

ILLINOIS POWER COMPANY



CLINTON POWER STATION, P.O. BOX 878, CLINTON, ILLINOIS 61727

March 3, 1986

Docket No. 50-461

Director of Nuclear Reactor Regulation  
Attention: Dr. W. R. Butler, Director  
BWR Project Directorate No. 4  
Division of BWR Licensing  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Subject: Clinton Power Station  
Equipment Seismic Assessment  
Program (ESAP) Supplemental Information

Dear Dr. Butler:

In letter U-600231 dated October 14, 1985, Illinois Power transmitted the report "Equipment Seismic Assessment Program for Safety-Related Mechanical & Electrical Equipment." This report describes the ESAP which provides additional assurance of the seismic capability of the Emergency Power Supply System and the Decay Heat Removal System at Clinton Power Station.

Phase III of this program (discussed in Section 4 of the report) evaluated the seismic capability of equipment critical to the plant functions of decay heat removal and emergency power supply against the Revised Response Spectra. At the time the report was prepared, the seismic evaluations had been completed for all listed equipment with the exception of the Division III diesel generator.

Per a request made by Mr. Arnold Lee of the NRC Staff in a telecon on January 23, 1986, this letter provides confirmation that the seismic evaluations have been completed for the Division III diesel generator. These evaluations are provided in the same format as used in Appendix B of the ESAP Report and are attached. They show that the Division III diesel is capable of withstanding an earthquake of the form predicted by the Revised Response Spectra.

If you should have any questions concerning this material, please contact me.

Sincerely yours,

F. A. Spangenberg  
Manager - Licensing and Safety

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Attachment

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cc: B. L. Siegel, NRC Clinton Licensing Project Manager  
NRC Resident Office  
Regional Administrator, Region III, USNRC  
Illinois Department of Nuclear Safety

Equipment Seismic Assessment Program  
Supplemental Information

The following Division III Diesel-Generator information is provided to supplement Appendix B of the Equipment Seismic Assessment Program (ESAP) Report:

1. Discussion page identifying equipment and status
2. Graph of horizontal (N-S) Spectra (Figure 1)
3. Graph of horizontal (E-W) Spectra (Figure 2)
4. Graph of vertical Spectra (Figure 3)
5. Input to ESAP Report Table B-2 (Table 1 plus Attachments 1 and 2)

<u>Diesel Generator System</u>	<u>Equipment Number</u>	<u>Status</u>
- Division III Emergency Diesel Generator Set	1E22-S001	<ul style="list-style-type: none"><li>- Division III diesel engine supplied by General Motors Electro Motive Division (EMD) and Division III mechanical components have been assessed based on the Revised Response Spectra. Table 1 contains a stress summary and a discussion of the method used to calculate the revised stresses.</li><li>- Electrical components and Instruments associated with the Division III Diesel Generator set have been evaluated based on a comparison of the Revised Response Spectra with the Emergency Diesel Generator System (EDGS) Owner's Group required response spectra.</li><li>- The Owner's Group required response spectra envelops the Revised Response Spectra for all frequencies. Therefore, the original qualification remains valid.</li><li>- See Figures 1, 2 and 3 for response spectra comparisons.</li></ul>
- Division III Generator supplied by Beloit Power Systems	1E22-S001A	<ul style="list-style-type: none"><li>- Equipment remains acceptable based on an assessment using the Revised Response Spectra. Table 1 provides a stress summary and discussion of the method used to calculate the revised stresses.</li></ul>

Division III Diesel Generator Set  
Instrumentation and Electrical Components  
Diesel Generator Bldg. Elev. 737'  
Horizontal (N-S) Spectra for Service Level C  
3% Damping

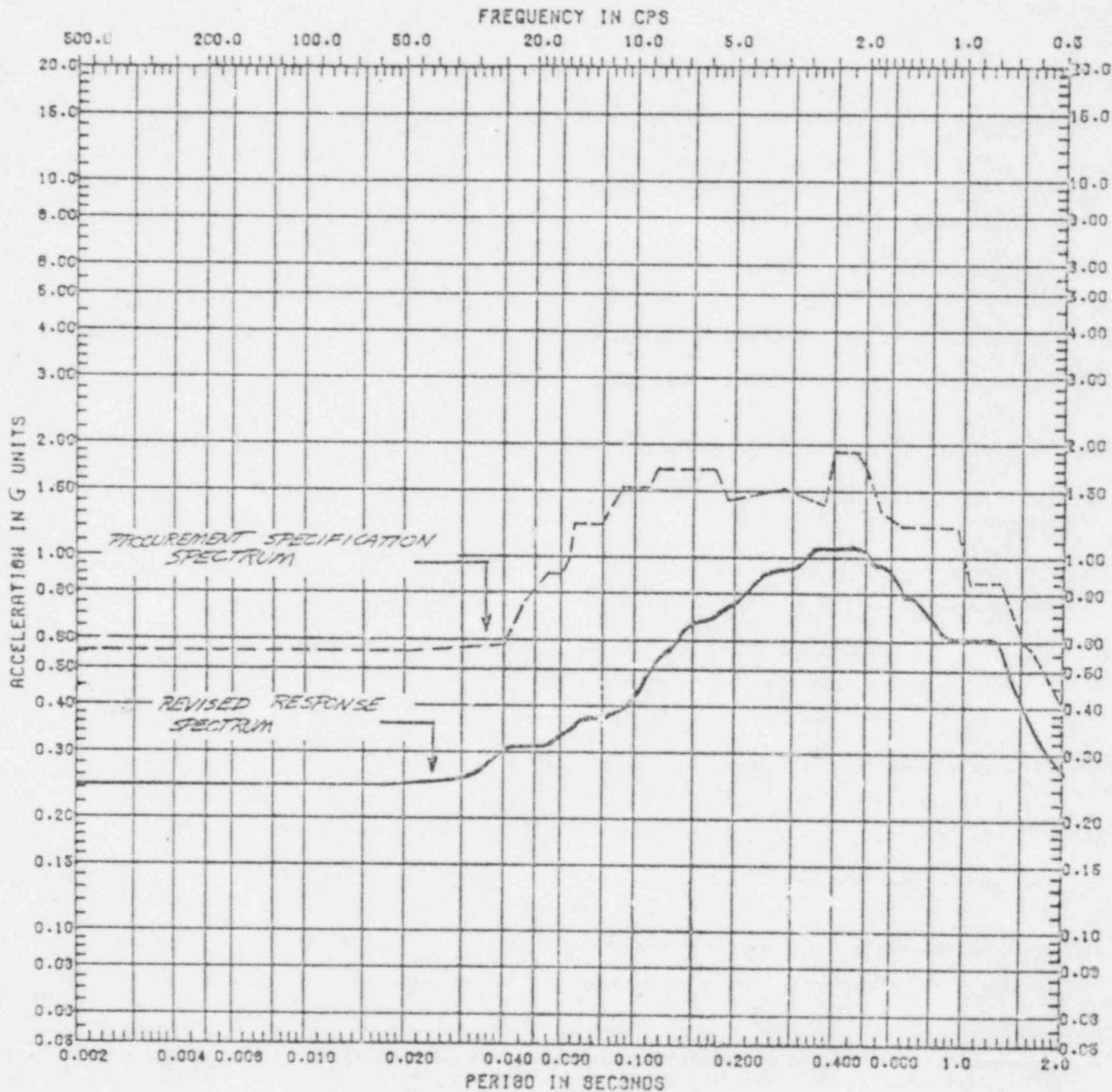


Figure 1

Division III Diesel Generator Set  
Instrumentation and Electrical Components  
Diesel Generator Bldg. Elev. 737'  
Horizontal (E-W) Spectra for Service Level C  
3% Damping

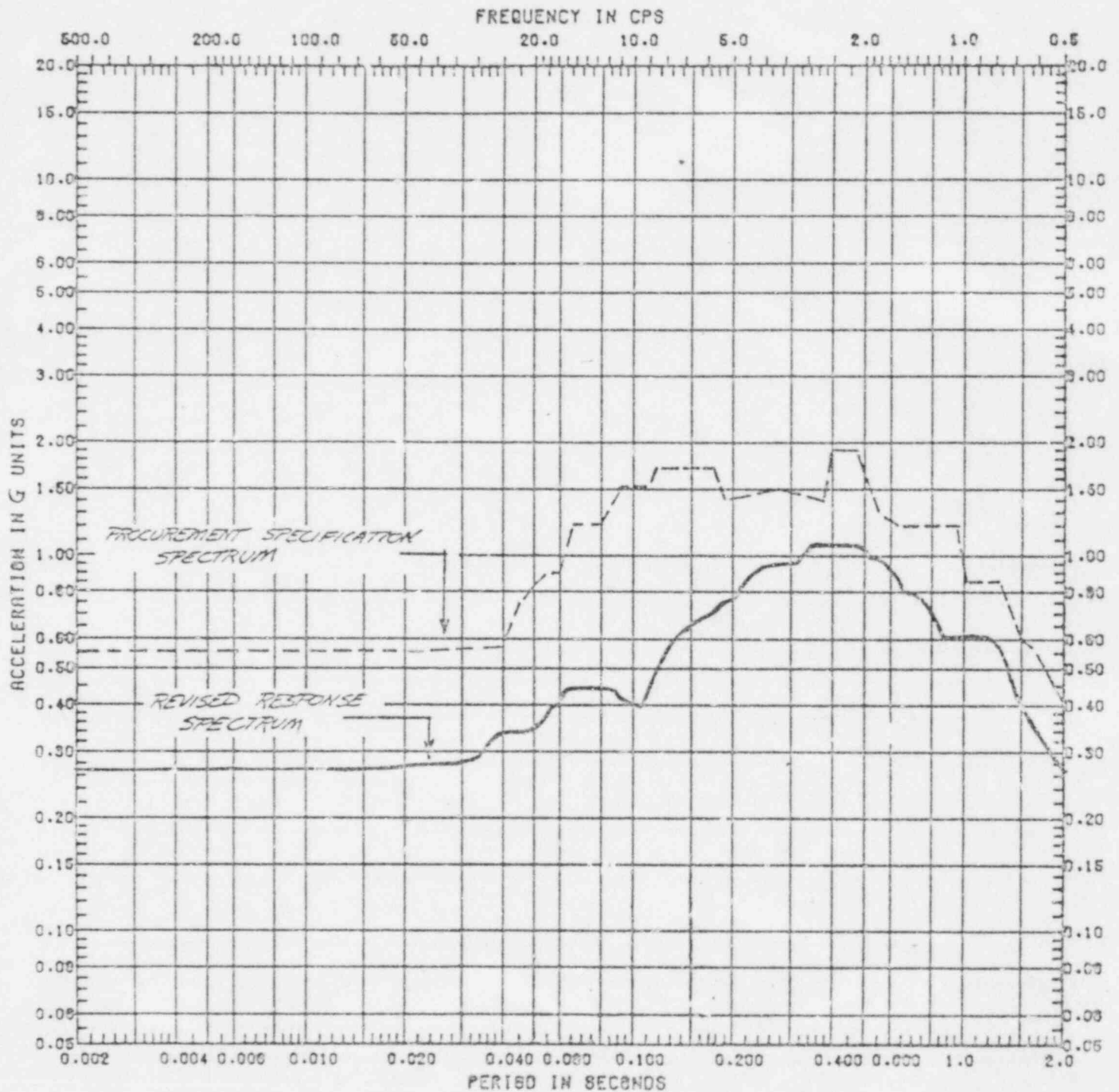


Figure 2

Division III Diesel Generator Set  
Instrumentation and Electrical Components  
Diesel Generator Bldg. Elev. 737'  
Vertical Spectra for Service Level C  
3% Damping

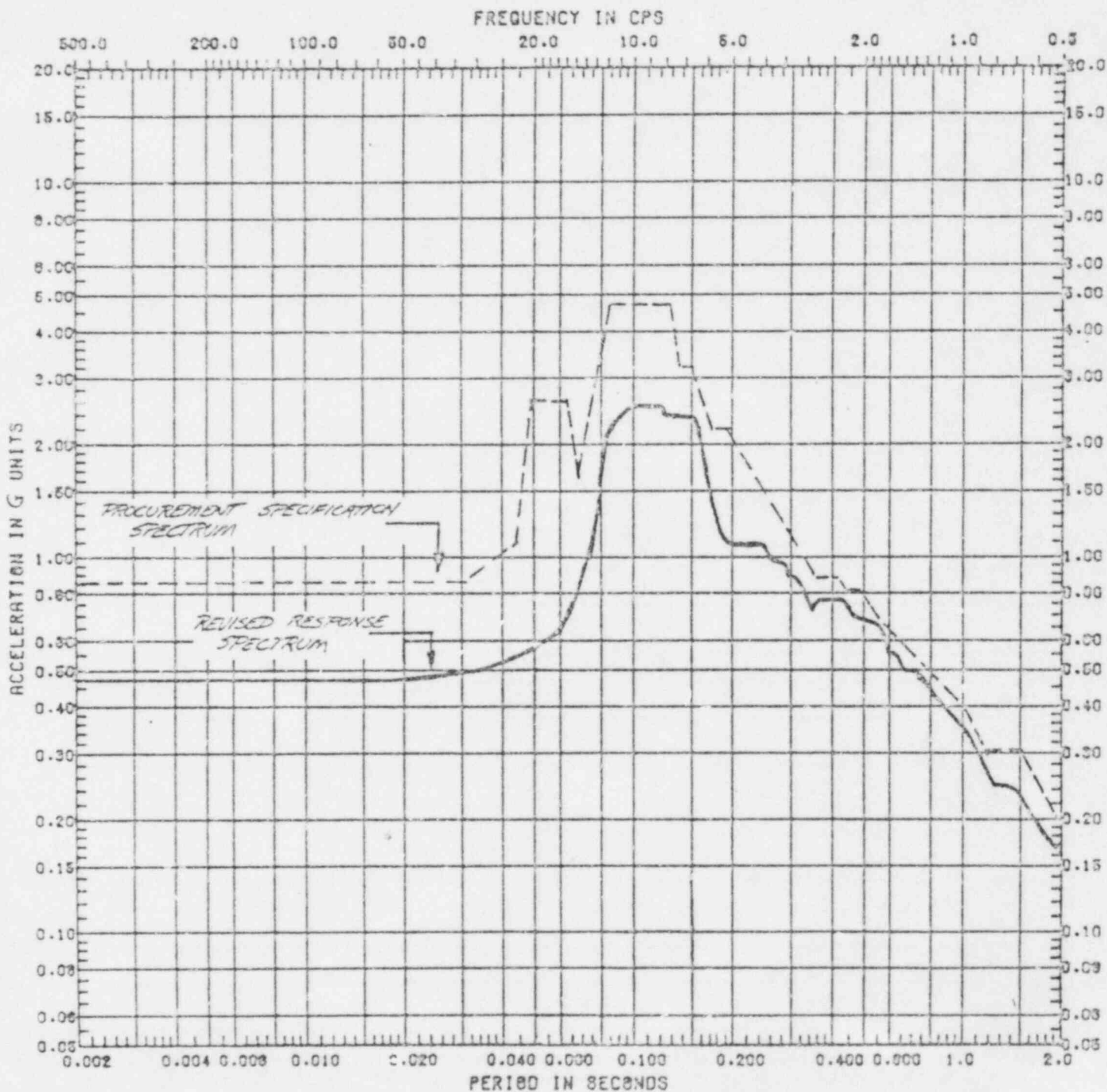


Figure 3

TABLE 1

MECHANICAL EQUIPMENT SERVICE LEVEL C STRESS COMPARISON  
WITH LEVEL C ALLOWABLE VALUES

<u>ITEM</u>	<u>EQUIPMENT</u>	<u>BLDC/ELEV.</u>	<u>MAX. STRESSED COMPONENTS</u>	<u>SERVICE LEVEL C STRESS (KSI)</u>	<u>REVISED SERVICE LEVEL C STRESS (KSI)</u>	<u>ALLOWABLE STRESS (KSI)</u>	<u>REVISED/ALLOWABLE</u>
I	Division III Diesel Generator System	Diesel/737'	-Air Start Piping	-	2.9	27.0	0.11
			-Aux. Lube Oil System Piping	-	12.6	27.0	0.47
			-16 Cylinder Engine				
			a) Accessory Rack Frame	7.75	10.0 (1)	(2)	
			b) Lube Oil Filter	10.78	13.91 (1)	(2)	
			c) Thermostatic Valve Mounting	5.01	6.46 (1)	(2)	
			d) Cooling Water Piping	0.70	0.90 (1)	(2)	
			e) Water Expansion Tank	5.01	6.50 (1)	(2)	
			f) Base	2.19	2.83 (1)	(2)	
			g) Heat Exchanger	13.97	18.02 (1)	(2)	
			h) Engine to Base Bolts	13.83 (Tension)	17.84 (1)	47.20	0.38
			i) Accessory Rack to Base Bolts	6.93 (Shear)	8.94 (1)	23.60	0.38
			j) Heat Exchanger to Base Bolts	1.47 (Tension)	1.88 (1)	35.95	0.05
			k) Heat Exchanger to Base Bolts	0.67 (Shear)	0.86 (1)	17.98	0.05
			l) Oil Filter to Rack Bolts	14.75 (Tension)	19.03 (1)	47.20	0.40
			m) Oil Filter to Rack Bolts	4.01 (Shear)	5.17 (1)	23.60	0.22
			n) Oil Cooler to Rack Bolts	1.05 (Tension)	1.35 (1)	28.40	0.05
			o) Oil Cooler to Rack Bolts	0.45 (Shear)	0.58 (1)	14.20	0.04
			p) Oil Cooler to Rack Bolts	3.39 (Tension)	4.37 (1)	12.05	0.36
			q) Oil Cooler to Rack Bolts	2.76 (Shear)	3.56 (1)	6.03	0.59
			r) Water Expn. Tank to Rack Bolts	0.75 (Tension)	0.97 (1)	35.95	0.03
			s) Water Expn. Tank to Rack Bolts	0.66 (Shear)	0.85 (1)	17.98	0.05
			-Div. 3 Generator				
			a) Rotor Shaft	24.3	24.3 (3)	35.6	0.68
			b) Anchor Bolts	37.8	37.8 (3)	44.0	0.86
			c) Bearing Cap Housing Bolts	6.34	6.34 (3)	44.0	0.14



TABLE 1 (Cont'd)

MECHANICAL EQUIPMENT SERVICE LEVEL C STRESS COMPARISON  
WITH LEVEL C ALLOWABLE VALUES

<u>ITEM</u>	<u>EQUIPMENT</u>	<u>BLDG/ELEV.</u>	<u>MAX. STRESSED COMPONENTS</u>	<u>SERVICE LEVEL C STRESS (KSI)</u>	<u>REVISED SERVICE LEVEL C STRESS (KSI)</u>	<u>ALLOWABLE STRESS (KSI)</u>	<u>REVISED/ ALLOWABLE</u>
1	Division III Diesel Generator System (Cont'd)	Diesel/737'	-Div. 3 Generator (cont'd)				
			d) Bearing Bracket to Stator End Frame Welds	2.2	2.2 (3)	14.0	0.16
			e) Ribs connecting BHB to BHB	6.2 (Compression)	6.2 (3)	17.6	0.35
			Ring	0.21 (Bending)	0.21 (3)	14.4	0.01
			f) Stator Shell to Stator End Frame Weld	8.0 (Shear)	8.0 (3)	27.0	0.30
			g) Rotor Dove- tail	2.44	2.44 (3)	7.64	0.32
			h) Spider	10.3 (Tension)	10.3 (3)	13.5	0.76
				6.06 (Shear)	6.06 (3)	12.0	0.51
				10.3 (Bending)	10.3 (3)	22.5	0.46
				6.27 (Tension)	6.27 (3)	13.5	0.46

- NOTES: (1) Refer to Attachment 1 to table 1 for derivation of revised Service Level C Stresses.
- (2) The Seismic Qualification Package states that the resultant Service Level C stresses are below design limits for these items, but does not provide specific allowable limits. However, these resultant stresses are low by inspection and it is concluded that the equipment remains acceptable.
- (3) Refer to Attachment 2 to table 1 for derivation of revised Service Level C Stresses.

ATTACHMENT 1 TO TABLE 1

Derivation of revised Service Level C Stresses for the Division III  
Emergency Diesel Generator Set.

The Division III Emergency Diesel Generator Set is qualified in package  
SQ-CL027 for the following peak accelerations:

$$\begin{aligned} H_1 &= 0.85g \\ H_2 &= 0.89g \quad \text{SSE, 3\% Damping} \\ V &= 4.70g \end{aligned}$$

From the Revised Response Spectra at 3% damping, the revised seismic  
coefficients are obtained:

$$\begin{aligned} H_{NS} &= 1.1g \\ H_{EW} &= 1.1g \\ V &= 2.5g \end{aligned}$$

Considering the "Worst Case" ratio of Revised/Qualified:

$$1.1g/0.85g = 1.29g$$

Therefore, the existing service Level C Stresses are multiplied by 1.29  
in order to obtain the revised service Level C Stresses.

ATTACHMENT 2 TO TABLE 1

Derivation of revised Service Level C Stresses for the Division III generator (1E22-S001A)

Seismic qualification package SQ-CL680 determined that the generator is rigid and then performed a static/simplified dynamic analysis with Service Level C seismic coefficients as follows:

$$\begin{aligned} H_1 &= 0.55g \\ H_2 &= 0.55g \quad \text{SSE, 2\% Damping} \\ V &= 1.2g \end{aligned}$$

Since the equipment is rigid, we will use the applicable ZPAs from the Revised Response Spectra (at 2% Damping) in order to modify component stresses.

Revised Seismic Coefficients:

$$\begin{aligned} H_1 &= 0.27g \quad (\text{E-W}) \\ H_2 &= 0.25g \quad (\text{N-S}) \\ V &= 0.8g \end{aligned}$$

Note that the seismic coefficients obtained from the Revised Response Spectra are less than those used in the original analysis. Therefore, the component stresses were not modified and the Division III generator remains acceptable.