

GRAND GULF NUCLEAR STATION UNITS 1 & 2

SEISMIC QUALIFICATION EVALUATION CLASS 1E EQUIPMENT

COMPONENT NAME: HIGH PRESSURE CORE SPRAY DIESEL GENERATOR
MPL OR EDL ITEM NO.: SYSTEM Attached
MPL REFERENCE: E22-S001, S002, S003, S004

PRELIMINARY

PREPARED BY: W.C. Sherbin, Sr. Engineer DATE 4/20/82

ORGANIZATION GE - Qualification Engineering -- Valley Forge, PA

REVIEWED BY: Carl Schmid, Sr. Engineer DATE Apr. 20, 1982

8204300121

APPROVED BY: N. Luria, Manager DATE _____
Qualification Engineering

GENERAL  ELECTRIC

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1.0 GRAND GULF HPCS SEISMIC QUALIFICATION

Table 1 below lists the items and qualification methods used on the Grand Gulf HPCS System. Each one is discussed separately in this report.

TABLE 1. Grand Gulf HPCS System

<u>MPL NUMBER</u>	<u>ITEM</u>	<u>QUALIFICATION METHODS</u>
E22-S001	HPCS Diesel Engine - Generator	Analysis and Test
E22-S002	Motor Control Center	Test
E22-S003	HPCS Transformer	Test
E22-S004	HPCS Switchgear	Test

1.1 E22-S001, HPCS Diesel Engine - Generator

The Diesel Engine - Generator qualification is based on stress analyses and seismic testing performed by the vendor. Table 2 shows a summary of the critical items that are fastened or electrically connected to the engine - generator. Items 1 through 17 are qualified by stress analysis with positive margins of safety and resonant frequencies greater than 33 hertz. The analyses are contained in References 1,2,3 & 7. Item 18, the Mechanical Overspeed Trip, is seismically qualified by an operability verification. The analysis is contained in Reference 4. The Battery and Rack, item 19, was tested to 1.5g biaxial at resonance. Reference 5 contains the test report. Item 20, the Engine - Generator Starting and Control System is qualified by similarity to a tested Cofrentes unit. The vendor still needs to certify the seismic capability of a modified reactor bracket. The test report of the Cofrentes unit is contained in reference 6.

1.2 E22-S002, Motor Control Center

The Motor Control Center is qualified to SQRT criteria. The forms are in the attached Appendix 1.

TABLE 2
HPCS DIESEL GENERATOR

MPL No. E22-S001

Critical Locations	Wt. (lbs)	Loading Combination	Calc. Max. Tensile Stress	Allow. Tensile Stress	Margin Of Safety, %
• <u>Stress Evaluations</u>					
1. Air intake filter	250	3gH + 2gV	2,168	40,000	> 500
2. Accessory rack	4,500	3gH + 2gV	8,978	40,000	345
3. Engine lube oil filter	1,000	3gH + 2gV	8,107	40,000	393
4. Water expansion tank	925	3gH + 2gV	11,250	40,000	> 500
5. Governor	100	3gH + 2gV	1,341	40,000	> 500
6. Primary oil pump	197	3gH + 2gV	2,062	40,000	> 500
7. Scavenging oil filter	203	3gH + 2gV	3,298	40,000	> 500
8. Scavenging oil pump	230	3gH + 2gV	3,446	40,000	> 500
9. Engine lube oil cooler	1,230	3gH + 2gV	4,223	22,000	420
10. Engine at base	28,150	2.12gH + 1.5gV	10,989	40,000	243
11. Generator at base	41,500	2.12gH + 1.5gV	10,653	40,000	209
12. Engine at foundation	43,000	2.12gH + 1.5gV	12,158	40,000	199
13. Generator at foundation	43,604	2.12gH + 1.5gV	8,069	40,000	383
14. Heat Exchanger	2,095	2.12gH + 1.5gV	9,333	40,000	329
15. Air turning box	500	2.12gH + 1.5gV	5,539	40,000	> 500
16. Air receiver assembly	7,156	3gH + 2gV			281 MIN.
17. Compressor air tanks	983	1.5gH + 1.5gV	13,980	38,000 yield	POSITIVE
• <u>Operability Consideration</u>					
18. Mechanical overspeed trip	-----	3gH + 2gV	Operates	Satisfac- torily	65
• <u>Seismic Tests</u>					
19. Battery and Rack	1,200	1.5gH + 1.5gV biaxial at reson- ances	Operates	Satisfac- torily	-----
20. Engine Generator Starting and Control System	9,200	TRS envelopes RRS (IEEE 344-1975)	Operates	Satisfac- torily (Vendor to certify bracket change)	

NOTE: Allow tensiles reduced per Section 1.6.3 of the AISC Steel Handbook

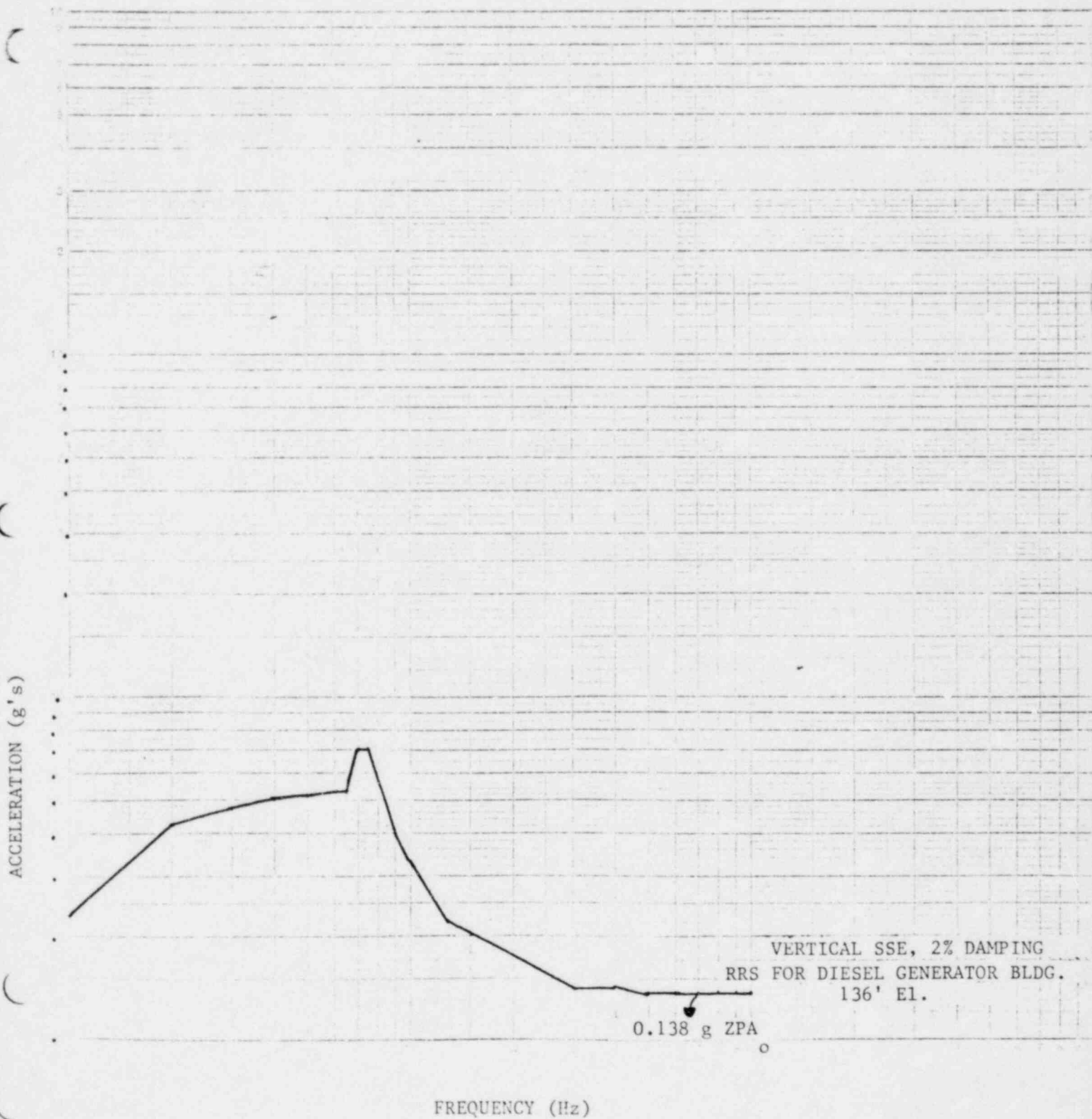
$$* \text{ Margin of Safety} = \left[\frac{\text{ALLOWABLE STRESS}}{\text{CALCULATED STRESS}} - 1 \right] 100 = \%$$

1.3 E22-S003, HPCS Transformer

The HPCS Transformer is qualified to SQRT criteria. The forms are in the attached Appendix 2.

1.4 E22-S004, HPCS Switchgear

The HPCS Switchgear is qualified to SQRT criteria. The forms are in the attached Appendix 3.



ACCELERATION (g's)

0.219 g ZPA

HORIZONTAL SSE, 2% DAMPING

RRS FOR DIESEL GENERATOR BLDG.,
136' EL.

FREQUENCY (Hz)

REFERENCES

1. Seismic Analysis of Diesel Emergency Generator, GE VPF #3636-67-2, September 4, 1975.
2. Seismic Analysis of Diesel Emergency Generator, GE VPF #3737-62-3, April 28, 1975.
3. Seismic Analysis of the Horizontal Cylinder Compressor Air Tanks, GE VPF #3737-82-1, March 12, 1975.
4. Seismic Calculations, Part Number 5-046-12-102-004; GE VPF #3636-81-2, November 11, 1974.
5. Seismic Test of an Emergency Generator Starting and Control System, Wyle Report #42749-1, June 24, 1974.
6. Seismic Test Report, Engine Generator Control Panel Switchgear Assembly, Wyle Report #43026-1, October 22, 1975.
7. Dynamic Behavior of the Mechanical Overspeed Trip on the General Motors Diesel Engine, 654 Series, When Subjected To Seismic Excitations, GE VPF #3737-93-1, July 5, 1974.

APPENDIX 1

Qualification Summary of Equipment

MPL: E22-S002

I. Plant Name: Grand Gulf Nuclear Station

Type:

1. Utility: Missippi Power & Light

PWR

2. NSSS: GE 3. A/E: Bechtel

BWR- 6-Mk III

II. Component Name Low Voltage Motor Control Center

1. Scope: ☒ NSSS ☐ BOP

2. Model Number: Series P-32000 Quantity: 1

3. Vendor: Powell Electrical Manufacturing Company

4. If the component is a cabinet or panel, name and model No. of the devices included: Panel was tested as a unit.

5. Physical Description a. Appearance 6-Bay Cabinet

b. Dimensions 120 in. Wide X 90 in. High X 30 in. Deep

c. Weight 4200 lbs.

6. Location: Building: Control Building

Elevation: 111 feet

7. Field Mounting Conditions ☒ Bolt (No. 12, Size 5/8")
☒ Weld (Length 3 1/2", every 15")
☐

8. a. System in which located: High Pressure Core Spray (HPCS)

b. Functional Description: Inject High Pressure Water

c. Is the equipment required for ☐ Hot Standby ☐ Cold Shutdown
☒ Both ☐ Neither

9. Pertinent Reference Design Specifications: GE Purchasing Spec. No.
21A9301 and Powell Drawing No. B57746-6

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III. Is Equipment Available for Inspection in the Plant: ☒ Yes ☐ No

IV. Equipment Qualification Method:

☒ Test ☐ Analysis ☐ Combination of Test and Analysis

Qualification Report*: Seismic Test Report Number 43549-1

(No., Title and Date) Low Voltage MCC Seismic Test

Company that Prepared Report: Wyle Labs, May 6, 1977

Company that Reviewed Report: GE

V. Vibration Input:

1. Loads considered: a. ☒ Seismic only

b. ☐ Hydrodynamic only

c. ☐ Combination of (a) and (b)

2. Method of Combining RRS: ☐ Absolute Sum ☐ SRSS ☐ N/A
(other, specify)

3. Required Response Spectra (attach the graphs): Attached

4. Damping Corresponding to RRS: OBE N/A SSE 2%

5. Required Acceleration in Each Direction: ☒ ZPA ☐ Other
(specify)

OBE	S/S =	<u>N/A</u>	F/B =	<u>N/A</u>	V =	<u>N/A</u>
SSE	S/S =	<u>0.26</u>	F/B =	<u>0.26</u>	V =	<u>0.21</u>

6. Were fatigue effects or other vibration loads considered?

☐ Yes ☒ No

If yes, describe loads considered and how they were treated in overall qualification program: _____

*NOTE: If more than one report complete items IV thru VII for each report.

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VI. If Qualification by Test, then Complete*:

1. ☐ Single Frequency ☒ Multi-Frequency: ☒ random ☒ sine beat
2. ☐ Single Axis ☒ Multi-Axis (with sine beat)
3. No. of Qualification Tests: OBE 0 SSE 77 Other 2 Sine Sweep (specify)
4. Frequency Range: 1-250 Hz
5. Natural Frequencies in Each Direction (Side/Side, Front/Back, Vertical):
S/S = 18 Hz F/B = 15 Hz V = 16 Hz
6. Method of Determining Natural Frequencies
☒ Lab Test ☐ In-Situ Test ☐ Analysis
7. TRS enveloping RRS using Multi-Frequency Test ☒ Yes (Attach TRS & RRS graphs) ☐ No
8. Input g-level Test: OBE S/S = F/B = V =
SSE S/S = 1.8 F/B = 1.8 V = 1.7
9. Laboratory Mounting:
1. ☐ Bolt (No. , Size) ☒ Weld (Length) ☐
10. Functional operability verified: ☒ Yes ☐ No ☐ Not Applicable
See Note 1
11. Test Results including modifications made: Specimen operated satisfactorily in side-side/vertical orientation. Contact chatter is noted in front-back/vertical tests. After modifications were made, the specimen passed the front-back/vertical tests. These modifications were necessary after 29 tests.
12. Other test performed (such as aging or fragility test, including results):
None

*Note: If qualification by a combination of test and analysis also complete Item VII.

NOTE 1: The unit at Grand Gulf has all the seismic bracing as required after seismic testing. However, per paragraph 6.3.1 of referenced seismic report, tray 5A required adding a screw through the side after test 57 to prevent contact chatter. The manufacturer claims that there is no other documentation to support the addition of this screw. It is his opinion that the technical reviewers of the test decided that it was not necessary. The test ZPA's in this case was 2.8g horizontal and 4.0g vertical.

VII. If Qualification by Analysis, then complete:

N/A

1. Method of Analysis:

☐ Static Analysis ☐ Equivalent Static Analysis

☐ Dynamic Analysis: ☐ Time-History ☐ Response Spectrum

2. Natural Frequencies in Each Direction (Side/Side, Front/Back, Vertical):

S/S = _____ F/B = _____ V = _____

3. Model Type: ☐ 3D

☐ 2D

☐ 1D

☐ Finite Element ☐ Beam

☐ Closed Form Solution

4. ☐ Computer Codes: _____

Frequency Range and No. of modes considered: _____

☐ Hand Calculations

5. Method of Combining Dynamic Responses: ☐ Absolute Sum ☐ SRSS

☐ Other: _____

(specify)

6. Damping: OBE _____ SSE _____ Basis for the damping used: _____

7. Support Considerations in the model: _____

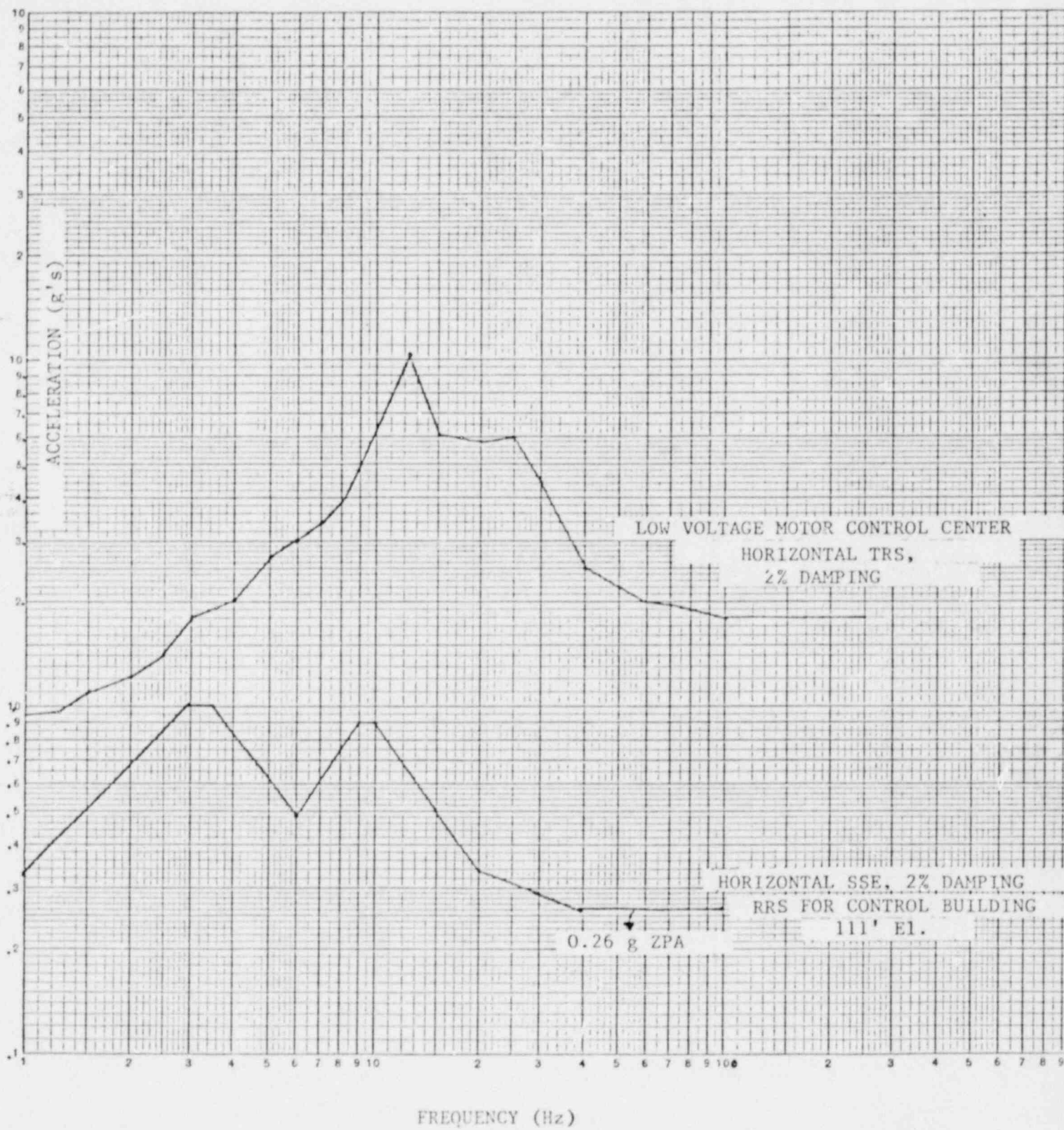
8. Critical Structural Elements:

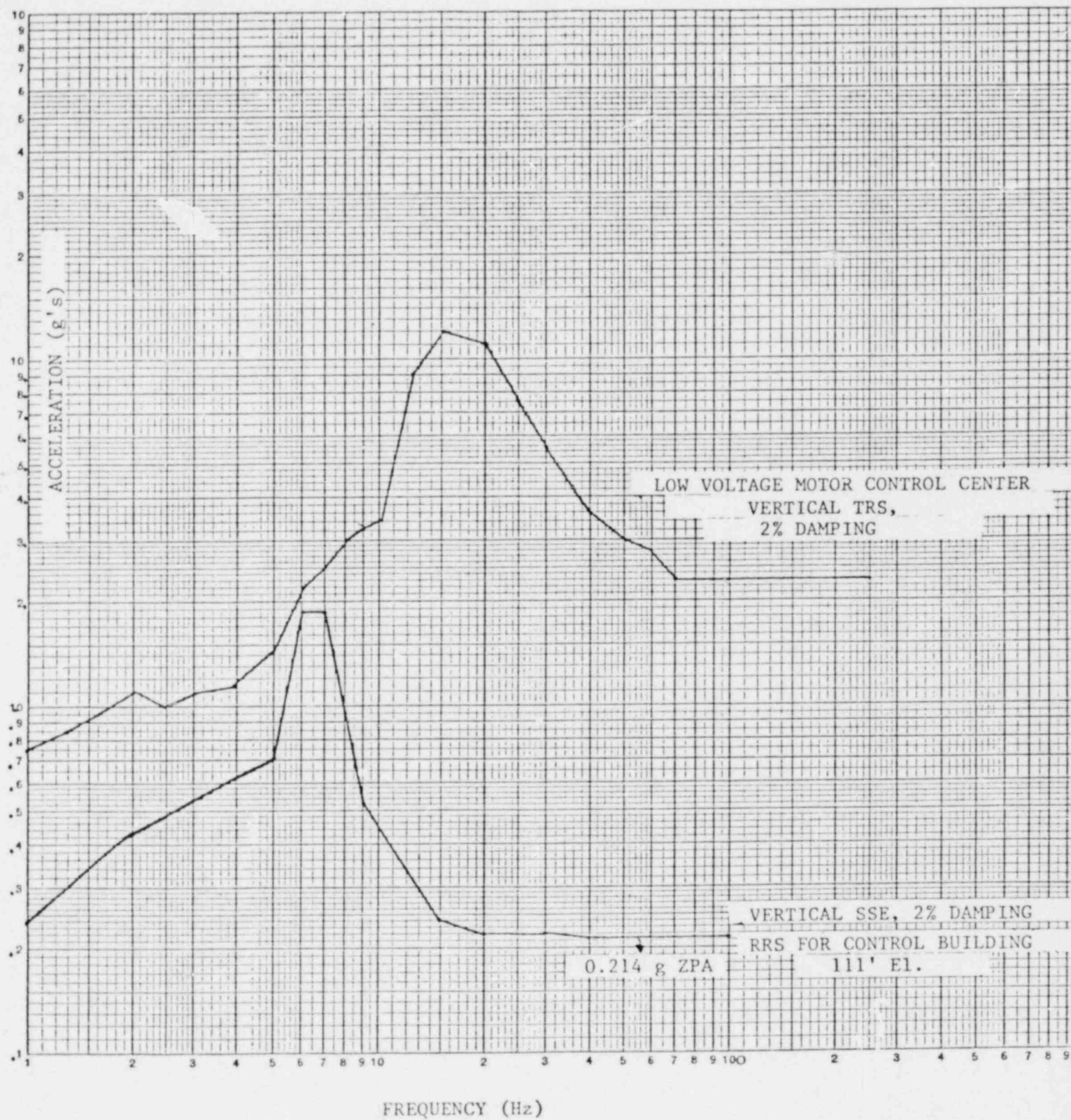
A. Identification	Location	Governing Load	Seismic	Total	Stress
		or Response			
		Combination	Stress	Stress	Allowable

B. Max. Critical
Deflection

Location

Maximum Allowable Deflection
to Assure Functional Opera-
bility





APPENDIX 2

Qualification Summary of Equipment

MPL: E22-S003

I. Plant Name: Grand Gulf Nuclear Station

Type:

1. Utility: Mississippi Power & Light

PWR

2. NSSS: GE 3. A/E: Bechtel

BWR- 6-Nk III

II. Component Name Transformer

1. Scope: ☒ NSSS ☐ BOP

2. Model Number: Elma Engineering #376 Quantity: 1 ea.

3. Vendor: Elma Engineering

4. If the component is a cabinet or panel, name and model No. of the devices included: Transformer was tested as a unit.

5. Physical Description a. Appearance Sheet steel enclosure

b. Dimensions 50"W X 54"H X 30"Dp.

c. Weight 3550 lbs.

6. Location: Building: Control Building

Elevation: 111 feet

7. Field Mounting Conditions ☒ Bolt (No. 6, Size 1/2 in.)
☐ Weld (Length)

8. a. System in which located: High Pressure Core Spray (HPCS)

b. Functional Description: Inject High Pressure Water

c. Is the equipment required for ☐ Hot Standby ☐ Cold Shutdown
☒ Both ☐ Neither

9. Pertinent Reference Design Specifications: GE Purchase Spec. # 21A3598
and Drawing # 163C1398

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III. Is Equipment Available for Inspection in the Plant: ☒ Yes ☐ No

IV. Equipment Qualification Method:

☒ Test ☐ Analysis ☐ Combination of Test and Analysis

Qualification Report*: Seismic Testing of 750 Kva Transformer for Elma Engineering

(No., Title and Date) Report # 58338, September 18, 1978

Company that Prepared Report: Wyle Laboratories

Company that Reviewed Report: General Electric Company

V. Vibration Input:

1. Loads considered: a. ☒ Seismic only
 b. ☐ Hydrodynamic only
 c. ☐ Combination of (a) and (b)

2. Method of Combining RRS: ☐ Absolute Sum ☐ SRSS ☐ N/A
 (other, specify)

3. Required Response Spectra (attach the graphs): Attached

4. Damping Corresponding to RRS: OBE N/A SSE 2%

5. Required Acceleration in Each Direction: ☒ ZPA ☐ Other
 (specify)

OBE	S/S =	<u>N/A</u>	F/B =	<u>N/A</u>	V =	<u>N/A</u>
SSE	S/S =	<u>0.26</u>	F/B =	<u>0.26</u>	V =	<u>0.21</u>

6. Were fatigue effects or other vibration loads considered?

☐ Yes ☒ No

If yes, describe loads considered and how they were treated in overall qualification program: _____

*NOTE: If more than one report complete items IV thru VII for each report.

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VI. If Qualification by Test, then Complete*:

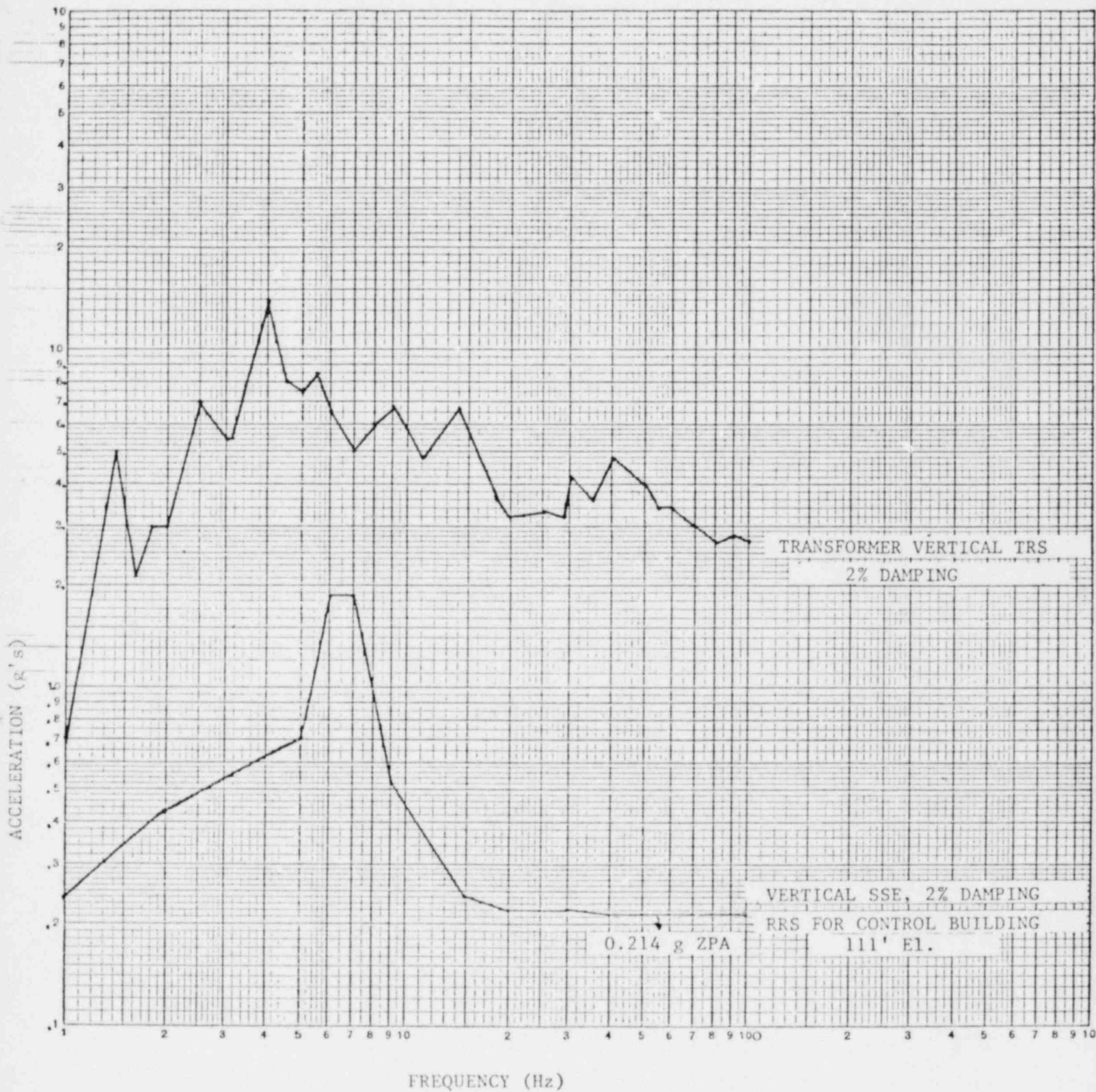
1. ☐ Single Frequency ☒ Multi-Frequency: ☒ random ☒ sine beat
2. ☐ Single Axis ☒ Multi-Axis
3. No. of Qualification Tests: OBE 0 SSE 11 Other (specify)
4. Frequency Range: 1.25 to 100 Hz
5. Natural Frequencies in Each Direction (Side/Side, Front/Back, Vertical):
S/S = none detected F/B = none detected V = none detected
6. Method of Determining Natural Frequencies
☒ Lab Test ☐ In-Situ Test ☐ Analysis
7. TRS enveloping RRS using Multi-Frequency Test ☒ Yes (Attach TRS & RRS graphs) ☐ No
8. Input g-level Test: OBE S/S = N/A F/B = N/A V = N/A
SSE S/S = 1.8 F/B = 1.8 V = 2.7
9. Laboratory Mounting:
1. ☒ Bolt (No. 6, Size 1/2 in.) ☐ Weld (Length) ☐
10. Functional operability verified: ☒ Yes ☐ No ☐ Not Applicable
11. Test Results including modifications made: At 5Hz sine beat (X-Y) three 3/8 inch bolts sheared. This had no effect on function. Bolts changed to 1/2 inch and retested. The Grand Gulf installation has 1/2" bolts.
12. Other test performed (such as aging or fragility test, including results):

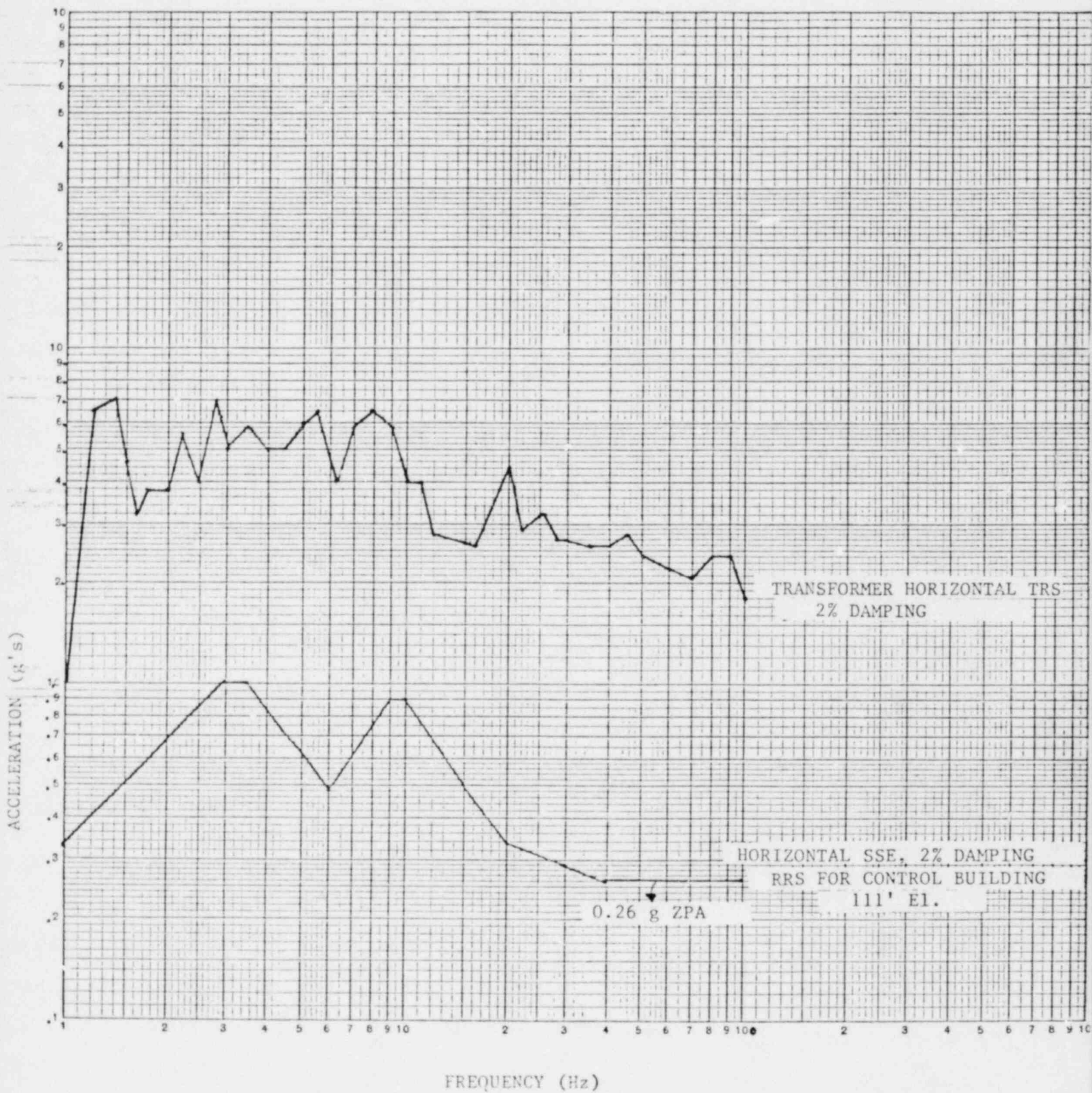
*Note: If qualification by a combination of test and analysis also complete Item VII.

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N/A

- Maximum Allowable Deflection
-
- to Assure Functional Opera-
-
- bility





APPENDIX 3

Qualification Summary of Equipment

MPL: E22-S004

I. Plant Name: Grand Gulf Nuclear Station

Type:

1. Utility: Mississippi Power & Light

PWR

2. NSSS: GE

3. A/E: Bechtel

BWR - 6-Mk III

II. Component Name HPCS Metalclad Switchgear, 4.16KV - 1200A - 350 MVA

1. Scope: ☐ NSSS ☐ BOP

2. Model Number: GE Type M26H Quantity: 1 (8 bay)

3. Vendor: General Electric

4. If the component is a cabinet or panel, name and model No. of the devices included: Device list attached

5. Physical Description a. Appearance 8-bay rack

b. Dimensions 17'4" Wide X 6'7" Deep X 7'6" High

c. Weight 26,250 lbs

6. Location: Building: Control Building

Elevation: 111 feet

7. Field Mounting Conditions ☒ Bolt (No. 4 in front & 2 in rear of each bay, Size 1/2")
☐ Weld (Length)

8. a. System in which located: High Pressure Core Spray (HPCS)

b. Functional Description: Inject High Pressure Water

c. Is the equipment required for ☐ Hot Standby ☐ Cold Shutdown
☒ Both ☐ Neither

9. Pertinent Reference Design Specifications: GE Purchase Spec

21A9300AL and GE Swgr. Dwg. 0126D9539

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III. Is Equipment Available for Inspection in the Plant: ☒ Yes ☐ No

IV. Equipment Qualification Method:

☒ Test ☐ Analysis ☐ Combination of Test and Analysis

Qualification Report*: Seismic Simulation Test Program on
 (No., Title and Date) 4.16KV-1200A-350MVA Metalclad Switchgear
 Company that Prepared Report: Wyle Labs #43581-1
 Company that Reviewed Report: GE

V. Vibration Input:

1. Loads considered: a. ☒ Seismic only
 b. ☐ Hydrodynamic only
 c. ☐ Combination of (a) and (b)

2. Method of Combining RRS: ☐ Absolute Sum ☐ SRSS ☐ N/A
 (other, specify)

3. Required Response Spectra (attach the graphs): Attached

4. Damping Corresponding to RRS: OBE N/A SSE 2%

5. Required Acceleration in Each Direction: ☒ ZPA ☐ Other
 (specify)

OBE	S/S =	<u>N/A</u>	F/B =	<u>N/A</u>	V =	<u>N/A</u>
SSE	S/S =	<u>0.26</u>	F/B =	<u>0.26</u>	V =	<u>0.21</u>

6. Were fatigue effects or other vibration loads considered?

☐ Yes ☒ No

If yes, describe loads considered and how they were treated in overall qualification program: _____

*NOTE: If more than one report complete items IV thru VII for each report.

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VI. If Qualification by Test, then Complete*:

1. ☐ Single Frequency ☒ Multi-Frequency: ☒ random ☒ sine beat
2. ☐ Single Axis ☒ Multi-Axis (with sine beat) _____
3. No. of Qualification Tests: OBE 0 SSE 61 Other 3 sine sweeps (specify)
4. Frequency Range: 0-250 Hz
5. Natural Frequencies in Each Direction (Side/Side, Front/Back, Vertical):
S/S = 7 Hz F/B = 8 Hz, 18 Hz V = 23 Hz
6. Method of Determining Natural Frequencies
☐ Lab Test ☐ In-Situ Test ☐ Analysis
7. TRS enveloping RRS using Multi-Frequency Test ☒ Yes (Attach TRS & RRS graphs)
☐ No
8. Input g-level Test: OBE S/S = _____ F/B = _____ V = _____
ZPA SSE S/S = 2.0 F/B = 1.8 V = 2.25
9. Laboratory Mounting:
1. ☒ Bolt (No. _____, Size _____) ☐ Weld (Length _____) ☐ _____
10. Functional operability verified: ☒ Yes ☐ No ☐ Not Applicable
11. Test Results including modifications made: _____

12. Other test performed (such as aging or fragility test, including results):
See attached device list.

*Note: If qualification by a combination of test and analysis also complete Item VII.

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VII. If Qualification by Analysis, then complete:

N/A

1. Method of Analysis:

- ☐ Static Analysis ☐ Equivalent Static Analysis
☐ Dynamic Analysis: ☐ Time-History ☐ Response Spectrum

2. Natural Frequencies in Each Direction (Side/Side, Front/Back, Vertical):

S/S = _____ F/B = _____ V = _____

3. Model Type: ☐ 3D ☐ 2D ☐ 1D
☐ Finite Element ☐ Beam ☐ Closed Form Solution

4. ☐ Computer Codes: _____

Frequency Range and No. of modes considered: _____

☐ Hand Calculations

5. Method of Combining Dynamic Responses: ☐ Absolute Sum ☐ SRSS
☐ Other: _____
(specify)

6. Damping: OBE _____ SSE _____ Basis for the damping used: _____

7. Support Considerations in the model: _____

8. Critical Structural Elements:

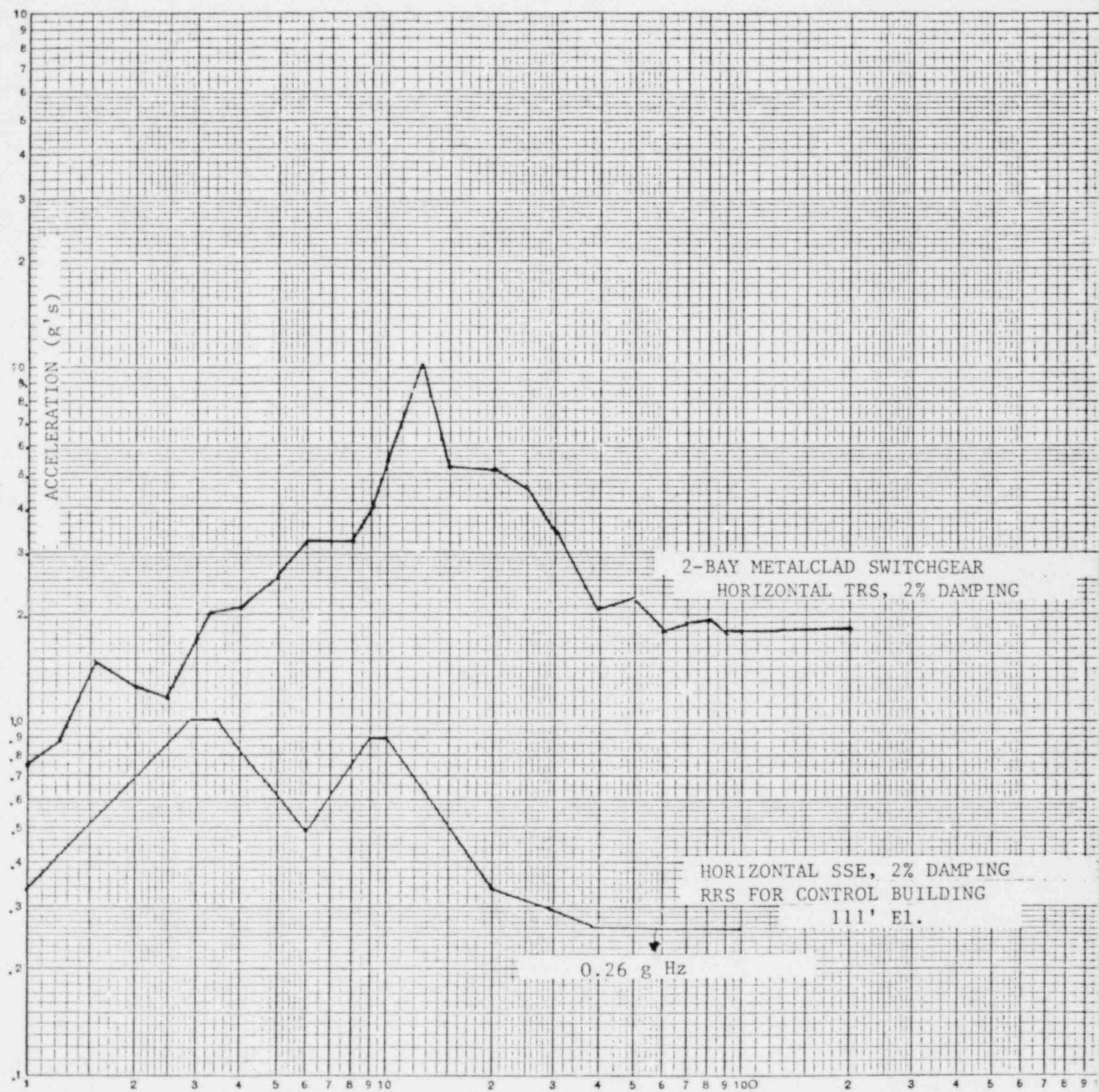
A. Identification	Location	Governing Load or Response Combination	Seismic Stress	Total Stress	Stress Allowable

B. Max. Critical Deflection	Location	Maximum Allowable Deflection to Assure Functional Opera- bility

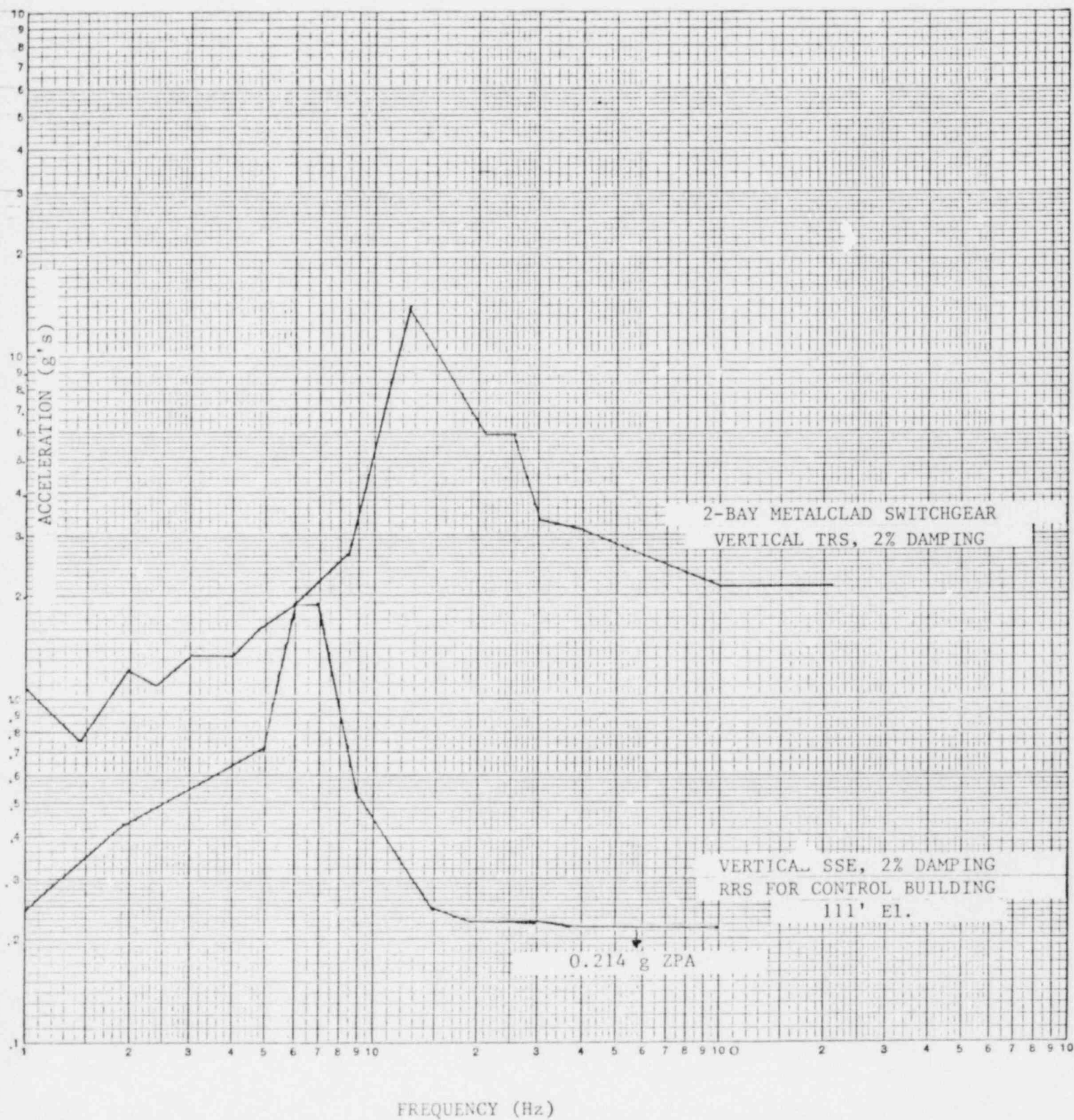
100

4

System: HPCS Metalclad Switchgear



FREQUENCY (Hz)



ATTACHMENT NO. 4

Electroswitch Series 20K Switches on Panel H13-P601
C41A-S01, E12A-S03, E12A-S57, E21A-S07, E22A-S03,
E21A-S06, E22B-S02/S07/S09/S10/S15/S16, E51A-S15

GRAND GULF
NUCLEAR STATION
UNIT 1

SEISMIC AND HYDRODYNAMIC LOADS
REQUALIFICATION CERTIFICATION

JOB NO. MPL-02

EQUIPMENT NAME: ECCS Switches, Panel H13-P601 SPEC. NO:

EQUIPMENT NO: See Attached List

LOCATION: Control Room

EQUIPMENT CLASSIFICATION: ☒ ACTIVE ☐ PASSIVE

SEISMIC QUALIFICATION REPORT REFERENCE:

Electroswitch Corp. Engineering Test Report No. 1981-2
Electroswitch Corp. Engineering Test Report No. 2392-10

THE ABOVE SEISMIC QUALIFICATION REPORT(S) HAVE BEEN REEVALUATED AND
REQUALIFIED WHERE NECESSARY TO SHOW THAT THE ABOVE-MENTIONED COMPONENT
IS CAPABLE OF PERFORMING ITS INTENDED SAFETY FUNCTION UNDER ALL THE
APPLICABLE LOADING COMBINATIONS INCLUDING THE POOL DYNAMIC LOADS.

PREPARED: G.P. Chew
APPROVED: V.J. Brocato
DATE: 4/20/82

GRAND GULF NUCLEAR STATION UNIT 1

QUALIFICATION SUMMARY

1. Equipment Name ECCS Switches, Panel H13-P601
2. Equipment No. See Attached List
3. Qualification Documentation (Enclosed with this report.)
 - A. Qualification Summary of Equipment (SQRT form), including required response spectra with TRS plotted on RRS graph as appropriate.

B. Reference Documents

Reference Number	Document Identification	Revision or Date	Title/Subject
1	1981-2	11/20/75	Engineering Test Report
2	2392-10	11/29/78	Engineering Test Report

C. Additional Supporting Documents

Document Identification	Revision or Date	Title/Subject
SQRT Forms	3/27/81	Panel H13-P601 Qualification

QUALIFICATION SUMMARY (CONTINUED)

EQUIPMENT NO. See Attached

4. Functional Requirements

Switches are active and are required to remain operable during and after a seismic event.

5. Demonstration Capability

Specimens were subjected to seismic loads greater than required for Grand Gulf installation. Specimens functioned properly throughout testing and showed no signs of damage or deterioration.

6. Rationale for Qualification Certification

(Include Decision analysis with comparison to acceptance criteria, approach for demonstrating operability, and consideration of high-frequency response.)

The switches are located in panel H13-P601 which was tested seismically to envelop the Grand Gulf RRS. The TRS enveloped the RRS by a large margin resulting in measured accelerations at the panel device locations being excessive. The panel TRS and responses were ratioed down such that the adjusted TRS enveloped the RRS by a factor of two. The resulting adjusted device accelerations are enveloped by the switch test data, indicating the switches satisfactorily meet the Grand Gulf requirements with margin.

Qualification Summary of Equipment

I. Plant Name: Grand Gulf Nuclear Station Unit I

Type:

1. Utility: Mississippi Power and Light Co.

PWR

2. NSSS: G.E.

3. A/E: Bechtel Power Corp.

BWR 6, Mark III

II. Component Name ECCS Switches, Panel H13-P601 (See Attached)

1. Scope: ☒ NSSS ☐ BOP

2. Model Number: Series 20K

Quantity: 14

3. Vendor: Electroswitch Corp.

4. If the component is a cabinet or panel, name and model No. of the devices included: N/A

5. Physical Description a. Appearance 6 deck switch

b. Dimensions 4½" L x 2" x 2"

c. Weight 1½ lbs.

6. Location: Building: Control Room

Elevation: 166'

7. Field Mounting Conditions ☐ Bolt (No. _____, Size _____)
☐ Weld (Length _____)
☒ Panel Mounted

8. a. System in which located: RHR

b. Functional Description: Manual Start of RHR Pump

c. Is the equipment required for ☒ Hot Standby ☐ Cold Shutdown
☐ Both ☐ Neither

9. Pertinent Reference Design Specifications:

Prepared by: B. Chow 4/20/82

Verified by: B. Fath 4/20/82

12/80

III. Is Equipment Available for Inspection in the Plant: ☒ Yes ☐ No

IV. Equipment Qualification Method:

☒ Test

☐ Analysis

☐ Combination of Test
and Analysis

Qualification Report*: 1981-2, Report of Seismic Qual. Tests

(No., Title and Date) Series 10 and Series 20 Switches, 11/20/75

Company that Prepared Report: Electroswitch Corp.

Company that Reviewed Report: NUTECH

Report referenced for resonance search results only. Switch
contained 10 decks, whereas Grand Gulf has 6 decks.

V. Vibration Input:

1. Loads considered: a. ☒ Seismic only

b. ☐ Hydrodynamic only

c. ☐ Combination of (a) and (b)

2. Method of Combining RRS: ☐ Absolute Sum ☐ SRSS ☐ (other, specify)

3. Required Response Spectra (attach the graphs): _____

4. Damping Corresponding to RRS: OBE _____ SSE _____

5. Required Acceleration in Each Direction: ☒ ZPA ☐ Other
(specify) _____

OBE	S/S =	F/B =	V =
SSE	S/S =	F/B =	V =

6. Were fatigue effects or other vibration loads considered?

☐ Yes ☒ No

If yes, describe loads considered and how they were treated in overall
qualification program: _____

*NOTE: If more than one report complete items IV thru VII for each report.

VI. If Qualification by Test, then Complete*:

1. ☐ Single Frequency ☒ Multi-Frequency: ☐ random ☐ sine beat
☐ ☐ ☐
2. ☐ Single Axis ☒ Multi-Axis
3. No. of Qualification Tests: OBE _____ SSE _____ Other _____
(specify)
4. Frequency Range: 0.5-35 Hz
5. Natural Frequencies in Each Direction (Side/Side, Front/Back, Vertical):
S/S = >35 Hz F/B = >35 Hz V = >35 Hz
6. Method of Determining Natural Frequencies
☒ Lab Test ☐ In-Situ Test ☐ Analysis
7. TRS enveloping RRS using Multi-Frequency Test ☐ Yes (Attach TRS & RRS graphs)
☐ No
8. Input g-level Test: OBE S/S = _____ F/B = _____ V = _____
SSE S/S = _____ F/B = _____ V = _____
9. Laboratory Mounting:
1. ☐ Bolt (No. _____, Size _____) ☐ Weld (Length _____) ☐ _____
10. Functional operability verified: ☐ Yes ☐ No ☐ Not Applicable
11. Test Results including modifications made: _____

12. Other test performed (such as aging or fragility test, including results):

*Note: If qualification by a combination of test and analysis also complete Item VII.

III. Is Equipment Available for Inspection in the Plant: ☒ Yes ☐ No

IV. Equipment Qualification Method:

☒ Test

☐ Analysis

☐ Combination of Test
and Analysis

Qualification Report*: 2392-10, Qual. Inspection of Series 20K

(No., Title and Date) Instrument and Control Switch, 11/29/78

Company that Prepared Report: Electroswitch Corp.

Company that Reviewed Report: NUTECH

Specimens had 12 decks, whereas Grand Gulf has 6 decks.

V. Vibration Input:

1. Loads considered: a. ☒ Seismic only

b. ☐ Hydrodynamic only

c. ☐ Combination of (a) and (b)

2. Method of Combining RRS: ☐ Absolute Sum ☐ SRSS ☒ panel test data
(other, specify)

3. Required Response Spectra (attach the graphs): See adjusted panel data

4. Damping Corresponding to RRS: OBE 4% SSE 4%

5. Required Acceleration in Each Direction: ☒ ZPA ☐ Other
(specify)

OBE	S/S =	<u><2.34</u>	F/B =	<u><2.34</u>	V =	<u><2.34</u>
SSE	S/S =	<u><4.68</u>	F/B =	<u><4.68</u>	V =	<u><4.68</u>

6. Were fatigue effects or other vibration loads considered?

☐ Yes ☒ No

If yes, describe loads considered and how they were treated in overall qualification program: _____

*NOTE: If more than one report complete items IV thru VII for each report.

VI. If Qualification by Test, then Complete*:

1. ☐ Single Frequency ☒ Multi-Frequency: ☐ random ☐ sine beat
2. ☐ Single Axis ☒ Multi-Axis
3. No. of Qualification Tests: OBE 5 SSE 1 Other (specify)
4. Frequency Range: 1 - 100 Hz
5. Natural Frequencies in Each Direction (Side/Side, Front/Back, Vertical):
 S/S = F/B = V =
6. Method of Determining Natural Frequencies Test Report #1981-2
☐ Lab Test ☐ In-Situ Test ☐ Analysis
7. TRS enveloping RRS using Multi-Frequency Test ☐ Yes (Attach TRS & RRS graphs)
☐ No
8. Input g-level Test: OBE S/S = 2.5 F/B = 2.5 V = 2.5
 SSE S/S = 5.0 F/B = 5.0 V = 5.0
9. Laboratory Mounting:
 1. ☐ Bolt (No. , Size) ☐ Weld (Length) ☐
10. Functional operability verified: ☒ Yes ☐ No ☐ Not Applicable
11. Test Results including modifications made: Specimens did not change
state due to seismic loads. No evidence of damage or deterioration
12. Other test performed (such as aging or fragility test, including results):
Environmental testing per IEEE 323-1974 prior to seismic
test. Performed satisfactorily.

*Note: If qualification by a combination of test and analysis also complete Item VII.

