



# THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

P.O. BOX 5000 - CLEVELAND, OHIO 44101 - TELEPHONE (216) 622-9800 - ILLUMINATING BLDG. - 55 PUBLIC SQUARE

*Serving The Best Location in the Nation*

MURRAY R. EDELMAN  
VICE PRESIDENT  
NUCLEAR

August 2, 1984  
PY-CEI/NRR 0129 L

Mr. B. J. Youngblood, Chief  
Licensing Branch No. 1  
Division of Licensing  
U. S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Perry Nuclear Power Plant  
Docket Nos. 50-440; 50-441  
Supplemental Information for  
Upcoming SQRT Audit

Dear Mr. Youngblood:

This submittal forwards completed copies of summary forms for one NSSS and one BOP item identified for the upcoming Seismic Qualification Review Team (SQRT) audit. These forms are provided for your information, and supplement the information provided on the completed forms submitted with our July 25, 1984 letter (PY-CEI/NRR-0126L). The previously submitted information was provided in the format transmitted to the Cleveland Electric Illuminating Company in your November 30, 1982 letter requesting information for the Plant Site Audit for Seismic and Dynamic Qualification Review for Perry Nuclear Power Plant.

If there are any further questions, please feel free to call.

Very truly yours,

Murray R. Edelman  
Vice President  
Nuclear Group

MRE:njc

## Attachments

cc: J. Silberg, Esq.  
J. Grobe, NRC Resident  
J. Stefano w/a  
G. Bagchi; NRC w/a  
J. Singh, E.G. & G. Idaho w/a

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A PDR

A048  
1/1

## QUALIFICATION SUMMARY OF EQUIPMENT

- ° To be completed to stand on its own (do not refer to any document)  
 ° All questions are to be answered (if not applicable; mark "N/A")

I. Plant Name: PERRY NUCLEAR POWER PLANT

1. Utility: CLEVELAND ELECTRIC ILLUMINATING

2. Location: PERRY, OHIO

3. Type: BWR-G 4. Capacity (MWe Net): 1205

5. Containment Type: MK-3 6. Cooling Source: LAKE ERIE

7. NRC Docket No.: 50-4404-441 8. CP Docket Date: 5-3-77

9. NSSS Vendor: GE 10. A/E: GAI

II. Component Name: REACTOR CORE ISOLATION COOLING STEAM TURBINE ASSEMBLY

1. Scope: ☒ NSSS ☐ BOP
2. Vendor: TERRY CORPORATION 3. Vendor Model No.: GS-2N
4. Manufacturer: SAME 5. Manufacturer Model No.: SAME
6. Purchase Spec. No.: 21A9526AE, R3 7. Total No. in Safety Systems: 1 PER UNIT
8. Location (Choose the worst one with respect to seismic)
- a. Building: AUX b. Elevation and Area: 599'-0" AS-3  
AD-6
- c. Environment: ☒ Harsh ☐ Mild
9. Field Mounting:
- a. ☐ Floor ☐ Wall ☐ Pipe ☐ Panel  
☒ Other (describe) TURBINE-FLOOR, CONTROLS -WALL
- b. ☒ Bolted; description: G - 1"  $\phi$   
---(no. size, grade, etc.)  
☐ Welded; description: ---  
(size, length, electrode type, etc.)  
☐ Other; description: ---
- c. Mounting restriction from the manufacturer, if any: (horizontal vertical, etc.) NONE
10. Functional Description of the Equipment:
- a. System in which located: REACTOR CORE ISOLATION COOLING  
 (for item 8 in II, above)
- b. Type: ☒ Active ☐ Passive
- c. Equipment required for: ☒ Hot standby ☐ Cold shutdown  
☐ Both ☐ Neither
- d. Intended safety function: RCIC TURBINE DRIVES THE RCIC PUMP, PROVIDING  
WATER TO THE REACTOR VESSEL TO MAINTAIN INVENTORY DURING REACTOR  
ISOLATION, THE "CONTROL ROD DEAD" ACCIDENT, AND THE ATWS EVENT.

- e. Direct consequences of its failure (brief description of the effect on the system): NONE IF HPCS STARTS UPON RCIC FAILURE. POTENTIAL FOR CORE UNCOVERING, SHOULD THE HPCS FAIL SIMULTANEOUSLY WITH RCIC.
- f. Redundancies, if any: HI PRESSURE CORE SPRAY - SAFETY RELATED; CRD PUMPS AND FEEDWATER PUMPS - NOT SAFETY RELATED.

III. Equipment Qualification Method:

☐ Test ☐ Analysis

☒ Combination of test & analysis ☐ Other (describe) \_\_\_\_\_

IV. Loads and Load Combinations:

1. Loads:

- a. ☒ Seismic b. ☐ Hydrodynamic  
c. ☒ Flow induced vib.\* d. ☐ Normal operation vib.  
e. ☐ Other dynamic loads: (specify) \_\_\_\_\_

2. Combination technique: SEISMIC IS ONLY DYNAMIC LOAD ON TURBINE

3. Required acceleration in each direction:

- a. ☐ ZPA ☒ Other; specify: SEE RRS  
b. OBE: s/s RRS; f/b: RRS; v: RRS  
SSE: s/s RRS; f/b: RRS; v: RRS

V. Qualification by Test (complete this section for each report including partial test:

1. Test report: (Company) WYLE LABORATORIES

- a. Title: QUALIFICATION TEST PROGRAM ON GS-2N TURBINE ELECTRONICS CONTROL SYSTEM AND ELECTRICAL ASSEMBLIES

no.: 58412; revision: B; date: 14 APRIL 1980

- b. Reviewed by: TERRY CORD & GEN ELECTRIC CO

2. Qualification report: (Company) ENVIRONMENTAL QUALIFICATION REPORT FOR 248

- a. Title: ENVIRONMENTAL QUALIFICATION REPORT FOR GS-2N RCIC TURBINE ELECTRICAL ACCESSORIES AND ELECTRICAL CONTROL SYSTEM

no.: E/L 20458; revision: 1; date: 4-21-80

- b. Reviewed by: GENERAL ELECTRIC COMPANY

3. Laboratory mounting:

- a. Describe [from shaker table to the equipment; include orientation, bolt (size, no., gr., etc.), weld (type, size, length, electrode type, etc.)]: SIMULATED "INSTALLED EQUIPMENT" MOUNTING USING 6-1"Ø BOLTS, CARBON STEEL, SAE GRADE 5.

\* Shop tests were run at 0 to 100% turbine speed with low steam flow. No significant vibration effects were noted.

b. If different from field mounting include equivalency justification:

NO DIFFERENCE

4. Resonance search: ☒ yes ☐ no

a. Technique: SINE SWEEP

b. Excitation magnitude & frequency interval (or sweep rate):

EXCITATION ~ 0.2g, FROM 1 TO 100 Hz AT ONE OCTAVE/MINUTE

c. Resonances found: (up to: 33 Hz)

s/s: 17, 24; f/b: 16, 22; v: 18, 33

5. Test Description:

a. Input:

(a) ☐ single axis; ☒ biaxial; ☐ pseudo biaxial;

☐ tri-axial ☒ random; ☐ sine beat;

☐ other: \_\_\_\_\_

☐ phase coherent; ☒ phase incoherent

(b) Frequency range: 1 TO 60 Hz

(c) Input level (g-level & frequency)

OBE: s/s: RR1; f/b: RR1; v: RR1

SSE: s/s: RR1; f/b: RR1; v: RR1

(d) Number of tests performed: OBE: 5; SSE: 1; other: —

(e) Sequential test, including fatigue & vibration aging

conducted: ☐ yes ☒ no

Justification, if not performed: QUALIFICATION TEST PROGRAM WAS COMPLETED PRIOR TO ANY RRT'S FOR FATIGUE OR VIBRATION AGING.

b. Output:

(a) TRS generated: ☒ yes ☐ no

(b) Percent damping in TRS generation: 2%

(c) Percent damping used in RRS: 2%

(d) Margin included in RRS: SEE RRS RELATIVE TO PNDP FRC ON FREQUENCY BASIS  
☒ by test lab. ☐ by others: (specify) \_\_\_\_\_

(e) Attach sets of TRS and RRS comparison plots (if not provided, explain): ATTACHED

c. Results:

(a) Basis of qualification:

[X] structural integrity verified; [X] operability verified

(b) Failures detected during qualification tests: NONE

(c) Anomalies (with disposition) if any: TURBINE TRIP CORRECTIVE ACTION REQUIRED; LUBE OIL PIPING VIBRATION, ADDITIONAL PIPING SUPPORTS HAVE BEEN DEFINED.

(d) Modifications made (in the equipment or mounting) during the qualification phase; describe, if any: STIFFENED T+T VALVE CATCH LEVER SPRING, LARGER ALIGNMENT PINS IN COUPLING END PEDESTAL POSITIVE PEDESTAL BOLT LOCKING, IMPROVED PIPING SUPPORT.

(e) How (modifications) implemented in the field: FIELD DISPOSITION INSTRUCTIONS (102-82411 AND 78-89212 FOR UNITS 1 & 2 RESPECTIVELY)

d. Other tests performed (such as fragility test; include results) BEFORE TO DYNAMIC TEST QUALIFICATION, THE TURBINE COMPONENTS WERE SUBJECTED TO RADIATION AGING, AND THERMAL AND MECHANICAL AGING, IN ORDER TO SIMULATE THEIR "END OF LIFE" CONDITION.

VI. Qualification by Analysis (complete this section for each report )

1. Analysis Report: (Company) GENERAL ELECTRIC COMPANY

a. Title: RCIC TURBINE ALLOWABLE NOZZLE LOADS

(RETRIEVABLE FROM DESIGN RECORD FILE # ESI-00124)

no.: N/A; revision: 0; date: 3.18.83

b. Reviewed by: GENERAL ELECTRIC

2. Qualification Report: (Company) SAME AS VI.1 ABOVE

a. Title: \_\_\_\_\_

no.: \_\_\_\_\_; revision: \_\_\_\_\_; date: \_\_\_\_\_

3. Failure modes: NONE EVALUATED

4. Method of Analysis:

[X] static\* [ ] static coefficient [ ] dynamic

[ ] time history [ ] response spectrum \* USING TEST ACCL DATA

5. Natural frequencies (up to cut off frequency of: N/A):

s/s: N/A; f/b: N/A; v: N/A

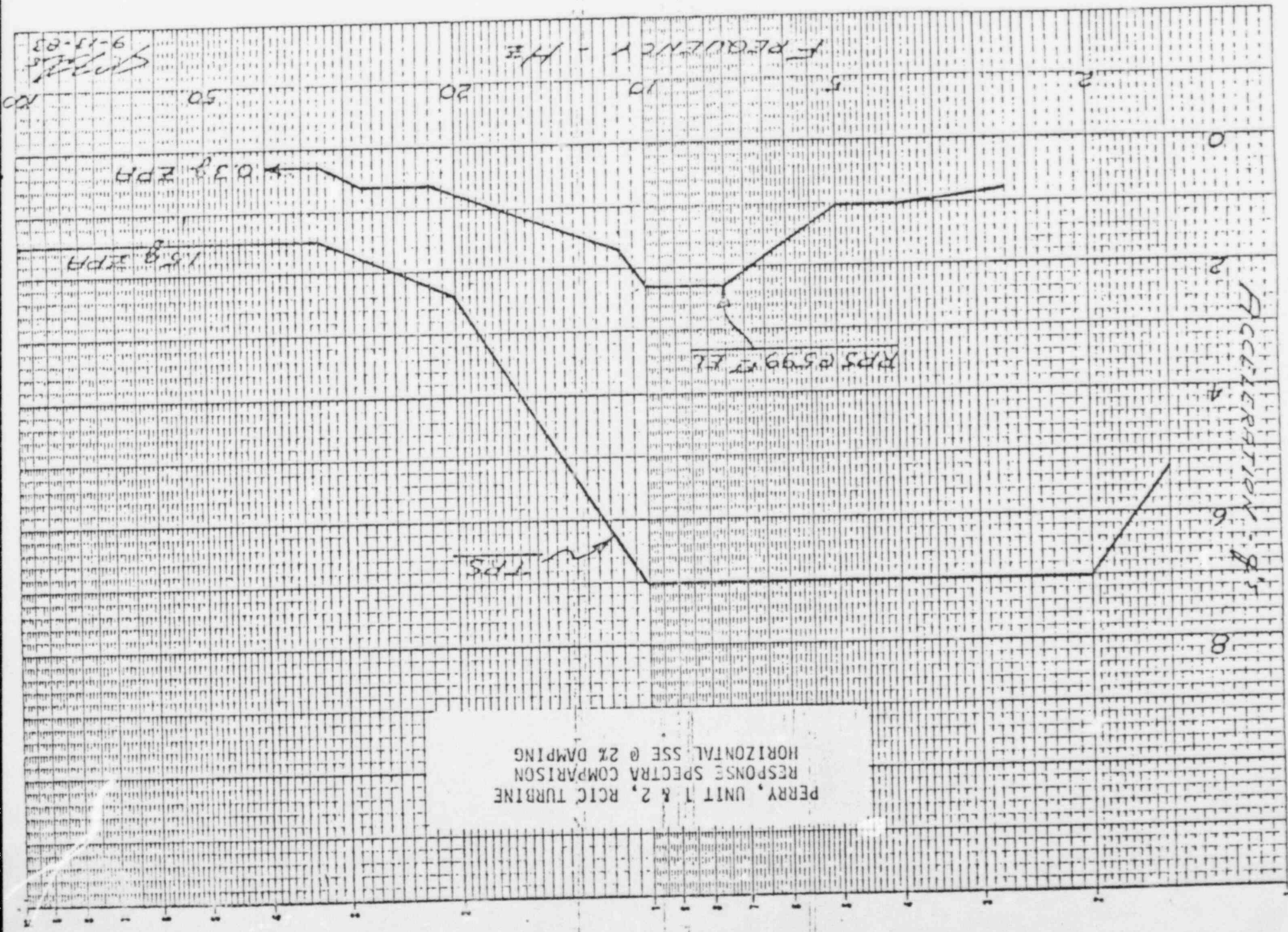
6. Model type:  
☐ 1D; ☐ 2D; ☒ 3D  
☐ finite element: (kinds of elements used) \_\_\_\_\_  
☒ other: (specify) MANUAL CALCULATION
7. Support & Boundary conditions in the model:  
NONE
8. Computer codes used: NONE  
Method of verification: INDEPENDENT REVIEW OF MANUAL CALCULATION
9. Damping: OBE: N/A; SSE: 2%; Basis: GE SPEC 3B5HA 603 TABLE 4.2
10. Fatigue & aging consideration: ☐ yes ☒ no
11. Responses:  
a. Method of combination: ☐ ABS; ☐ SRSS;  
☐ algebraic, ☒ other, specify: SEISMIC IS ONLY DYNAMIC FORCE  
b. For critical elements:

Identification	Location	Loads	Total calculated stresses	Allowable stresses	Source of allowables
PEDESTAL BOLTS, COUPLER	TENSION	TENSION	28.16 KIPS	25.00 KIPS	ASME CODE
TAPER PINS, COND END		SHEAR	12.14 KIPS	14.22 KIPS	"
GUIDE BLOCK WELD, GOV END		SHEAR	15.43 KIPS	27.30 KIPS	"

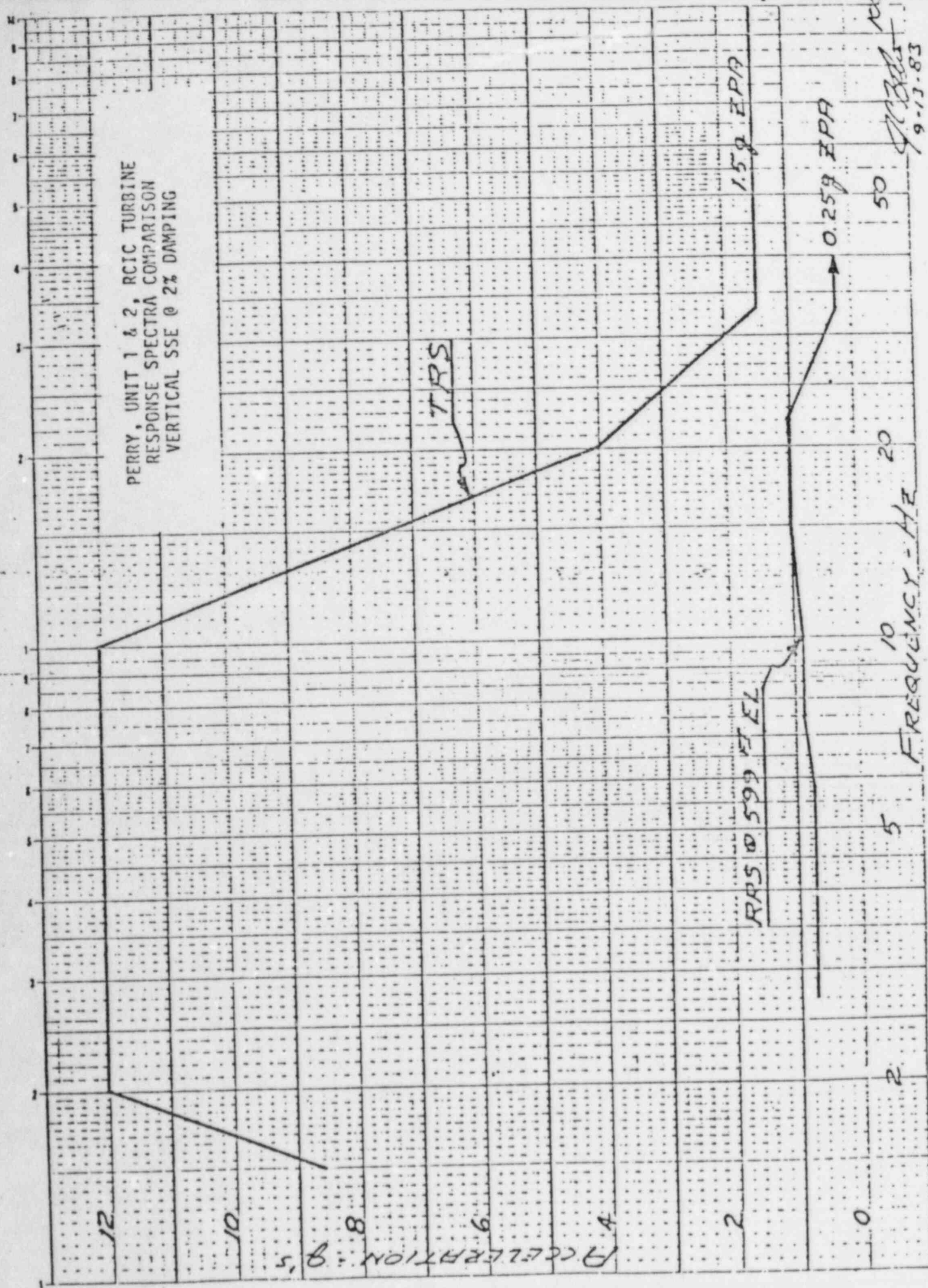
Identification	Location	Loads	Total defl.	Allow. defl.	Source of allow. defl.
TURBINE SHAFT	CENTER	SEISMIC + DL	0.014"	0.125"	CLEARANCE VIA TURBINE VENDOR

#### VII. Surveillance and Maintenance Program:

1. Qualified life: 15 YEARS BY TEST, 5 YEARS - WOODWARD GOVERNOR CO. RECOMMENDATION  
(based on weakest link or appendage in the equip.)
2. Basis: QUALIFICATION BY TEST AND ANALYSIS
3. Procedure of assuring operability of the equipment under seismic and dynamic condition throughout the plant life: IMPLEMENTATION OF MAINTENANCE PORTION OF TURBINE INSTRUCTION MANUAL,







9-17-83

PERRY, UNIT 1 & 2, RCIC-TURBINE  
RESPONSE SPECTRA COMPARISON  
VERTICAL OBE @ 2% DAMPING

8

9

6

4

2

0

ACCELERATION - g's

TRS

RRS @ 599 FT FL

100 EPR

0.27 EPR

2

5

10

20

50

100

FREQUENCY - Hz

RCIC  
9-13-87

# QUALIFICATION SUMMARY OF EQUIPMENT

MPL # INII F0020A

- ° To be completed to stand on its own (do not refer to any document)
- ° All questions are to be answered (if not applicable; mark "N/A")

I. Plant Name: PERRY NUCLEAR POWER PLANT

1. Utility: CLEVELAND ELECTRIC ILLUMINATING

2. Location: PERRY OHIO

3. Type: BWR-C 4. Capacity (MWe Net): 1205

5. Containment Type: MK-3 6. Cooling Source: LAKE ERIE

7. NRC Docket No.: 50-440 & 441 8. CP Docket Date: 5-3-77

9. NSSS Vendor: GE 10. A/E: GAI

II. Component Name: MAIN STEAM STOP 3<sup>RD</sup> ISOLATION VALVE

1. Scope: ☐ NSSS ☒ BOP

2. Vendor: BORG WARNER 3. Vendor Model No.: B1240

4. Manufacturer: SAHE 5. Manufacturer Model No.: SAHE

6. Purchase Spec. No.: 521-027 7. Total No. in Safety Systems: 4 IN UNIT 1

8. Location (Choose the worst one with respect to seismic)

a. Building: AUX. b. Elevation and Area: 620' STEAM TUNNEL

c. Environment: ☒ Harsh ☐ Mild

9. Field Mounting:

a. ☐ Floor ☐ Wall ☒ Pipe ☐ Panel

☐ Other (describe) \_\_\_\_\_

b. ☐ Bolted; description: \_\_\_\_\_

☒ Welded; description: BUTTWELD, CIRCUMFERENCE E 7018

☐ Other; description: \_\_\_\_\_

c. Mounting restriction from the manufacturer, if any: (horizontal vertical, etc.) NO RESTRICTIONS

10. Functional Description of the Equipment:

a. System in which located: NII - MAIN & REHEAT STEAM

(for item 8 in II, above)

b. Type: ☒ Active ☐ Passive

c. Equipment required for: ☐ Hot standby ☐ Cold shutdown

☐ Both ☒ Neither

d. Intended safety function: THE VALVE PROVIDES AN ISOLATION BOUNDARY

FOR THE MAIN STEAM ISOLATION VALVE (MSIV) LEAKAGE CONTROL SYSTEM

(LSC) (E32) OUTBOARD SUBSYSTEM JSH.

- e. Direct consequences of its failure (brief description of the effect on the system): POSSIBLE RADIOACTIVE STEAM LEAKAGE FROM CONTAINMENT ONLY IF BOTH MSIV'S ALSO FAIL. DOWNSTREAM LEAKAGE CONTROL SYSTEM IS DISABLED.
- f. Redundancies, if any: THE UPSTREAM LEAKAGE CONTROL SYSTEM AND MSIV'S SERVE TO CONTROL RADIOACTIVE STEAM LEAKAGE FROM CONTAINMENT.

III. Equipment Qualification Method:

- [ ] Test [X] Analysis  
 [ ] Combination of test & analysis [ ] Other (describe) \_\_\_\_\_

IV. Loads and Load Combinations:

1. Loads:  
 a. [X] Seismic b. [ ] Hydrodynamic  
 c. [X] Flow induced vib.\* d. [X] Normal operation vib. (FATIGUE)  
 e. [ ] Other dynamic loads: (specify) \_\_\_\_\_
2. Combination technique: \_\_\_\_\_
3. Required acceleration in each direction:  
 a. [ ] ZPA [X] Other; specify: <sup>VALVE</sup> COMPUTED ACCELERATION IN PIPING ANALYSIS  
 b. OBE: s/s —; f/b: —; v: —  
 SSE: s/s ≤ 3g; f/b: ≤ 3g; v: ≤ 3g

V. Qualification by Test (complete this section for each report including partial test:

1. Test report: (Company) \_\_\_\_\_  
 a. Title: \_\_\_\_\_  
 no.: \_\_\_\_\_; revision: \_\_\_\_\_; date: \_\_\_\_\_  
 b. Reviewed by: \_\_\_\_\_
2. Qualification report: (Company) \_\_\_\_\_  
 a. Title: \_\_\_\_\_  
 no.: \_\_\_\_\_; revision: \_\_\_\_\_; date: \_\_\_\_\_  
 b. Reviewed by: \_\_\_\_\_
3. Laboratory mounting:  
 a. Describe [from shaker table to the equipment; include orientation, bolt (size, no., gr., etc.), weld (type, size, length, electrode type, etc.)]: \_\_\_\_\_

\* Both, steam hammer due to fast closing of the turbine stop valves, and jet impingement were considered as part of flow induced vibrations. JSH.

b. If different from field mounting include equivalency justification:

4. Resonance search: ☐ yes ☐ no

a. Technique: \_\_\_\_\_

b. Excitation magnitude & frequency interval (or sweep rate): \_\_\_\_\_

c. Resonances found: (up to: \_\_\_\_\_)

s/s: \_\_\_\_\_; f/b: \_\_\_\_\_; v: \_\_\_\_\_

5. Test Description:

a. Input:

(a) ☐ single axis; ☐ biaxial; ☐ pseudo biaxial;

☐ tri-axial ☐ random; ☐ sine beat;

☐ other: \_\_\_\_\_

☐ phase coherent; ☐ phase incoherent

(b) Frequency range: \_\_\_\_\_

(c) Input level (g-level & frequency)

OBE: s/s: \_\_\_\_\_; f/b: \_\_\_\_\_; v: \_\_\_\_\_

SSE: s/s: \_\_\_\_\_; f/b: \_\_\_\_\_; v: \_\_\_\_\_

(d) Number of tests performed: GBE:\_\_\_\_; SSE:\_\_\_\_; other:\_\_\_\_

(e) Sequential test, including fatigue & vibration aging

conducted: ☐ yes ☐ no

Justification, if not performed: \_\_\_\_\_

b. Output:

(a) TRS generated: ☐ yes ☐ no

(b) Percent damping in TRS generation: \_\_\_\_\_

(c) Percent damping used in RRS: \_\_\_\_\_

(d) Margin included in RRS: \_\_\_\_\_

☐ by test lab. ☐ by others: (specify) \_\_\_\_\_

(e) Attach sets of TRS and RRS comparison plots (if not provided, explain): \_\_\_\_\_

c. Results:

(a) Basis of qualification:

[ ] structural integrity verified; [ ] operability verified

(b) Failures detected during qualification tests: \_\_\_\_\_

(c) Anomalies (with disposition) if any: \_\_\_\_\_

(d) Modifications made (in the equipment or mounting) during the qualification phase; describe, if any: \_\_\_\_\_

(e) How (modifications) implemented in the field: \_\_\_\_\_

d. Other tests performed (such as fragility test; include results) \_\_\_\_\_

VI. Qualification by Analysis (complete this section for each report )

1. Analysis Report: (Company) BORG-WARNER

a. Title: SEISMIC ANALYSIS OF 28 INCH 900 LBS CARBON STEEL GATE VALVE MOTOR OPERATOR

no.: NSR 81240; revision: D; date: 3-1-1984

b. Reviewed by: GILBERT ASSOCIATES, INC.

2. Qualification Report: (Company) SAME AS VI.1

a. Title: \_\_\_\_\_

no.: \_\_\_\_\_; revision: \_\_\_\_\_; date: \_\_\_\_\_

3. Failure modes: FAILURE OF BODY NECK

4. Method of Analysis: DYNAMIC FOR FREQUENCY DETERMINATION, STATIC FOR STRESS CALCULATIONS

[X] static [ ] static coefficient [X] dynamic

[ ] time history [ ] response spectrum

5. Natural frequencies (up to cut off frequency of: 33 Hz):

s/s: 47.5; f/b: 47.5; v: —

6. Model type:  
☐ 1D; ☒ 2D; ☐ 3D  
☒ finite element: (kinds of elements used) BEAMS  
☐ other: (specify) \_\_\_\_\_
7. Support & Boundary conditions in the model:  
FIXED FOR FREQUENCY DETERMINATION, SIMPLY SUPPORTED FOR STRESS CALCULATIONS
8. Computer codes used: MSC / NASTRAN  
Method of verification: GAT DESIGN CONTROL PROCEDURES
9. Damping: OBE: \_\_\_\_\_; SSE: \_\_\_\_\_; Basis: RRS NOT USED IN CALCS. SEE IV.
10. Fatigue & aging consideration: ☒ yes ☐ no
11. Responses: N/A  
a. Method of combination: ☐ ABS; ☐ SRSS;  
☐ algebraic, ☐ other, specify: \_\_\_\_\_  
b. For critical elements:

Identification	Location	Loads	Total calculated stresses	Allowable stresses	Source of allowables
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FOR PIPING ACCELERATIONS SEE P. 3

FOR STRESSES SEE REPORT NSR 81240 - SUMMARY SECTION P. 8

Identification	Location	Loads	Total defl.	Allow. defl.	Source of allow. defl.
CG OF ACTUATOR (NSR 81240 p. 61)			0.0098	*	*

\* MAX ALLOWABLE NOT GIVEN — MAX DISPLACEMENTS ARE SUFFICIENTLY SMALL AND VALVE MACHINING TOLERANCES ADEQUATELY ACCOMMODATE MOVEMENTS. IN ADDITION, THE DYNAMIC MOVEMENT OF THE YOKE ASSEMBLY ASSOCIATED WITH A SEISMIC EVENT WOULD TEND TO FREE ANY BINDING THAT MAY OCCUR.

## VII. Surveillance and Maintenance Program:

1. Qualified life: 40 YEARS  
(based on weakest link or appendage in the equip.)
2. Basis: THE MATERIAL USED IN THIS EQUIPMENT ARE CONSIDERED AGE INSENSITIVE & THE ARE
3. Procedure of assuring operability of the equipment under seismic and dynamic condition throughout the plant life: IMPLEMENTATION OF MAINTENANCE PROGRAM INCLUDING VENDOR REQUIREMENTS AND SURVEILLANCE TEST PROGRAM.
- APPLIED BELOW THEIR RECOGNIZED LIMITS.