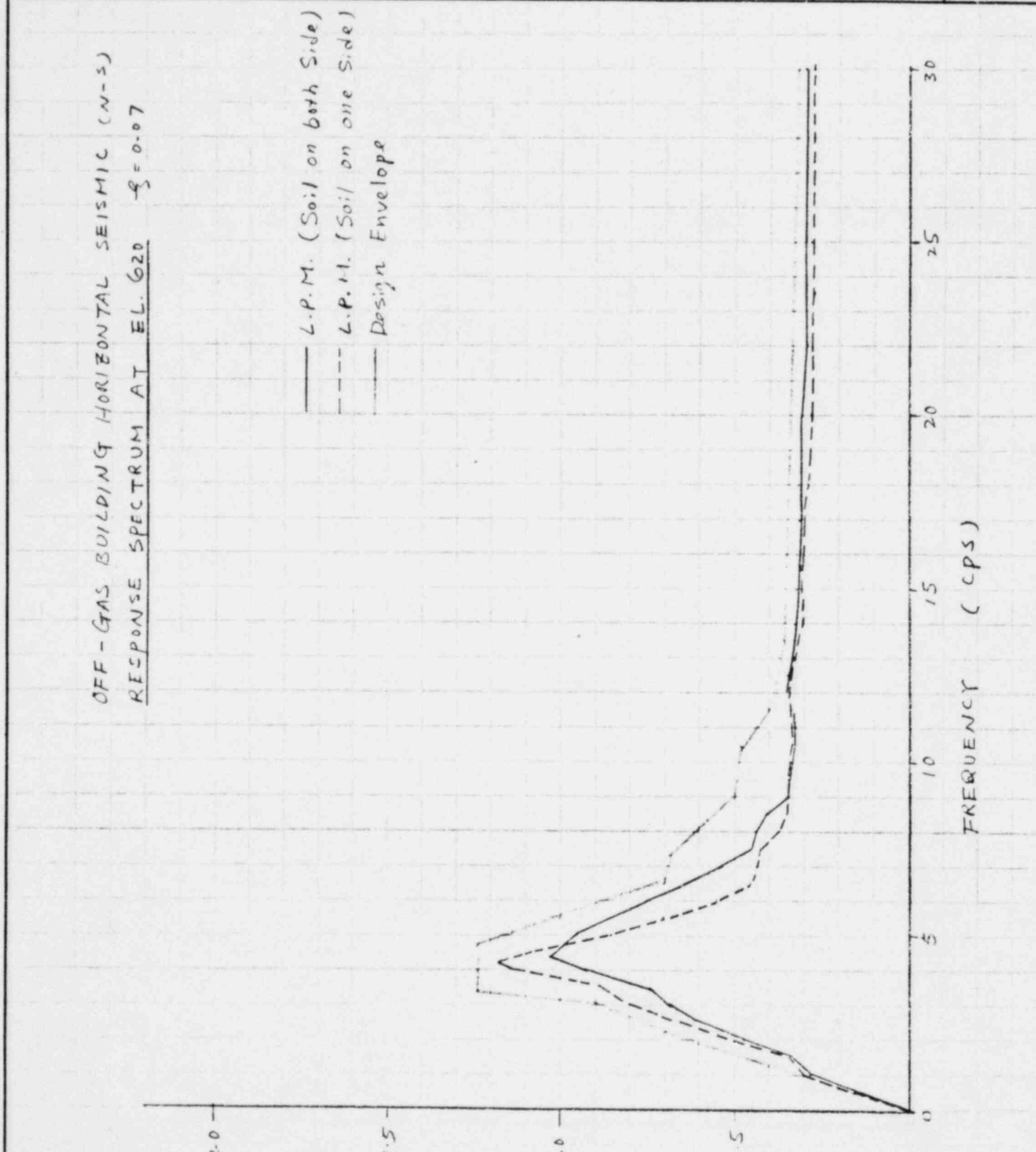

FIGURE 23-3 OFF-GAS ~ BUILDING FRS COMPARISONS GROUND LEVEL EL. 620'-0"

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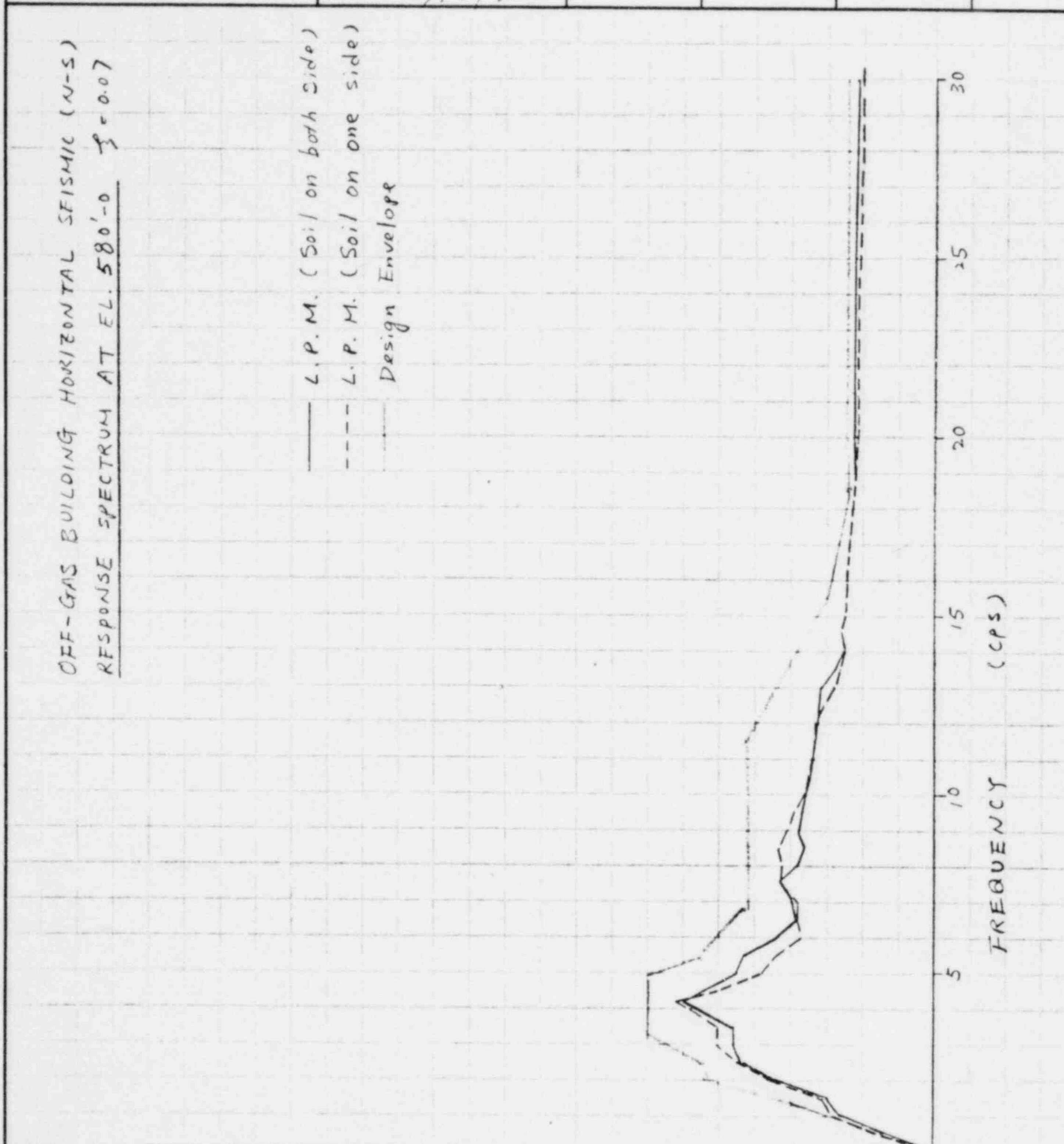

FIGURE 23-4 OFF-GAS BUILDING FRS COMPARISONS
BASE OF STRUCTURE EL. 580' 0"

USNRC WORK ITEM # 23

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CONCLUSIONS

AS CAN BE SEEN, THE LPM RESULTS ARE ENVELOPED BY THE DESIGN SPECTRA. THE LPM RESULTS TEND TO BE NARROW BANDED, DUE TO THE AVAILABILITY OF SINGLE DOMINANT MODES, IN THIS CASE THE ROCKING MODE. THE FINITE ELEMENT MODEL TENDS TO HAVE MORE OF A BROADER BANDED COMPOSITION.

THERE ARE ADDITIONALLY 2 MAJOR CONSERVATISMS STILL INHERENT IN THE RESULTS SHOWN.

1. FULL SOIL RADIATIONAL DAMPING, CONSISTENT WITH THE HALF-SPACE LPM METHOD IS NOT USED. A FACTOR OF SAFETY OF 1.5 IS APPLIED.

2. SIMILARLY, THE SOIL DAMPING, ASSOCIATED

WITH THE ROCKING MODE IS CALCULATED TO BE VERY LOW, 6.5% (4.3% IS USED). THIS IS ALSO DUE TO THE APPROXIMATION ASSUMING THE SOIL SPRINGS ARE ATTACHED AT THE BASE LEVEL (580'-0") ONLY, WITHOUT LATERAL SPRINGS, WHICH TENDS TO OVERESTIMATE THE ROCKING MODE INERTIAL EFFECTS) (B_ψ IN HALF-SPACE EQUATION IS OVER ESTIMATED) WHICH THEN UNDERESTIMATES THE DAMPING ASSOCIATED WITH THE ROCKING MODE ($D_\psi \propto 1/B_\psi\sqrt{B_\psi}$). SEE EQUATIONS ON PAGE 382, OF RICHART, HALL AND WOODS "VIBRATIONS OF SOILS AND FOUNDATIONS" FROM WHICH THE LPM PARAMETERS ARE DEVELOPED.

IT IS THEREFORE CONCLUDED THAT THE LUMPED PARAMETER MODES WHEN DEVELOPED CONSISTENT WITH THE FINITE ELEMENT MODELS, RESULT IN SIMILAR RESULTS, AND THAT SATISFACTORY VALIDATION WHEN USING THE REVISED SRP 3.7.2.II-4 CRITERIA IS ACHIEVED, JUSTIFYING THE FINITE ELEMENT SOIL-STRUCTURE ANALYSES CONDUCTED.

II DIESEL GENERATOR BUILDING (DGB)

SIMILARLY, AS FOR THE OFF-GAS BUILDING, A FINITE ELEMENT ANALYSIS IS USED TO DEVELOP SEISMIC DESIGN CRITERIA FOR THE DIESEL GENERATOR BUILDING.

HOWEVER, THE REASONS FOR USING FINITE ELEMENTS FOR THE ANALYSIS ARE DIFFERENT

WHEREAS THE OFF-GAS BUILDING HAD VARYING DEGREES OF EMBEDMENT, THE DGB IS NOT EMBEDDED, BUT IS FOUNDED AT GRADE. THE SOIL UNDERNEATH, HOWEVER IS A RELATIVELY THIN LAYER, ≈ 50', BEFORE THE BEDROCK IS REACHED. FOR THIS REASON AND FOLLOWING THE ORIGINAL (PRE JULY 1981) SRP, A FINITE ELEMENT APPROACH IS USED.

TO COMPLY WITH WORK ITEM #23, A LPM IS DEVELOPED AND ANALYSED TO CONSIDER DIFFERENCES IN ANALYTICAL METHODS IN THE VERTICAL DIRECTION. THE VERTICAL DIRECTION IS CHOSEN FOR COMPARISONS SINCE, IN THIS CASE, IT IS CONSIDERED TO BE THE MOST GEOLOGICALLY "COMPLEX", BECAUSE OF SOIL LAYERING AND THE UNDERLYING BEDROCK (FOR THE OFF GAS BUILDING THE HORIZONTAL DIRECTION WAS CHOSEN, CLEARLY, BECAUSE OF THE FULL AND PARTIAL EMBEDMENT EFFECTS).

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SOIL SPRINGS

SOIL SPRINGS FOR THE LUMPED PARAMETER MODEL (LPM) ARE DEVELOPED USING EQUATIONS PRESENTED IN "COMPLIANCES OF LAYERED ELASTIC SYSTEMS" BY CHRISTIANO, RIZZO AND JARECKI.

THE FOLLOWING SPRING VALUES ARE CALCULATED, REPRESENTATIVE OF THE DIFFERENT SOIL LAYERS AND BEDROCK.

SPRING DIRECTION	STIFFNESS
HORIZONTAL	5.16×10^{9} LBS
VERTICAL	1.96×10^{10} LBS
ROCKING	5.49×10^{13} FT LBS

SOIL DAMPING

AS FOR THE OFF-GAS BUILDING, SOIL RADIATIONAL DAMPING IS CALCULATED USING THE ELASTIC HALF-SPACE METHODS. HOWEVER, A FACTOR OF SAFETY OF 4 IS USED, SINCE THE DEGREE OF RADIATIONAL "ENERGY" REFLECTED FROM THE BEDROCK BECOMES MORE UNCERTAIN, AND ADEQUATE CONSERVATISM IS STILL REQUIRED.

THE FOLLOWING VALUES FOR RADIATIONAL DAMPING ARE CALCULATED:

SPRING DIRECTION	CALCULATED DAMPING	USED IN LPM ANALYSIS (F.S. = 4)
HORIZONTAL	78%	14%
VERTICAL	130%	33%
ROCKING	188%	47%

THE RELATIVELY HIGH RADIATIONAL DAMPING CALCULATED IS CONSISTENT WITH THE STRUCTURE OF THE DGB, WHOSE CONSTRUCTION CAN ALMOST BE MODELED AS A SLAB ON GRADE, FOR WHICH SOIL-STRUCTURE EFFECTS ARE MORE MINIMAL. THIS CONTRASTS WITH THE OFF-GAS BUILDING, CONSERVATIVELY MODELED AS A TALL CANTILEVER, HAVING SIGNIFICANT ROCKING MODES, AND GREATER INTERACTION EFFECTS, AND CONSEQUENTLY LOWER RADIATIONAL DAMPING. THE EFFECTIVE RADIUS, r_0, USED IN THE HALF-SPACE EQUATIONS IS ~35-40 FOR THE OFF-GAS BLDNG AND ~65-80 FT FOR THE DGB, WHILE THE MASS OF BOTH STRUCTURES IS MORE OR LESS SIMILAR. THIS MEANS THE SOIL LOADING UNDER THE STRUCTURES IS MUCH LESS FOR THE DGB THAN THE OFF-GAS BUILDING, AND HENCE, HIGHER DAMPING FOR THE DGB (AND LESS INTERACTION) IS EXPECTED.

FLOOR RESPONSE SPECTRA

A VERTICAL TIME HISTORY ANALYSIS SIMILAR TO THE ONE DONE FOR THE OFF-GAS BUILDING IS CONDUCTED.

FIGURES 23-5 AND 23-6 SHOW RESULTANTANT FLOOR RESPONSE SPECTRA, COMPARED WITH CORRESPONDING FLOOR RESPONSE SPECTRA OBTAINED FROM THE FINITE ELEMENT ANALYSIS. ALSO PLOTTED IS THE DESIGN FLOOR RESPONSE SPECTRA USED IN SUBSEQUENT SEISMIC QUALIFICATION.

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DIESEL GENERATOR BUILDING

VERTICAL RESPONSE SPECTRUM AT EL. 662.5'

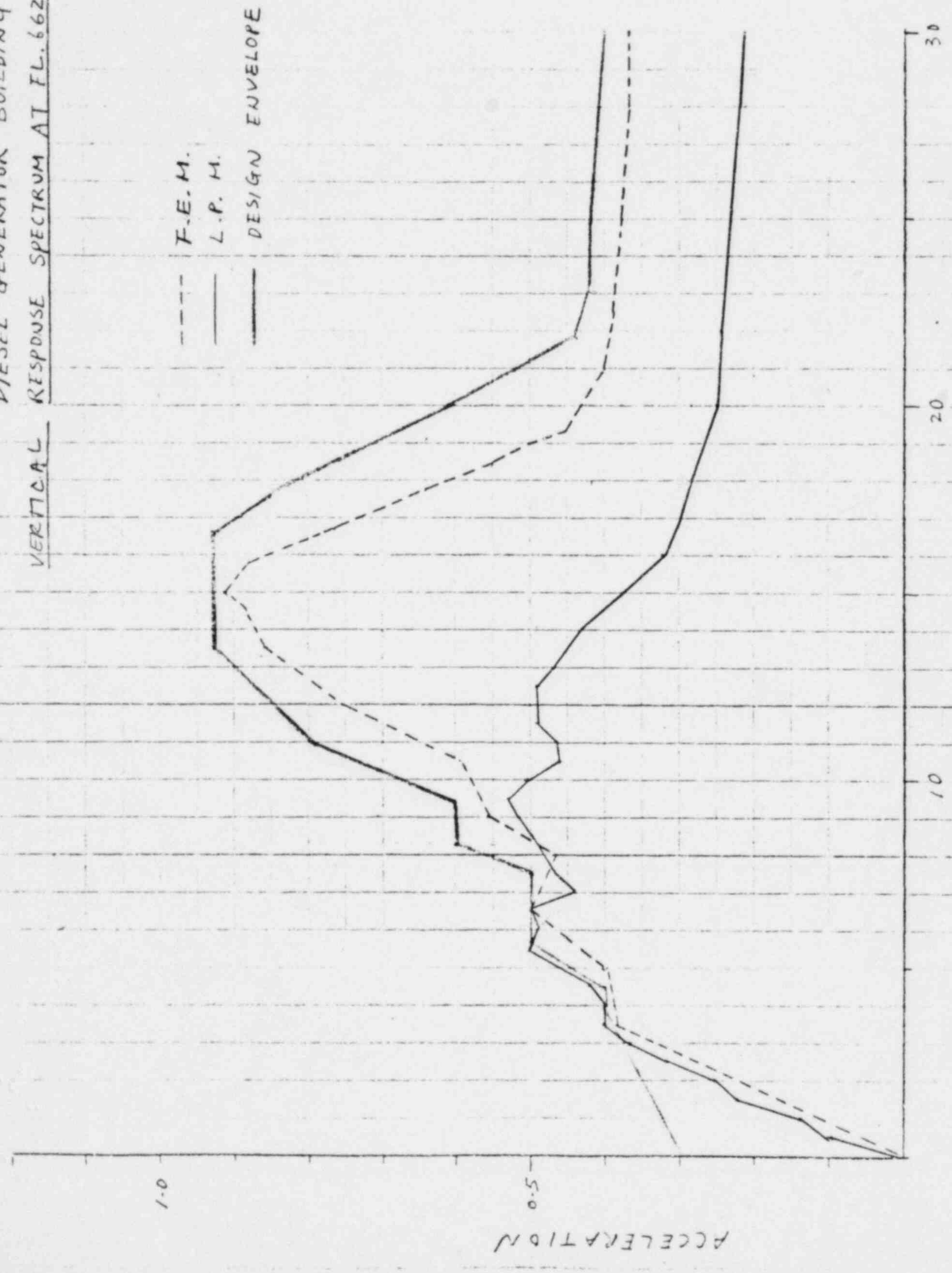

FIGURE 23-5 DIESEL GENERATOR BLDING
ROOF LEVEL EL. 662'-6"

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DIESEL GENERATOR BUILDING
RESPONSE SPECTRUM AT EL 620.0'
VERTICAL

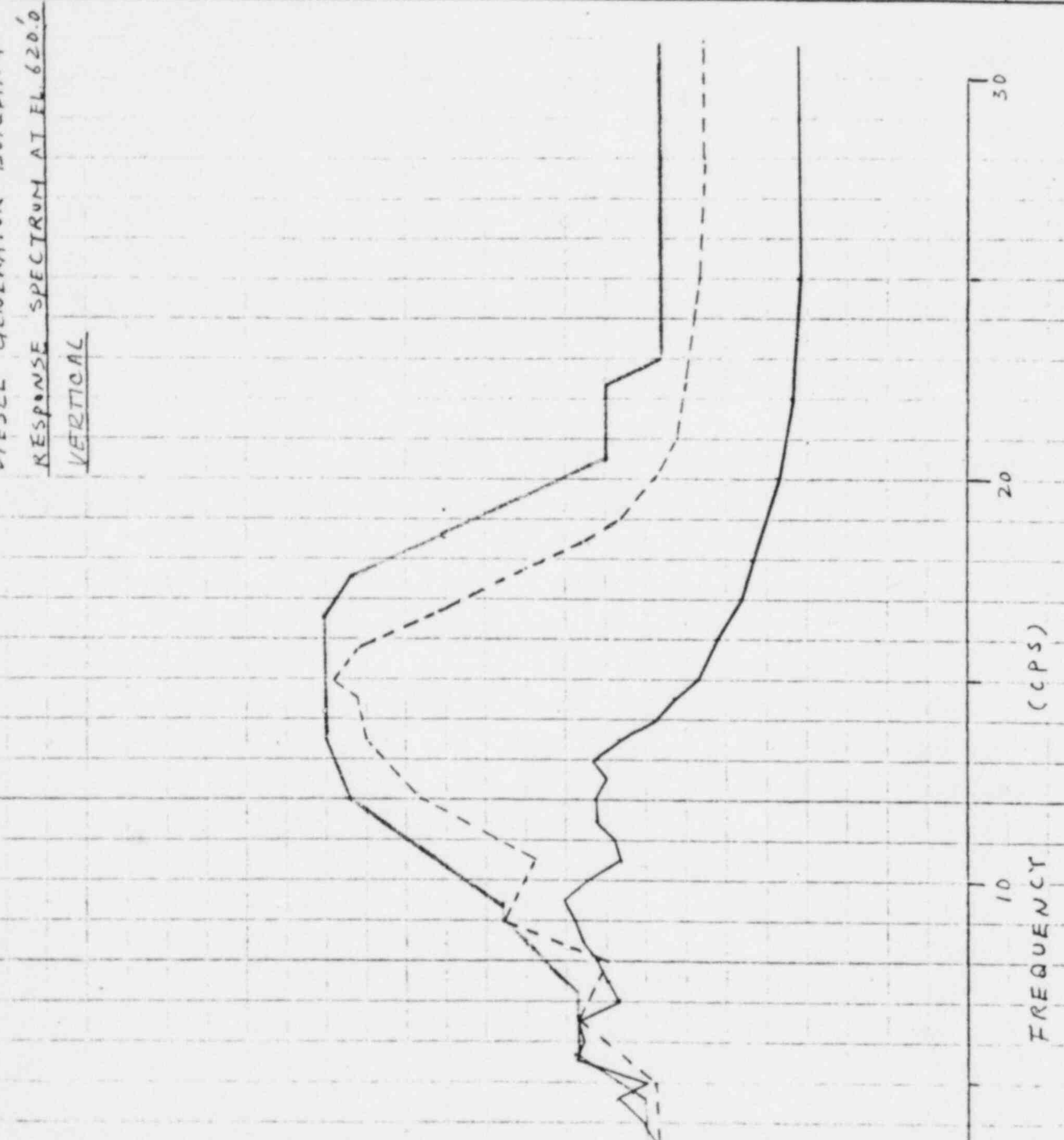

FIGURE 23-7 DIESEL GENERATOR BUILDING BASE ELEVATION

Gilbert Associates, Inc. Reading, Pennsylvania CALCULATION	SUBJECT PERRY DIESEL GENERATOR BLD. VERTICAL SEISMIC			CISIO	PAGE 28 17 OF PAGES 28
	REV. 0	1	2	3	
	MICROFILMED				
	ORIGINATOR S S HSIEH				
	DATE 3/2/82				

DIESEL GENERATOR BUILDING

VERTICAL RESPONSE SPECTRUM AT EL. 646.5'

FIGURE 23-6 DIESEL GENERATOR BLDNG EL. 646'6"

Gilbert Associates, Inc. Reading, Pennsylvania CALCULATION	SUBJECT PERRY NPP UNITS 1&2 SRP 3.7.2.II-4 COMPARISONS		CJSID 04-4549-320		PAGE 18 OF PAGES
	REV. 0	1	2	3	
	MICROFILMED				
	ORIGINATOR P. Rieck				
	DATE				

CONCLUSIONS

THE LPM ANALYSIS PREDICTS RESULTS SIGNIFCANTLY LESS THAN THE FINITE ELEMENT METHOD, FOR THE DIESEL GENERATOR BUILDING.

IT IS THEREFORE CONCLUDED THAT THE FINITE ELEMENT ANALYSIS CONDUCTED IS VALIDATED BY COMPARISON WITH THE NEW SRP 3.7.2.II-4 CRITERIA.