ATTACHMENT 5

TAA REPORTS ON THEIR REVIEW
OF THE
WNP-2 PLANT VERIFICATION PROGRAM
INCLUDING SUPPLY SYSTEM RESPONSE

An Evaluation

of the

Washington Public Power Supply System

WNP-2 PLANT VERIFICATION PROGRAM

prepared by

Technical Audit Associates, Inc.

May 28, 1982

Approved:

R. V. Laney

L. H. Roddis, Jr.

H. E. Sheets

CONTENTS

I. SUMMARY

The TAA team considers the Plant Verification Program draft of April 9, 1982, to be unsatisfactory for the purposes which WPPSS intends. This report contains a number of recommendations which we believe would sharpen the focus of the program, substantiate its objectivity, strengthen its engineering and design verification activities, and improve the clarity of presentation.

With these changes, the team believes that the program, when completed, would provide substantial additional confidence that WNP-2 has been designed and constructed to meet committed requirements.

II. INTRODUCTION

The Washington Public Power Supply System contracted with Technical Audit Associates on April 5, 1982 to review, evaluate and submit a report on the adequacy of the Supply System's Plant Verification Program(PVP) plan for WNP-2. We recognize that the verification program being addressed herein is one element of the Supply System's broader Plant Completion Plan which has been developed in response to the Managing Director's instructions of January 22, 1981(1). The bases for TAA's review are the draft PVP plan dated April 9, 1982, as modified by changes supplied on April 27,(2) and interviews with Supply System representatives and their principal contractors in Richland on April 26-28. The agenda for these interviews is shown in Appendix A. All persons shown were interviewed.

The TAA review team is identified in Appendix B.

The team held exit interviews with Supply System management at the conclusion of the April 26-28 visit to discuss initial impressions and to clarify points of uncertainty. An oral report of findings and recommendations was presented to Supply System management on May 25, followed by discussions intended to clarify the recommendations and to correct any erroneous information which the team might have obtained.

The TAA team report on the April 9 draft PVP, as modified, is presented below. For convenience, findings and recommendations appear under the following headings: Define the Purpose; Substantiate Objectivity; Strengthen Engineering and Design Verification; Improve the Presentation.

(1) "Acceptance Review Plans for Supply System Nuclear Facilities", letter, R. L. Ferguson to G. D. Bouchey, dated January 22, 1981, Appendix C hereto.
(2) The Supply System provided replacement pages for parts of Sections IIIA, VC, VD and VG.

III. FINDINGS AND RECOMMENDATIONS

Define the Purpose

Section I of the PVP, "Purpose", identifies three purposes for the PVP. The first two are related to educating and training Supply System personnel to accept the operating responsibilities of an owner. These are valid objectives but seem out of place in a document devoted to plant verification.

The third objective, to establish confidence that WNP-2 is ready to operate "in a safe and reliable manner" is considerably broader than is warranted by the PVP program put forth, inasmuch as the Supply System will not (nor should it) attempt to reverify the basic requirements contained in governing codes and standards, but rather accepts them as a point of departure. In addition, the PVP is not concerned with personnel qualification and training, operating crew manning, maintenance organization, or numerous other factors which must contribute to safe operation. For both of these reasons, we believe the purpose of the PVP should be stated more exactly.

Recommendation on Purpose

We recommend that the Plan's purpose be more exactly stated, as, for example:

> "To establish confidence that WNP-2 has been designed and built to committed requirements."

Substantiate Objectivity

The appearance of objectivity in an internal audit can be every bit as important as the fact of objectivity. The team is convinced that Supply System management wants an objective review to validate WNP-2 design and construction. We believe that a review conducted largely by Supply System personnel has important advantages over an external review, provided objectivity can be positively substantiated. In the team's opinion, the present PVP does not do all that should be done to assure that it will be conducted objectively.

Management's intent has been manifested in a number of ways. For example, the present verification program was initiated by the Managing Director's instructions of January, 1981, long before such reviews began to attract the wide attention they now receive; top management's statements to TAA team members reflect a determination to get the facts; comments from Supply System staff members concerning their understanding of management's purpose confirm this determination; and the Supply System's hiring TAA to assess the plan's adequacy and audit its performance clearly underscores a desire for external and independent standards.

We believe, however, that management's determination to have the PVP plan carried out in an objective manner could be strengthened and substantiated by incorporating a number of additional features in the plan. These are embodied in the recommendations which follow:

Recommendations to Substantiate Objectivity

1. Direct the PVP plan preparation and execution from the Managing Director level rather than from the WNP-2 Program Director level.
2. Consistent with recommendation 1, assign responsibility for plan execution to executives at the Director level, thus involving the Director of Technology, Director of Generation, Director of Quality Assurance, etc.
3. Require regular progress reports on implementation to the Managing Director.
4. Assign review responsibilities only to personnel who did not perform or direct the original design or construction work being reviewed; by including in the PVP a detailed person-by-person tabulation of reviewers' names, show that this rule has been observed.
5. Incorporate some external (not Supply System) personnel into the Supply System review teams by using loanees (as from other utilities) and through subcontract (as from another AE).
6. Incorporate in the PVP plan a specific provision for audit of its implementation by a competent independent organization which would report periodically to the Managing Director.
7. The team understands that Burns and Roe's involvement in startup testing is limited to the preparation of test acceptance criteria. Inasmuch as the test program is intended, insofar as possible, to validate

both design and construction, we recommend that Burns and Roe be required to review and comment on test procedures and to confirm that test results satisfy the acceptance criteria.

8. The Supply System places considerable reliance on Bechtel's expertise and performance record in construction management and QA/QC and is therefore providing normal QA/QC surveillance of Bechtel's activities. In view of the early history of WNP-2 construction and the late date of Bechtel's assumption of its present responsibility, the team recommends that the Supply System conduct intensive surveillance of Bechtel's QA/QC activities and construction maintenance performance until the Supply System is satisfied that these factors have been adequately compensated. This surveillance pattern should be explained in the PVP plan.

9. The team was told that the Project Test and Startup Section is conducting an extensive open-and-inspect program for major plant components because it has found evidence that some early construction maintenance programs were defective. We recommend that the Supply System emphasize their recognition of this problem, explain their criteria for selecting components to inspect, and give it greater prominence in the PVP. In this connection it would add to other evidences of primary system construction integrity

if it could be confirmed (as we were told) and stated in the PVP that none of the stainless steel primary system has been filled with water since installation.

Strengthen Engineering and Design Verification

TAA team members formed a distinct impression that insufficient engineering resources are being applied to perform requirements verification, system design verification, and timely transition of engineering responsibility to the Supply System. This could threaten timely completion of the PVP and meeting transition goals.

This impression is based more on a series of related pieces of information received during discussions of the PVP, rather than on a comprehensive assessment of total engineering workload and resources. This information includes the following:

- Test and Startup advised the team that suitable engineering information packages have not been provided to support their needs, making it necessary for them to prepare their own electrical diagrams. The team was also told that as many as forty drawings must be consulted to check a single valve control system, due to the absence of appropriate electrical wiring diagrams. We understand further that this situation is being corrected.
- Burns and Roe representatives do not reflect a sense of full involvement in the test program; their function appears to be limited to defining test acceptance criteria (see item 7, page 5, above).

- The need for engineering information packages assembled by systems is recognized by a requirements list in Section VA of the PVP. The organization best equipped to assemble these engineering packages, Burns and Roe, has not been involved in doing so.
- The team doubts that there is an estimate and schedule of the engineering effort required to assemble engineering information into system packages, perform requirements and system design verification as presented in the PVP, and transfer design control from Burns and Roe to the Supply System.
- There is no contractural provision for retaining Burns and Roe's experienced engineers and draftsmen in a continuing support role beyond commercial operation, although this is apparently receiving consideration. The team was told that some key Burns and Roe personnel have already left.
- Project Engineering and Central Engineering seem to have different views as to how and by whom these various problems are to be handled, what additional resources are needed, and who is to manage these resources.
- The amount of engineering effort estimated to be needed for an independent system design reverification (9 man-months/system) appears to us to be too low.

<u>Recommendations to Strengthen Engineering and Design Verification</u>

We believe that WPPSS management should devote attention to resolving the present unsatisfactory situation which is suggested by the above observations. Some constructive steps might include these:

1. Prepare a detailed definition, estimate, and schedule of the engineering effort required for requirements and system design verifications as described in the PVP, and for transition of design responsibility to the Supply System.
2. Identify clearly the organizational units responsible for performing these engineering functions, and fix the timing of the transfer of responsibility from one to the other.
3. Burns and Roe effort in support of the PVP and transition to Supply System design control should be contracted so as to permit Central Engineering to obtain the necessary support from Burns and Roe.
4. Define more clearly what is to be accomplished by an independent design review and by system document assembly, and develop means to insure that deficiency findings are resolved.
5. Assign Burns and Roe responsibility to help assemble suitable system information packages, allowing Central Engineering to give increased attention to the system design verification program.
6. Define in more detail the level of independent design reverification to be required for the systems chosen. Verify complete systems rather than partial systems. We believe that review in depth of a smaller number of systems is more useful for verification purposes than a larger number done in less detail.

7. Plan the transfer of design control responsibility from Burns and Roe to Central Engineering so that control of an entire system is transferred at one time, avoiding a situation where, for an interval, control of a single system is divided between organizations. As each system is turned over, obtain assurance from Burns and Roe that all required changes have been incorporated, or obtain status reports on those which have not.
8. Because of the intense interest in pipe hangers, describe prominently in the PVP what the Supply System has done to assure that WNP-2 hangers are satisfactory.

Improve the Presentation

The team believes that the April 9 PVP document does not clearly set forth what the verification program is and how and when it is to be carried out. The reader is required to do an unreasonable amount of digging, interpreting, and assuming in order to achieve a minimum understanding. As a result, the document does not convey the full strength of the PVP program.

Program logic is not adequately explained anywhere. Such an explanation would permit the reader to identify the sub-programs of the plan, the reasons for each, and their time relationships and relative importance. For example, one must read almost half-way through the document before learning that recurrent construction quality problems during the late 1970's led to a one-year shutdown of construction to take remedial measures. Yet, two of the major parts of the

PVP plan, the Restart and Quality Verification Programs, are intended to remedy this early quality breakdown.

It would be helpful to inform the reader at the outset that the PVP program incorporates and describes several types of verification actions and information as follows:

- Information to show that the design processes used have assured the integrity of plant design as reflected in construction drawings and other design paper.
- Actions to assure recovering from an early period of deficient construction quality and from several specific quality defects.
- Actions to assure continuing an acceptable level of construction quality after the resumption of construction.

(Note that all of the above are intended to verify that WNP-2 incorporates a normal acceptable level of design and construction quality, rather than to provide "extraordinary" assurances. They are essential to the PVP program in that they provide a baseline of acceptability which is the foundation for the extraordinary features of the PVP program.)

- Design requirements verification, systems design verification, opening and inspecting of components, audit of the plan and its implementation by an independent organization, and other beyond-the-ordinary actions, laid on top of an already acceptable level of design and construction quality, provide extra levels of assurance.

A program plan as important as this one should include a schedule of activities in sufficient detail to show important inter-dependencies, such as the dates of availability of requirements packages and dates of corresponding system verifications activities, and to allow progress to be measured and controlled. The schedule shown on the final page of the document is inadequate. It omits numerous PVP activities and lacks detail for those activities which are mentioned. The team recognizes that some PVP activities are part of the normal construction process and are already scheduled for other purposes. Nevertheless, we believe that the PVP program would gain credibility if all related activities are shown on its schedule. Existing schedules could be included by reference, if desirable.

With respect to format, we believe that the document would be significantly improved by two principal changes. First, provide an initial summary which states the reason for the program and identifies its principal parts, distinguishing those parts which are normal practice from those parts which go beyond the normal and add appreciably to verification of quality. Second, change the order of presentation to increase the visibility of and to emphasize those activities which go beyond normal good practice, since it is these that constitute "extra" verification..

Recommendations to Improve the Presentation

1. Provide a summary as the first section of the report. This summary should define the PVP in the context of

the Plant Completion Plan, identify the PVP component parts, explain the plan's logic, and lay the groundwork for the presentation sequence to follow.

2. In the next section describe how a baseline of acceptability is achieved. Present and discuss briefly the adequacy of the design process, referring to appendices for details. Present the problem of unsatisfactory construction quality in the late 1970's and briefly describe the remedial programs. Details of Restart and QVP should be put in appendices. This section should show that WNP-2 is establishing a baseline of adequate design and construction quality, and a management system to assure its continuation.
3. In the following section, highlight the extraordinary actions which the Supply System Management is taking to give additional assurance of quality, over and above that which would result from normal good design and construction practices as established in the preceding section.
4. Conclude with a section for reporting findings and correction of deficiencies. Demonstrate that a complete PVP program will give a basis for concluding that the plant was designed and built to meet original commitments.
5. Put in appendices: the detailed justification to show that Burns and Roe and GE design processes have been satisfactory, (Section IV); that pre June 1980 construction quality has been upgraded (Restart and QVP); that post June, 1980 and present construction

management and QA/QC practices are satisfactory; that present Supply System Project Management and QA/QC are satisfactory (Section IV); and that Performance Testing will be effectively conducted (VF).

AGENDA FOR TECHNICAL AUDIT ASSOCIATES VISIT TO WPPSS/WNP-2 April 26-29, 1982

April 26

8 a.m.	Interview with D. W. Mazur, Director of Projects, and J. R. Honekamp, Technical Specialist, Asst. to Managing Director
8:30 a.m.	TAA Team Executive Session
10:30 a.m.	Interview with R. G. Matlock, WNP-2 Program Director, at WNP-2
11:30 a.m.	Interview with T. A. Mangelsdorf, Bechtel WNP-2 Project Manager
12:45 p.m.	Plant Verification Program Overview Presentation by D. C. Timmins, Technical Specialist, Asst. to WNP-2 Program Director. (Several WPPSS and contractor staff also attended.)
2:30 p.m.	Interview with J. Verderber, Burns and Roe New York Office, and A. Forrest, Burns and Roe WNP-2 Project Director, Richland
3:30 p.m.	Interview with F. MacLean, S. Mather, and R. Friis, General Electric
4:30 p.m.	Tour WNP-2

April 27

8 a.m.	Interview Geoff Gelhaus, Supervisor, Systems Design, Central Engineering
9 a.m.	Interview Kirk Cowan, Technical Manager, WNP-2 Operations
10 a.m.	Interview Gerry Afflerback, Test and Startup Manager, WNP-2 Project
11 a.m.	Interview Roger Johnson, QA Manager, WNP-2 Project
12 a.m.	Interview H. Crisp, Construction Manager, WNP-2 Project, and R. L. Knawa, Manager, Quality Verification Program
1 p.m.	Interview Donald Johnson, Bechtel QA Manager, WNP-1 and 2.
1:30 p.m.	Interview Mel Leach, Bechtel Systems Completion Supervisor

2 p.m.	Interview Roger Nelson, Licensing Manager, WNP-2 Project
3 p.m.	Interview Bruce Holmberg, Engineering Manager, WNP-2 Project
4 p.m.	Interview J. M. Yatabe, Systems Engineering Supervisor, Central Engineering

<u>April 28</u>

8 a.m.	TAA Team Executive Session. J. R. Honekamp present as observer
2 p.m.	Interview R. G. Matlock, WNP-2 Program Director
2:30 p.m.	Exit interview with R. G. Matlock, P. K. Shen, W. C. Bibb, R. B. Glasscock, J. R. Honekamp, D. C. Timmins

<u>April 29</u>

8:30 a.m.	Exit interview (Laney, Sheets, Jewett only) with A. Squire, Deputy Managing Director, in Seattle

NOTE: Except as noted, persons interviewed were unaccompanied during team interviews.

Technical Audit Associates, Inc.
Plant Verification Program Plan Evaluation Team
for WPPSS/WNP-2

BIOGRAPHICAL INFORMATION

Frank B. Jewett, Jr., Assignment Manager: Founder & President TAA, member Technical Audit Board. Assignment Director: Indian Point -2 Containment Flooding Accident Audit, Nine Mile Point -2 Cost to Complete Audit. Former: President and Chief Executive Officer, Vitro Corporation of America; Director of Engineering Research and Development, General Mills, Inc. & Vice President Mechanical Division; Vice President & Manager Vacuum Equipment Division, National Research Corporation; Member President's Council, Cal Tech. Member: of the Corp., Wood Hole Oceanographic Institute; NY Academy of Sciences; ASME Safety Committee. Merit Citation, Crusade for Freedom. Registered Professional Engineering, Minnesota. BS, CIT; MBA (mcl) Harvard University.

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Commission; World Bank on Nuclear Safety in Korea. Member National Academy of Engineering; Fellow ASME. Adjunct Professor, University of California at Los Angeles. ASME Heat Trans. Memorial and Conf. Award. BS, MS, PhD, University of California, Berkley.

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Louis H. Roddis, Jr., Member of Review Panel: Consulting Engineer. Chairman Energy Research Advisory Board of US Department of Energy. Director: Hammermill Paper Co.; Gould Inc.; Research - Cottrell Inc. Former President and CEO, John K. McMullen Associates; President and V. Ch., Con Ed; Chairman and President, Penna Electric Co.; Deputy Director Reactor Development, USAEC; Project Officer Power Plant Development Nuclear Subs NAUTILUS and SEAWOLF, USN; Task Force I, Bikini atom weapons tests. Fellow: Royal Institute of Naval Architects, ASME, American Nuclear Society. Member and VC US National Committee CIGRE. Member: SNE, ASME, IEEE, ASEE, NSPE, HFS, ASHAE. Registered Professional Engineer, NY, NJ, PA, DC, SC, Chartered Engineer UK. Member National Academy of Engineering. Outstanding Service award USAEC. Expert witness.

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INTEROFFICE MEMORANDUM

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

Distribution:
- ☐ EDC WNP-1/4
- ☐ EDC WNP-2
- ☐ EDC WNP-3/5
- ☐ Admin File

A Squire (387)
DW Mazur (821)
RG Matlock (901A)
DE Dobson (1000)
PK Shen (388)
ME Witherspoon (13
LL Grumme (390)
lb/RLF
lb/GDB

ATTACHMENT C

Date: January 22, 1981

To: G. D. Bouchey, Director, Nuclear Safety (#396)

From: R. L. Ferguson, Managing Director (#387) R. L. Ferguson

Subject: ACCEPTANCE REVIEW PLANS FOR SUPPLY SYSTEM NUCLEAR FACILITIES

Reference:

Confirming our recent discussions on this matter, I would like to request that you develop detailed "acceptance review" plans for each of our Projects which will assure a thorough, systematic review by Supply System personnel of our nuclear plants prior to turnover from our contractors for commercial operation and which will constitute a well-documented basis for my acceptance of plant completion, safety and technical adequacy.

As we discussed, the Supply System reviews will involve all of our technical organizations. The plan should cover design documentation and safety reviews, engineering certifications, construction completion/turnover process, startup testing and operational readiness assessments culminating in fully operational plants ready for commercial power production.

In developing these plans for plant acceptance, first priority should be given to WNP-2. For WNP-2, special consideration should be given to assuring that any undetected quality defects that significantly affect plant performance or safety would be identified and corrected in the course of our functional testing and acceptance reviews.

md

WP-102 R2

INTEROFFICE MEMORANDUM

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

Distribution:
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- ☐ EDC WNP-2
- ☐ EDC WNP-3/5
- ☐ Admin File

JR Honekamp:ar, 387

Date: July 19, 1982

To: Addressees

From: John R. Honekamp, 387 John Honekamp

Subject: SUPPLY SYSTEM RESPONSE TO THE TAA EVALUATION OF THE DRAFT WNP-2 PLANT VERIFICATION PROGRAM

Reference: IOM from J. R. Honekamp to Addressees, 6-3-82

Attached for your information is the response to the TAA evaluation of the Draft WNP-2 Plant Verification program which was transmitted to you in the referenced IOM. A revised WNP-2 Plant Verification Report was sent to TAA for their review on June 17, 1982. Based on my discussions with TAA, I believe that the revised Plant Verification Report is responsive to their recommendations.

The purpose of the attached memorandum is to provide the vehicle for closure of the items in their initial evaluation report. TAA will provide a final evaluation report based on their review of the revised WNP-2 Plant Verification Report and the attached response to their initial evaluation report. Their final evaluation report is due to be issued on July 30, 1982.

Attachment:
WNP-2 Plant Verification Program
by TAA (draft)

Addressees:
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WC Bibb, 685
GD Bouchey, 370
H Crisp, 901A
RL Ferguson, 387
C Foley, 570
G Gelhaus, 420
RB Glasscock, 280
B Holmberg, 901A
RT Johnson, 917Q
R Knawa, 930G
J Martin, 927M
RG Matlock, 901A
DW Mazur, 385
PK Shen, 580
A Squire, 386
D Timmins, 901A
M Wilson, 495
J Yatabe, 410

SUPPLY SYSTEM RESPONSE TO THE
MAY 28, 1982 EVALUATION OF THE
WNP-2 PLANT VERIFICATION PROGRAM BY
TECHNICAL AUDIT ASSOCIATES, INC.

TAA Recommendation on Purpose (page 3)*

We recommend that the Plan's purpose be more exactly stated, as, for example:

"To establish confidence that WNP-2 has been designed and built to committed requirements."

Supply System Response

The revised Plant Verification Report (Rev. 0) now provides a clear statement of purpose on page 1 of Section I.

TAA Recommendations to Substantiate Objectivity (page 5)

1. Direct the PVP plan preparation and execution from the Managing Director level rather than from the WNP-2 Program Director level.
2. Consistent with recommendation 1, assign responsibility for plan execution to executives at the Director level, thus involving the Director of Technology, Director of Generation, Director of Quality Assurance, etc.
3. Require regular progress reports on implementation to the Managing Director.
4. Assign review responsibilities only to personnel who did not perform or direct the original design or construction work being reviewed; by including in the PVP a detailed person-by-person tabulation of reviewers' names, show that this rule has been observed.
5. Incorporate some external (not Supply System) personnel into the Supply System review teams by using loanees (as from other utilities) and through subcontract (as from another AE).
6. Incorporate in the PVP plan a specific provision for audit of its implementation by a competent independent organization which would report periodically to the Managing Director.

Supply System Response

Section III of the revised Plant Verification Report (Rev. 0) now contains a description of the steps that have been taken to assure objectivity in the Requirements and Design Reverification reviews. The key revisions which address the TAA recommendations are:

*Page number in TAA report of May 28, 1982.

- (TAA Recommendation 1 - see Section III page 12 and Section IV pages 22 and 26 of Rev. 0.)

  The Technical Specialist, Office of the Managing Director has been assigned responsibility for:

  - Management overview of the program
  - Approval of the scope of the Requirements and Design reverification reviews and changes in the scope of these reviews
  - Approval of the findings review process
  - Approval of personnel selection to assure independence
  - Special findings reviews to resolve differences between the reviewer and the Findings Review Committee.

- (TAA Recommendation 2 - see Section III page 11 and Figure 3 of Rev. 0.)

  The responsibility for performing the Requirements and Design Reverification reviews has been assigned to the Systems Design Engineering group which reports to the Director of Technology, not the WNP-2 program. The responsibility for execution of the Testing program and the development/review of the operating procedures and Technical Specifications had already been assigned to the Director of Power Generation.

- (TAA Recommendation 3 - see Section IV page 28 and Figure 7 plus Section III Attachment 2 of Rev. 0.)

  The schedule for the Requirements and Design Reverification reviews (Figure 7) provides for two interim reports, a final report for each system, a report of the Findings Review Committee and a final report from the Technology Directorate integrating the results of the reverification reviews. The results of the Quality Verification Program are presently reported on a bimonthly basis in addition to the various contractor, system and task reports which document the completion of individual QVP activities. In addition to the above, the Management Review Group (Attachment 2, Section III) will provide periodic reports to the Managing Director on the results of the various audits and reviews related to the WNP-2 Plant Completion Plan which includes the Plant Verification program.

- (TAA Recommendation 4 - see Section II page 3 and Section III page 11 of Rev. 0.)

  The revised report now describes the basic approach of utilizing personnel who were not involved in the original design plus an organizational reporting relationship that is independent of the

WNP-2 program. Rather than including the names of the individuals in the report, we have chosen to issue criteria for the assessment of independence to the Manager of the Systems Design Engineering group and the Chairman of the Findings Review Committee and require them to provide written confirmation that the individuals assigned satisfy the criteria. These evaluations will be reviewed by the Technical Specialist, Office of the Managing Director. A copy of the criteria is included as Attachment I. As indicated in Attachment I, copies of the individual evaluations will be maintained in the program record.

o (TAA Recommendation 5 - see Section III page 11 and Section IV page 25 of Rev. 0.)

The program permits, but does not mandate, the use of outside personnel. As indicated in Section IV page 15, it is planned to utilize Bechtel personnel currently involved in reviews of ASME piping and supports in a similar capacity as part of the reverification reviews of the three selected systems. We believe that the program structure, which includes organizational independence plus a separate findings review process and outside independent technical audit has sufficient independence. It also has the advantage of maximizing the participation of Supply System engineers who will have responsibility for future configuration control.

o (TAA Recommendation 6 - see Section II page 3, Section III page 12 and Attachment 2, Section IV page 25 of Rev. 0.)

The program includes provisions for audit of the implementation of the Requirements and Design Reverification reviews including the findings review process by a highly qualified outside firm. We have not yet finalized the scope of the outside auditor in the areas of Construction Verification, Performance Verification and Operating Envelope Verification.

TAA Recommendation on Test Programs (pages 5/6)

7. The team understands that Burns and Roe's involvement in startup testing is limited to the preparation of test acceptance criteria. Inasmuch as the test program is intended, insofar as possible, to validate both design and construction, we recommend that Burns and Roe be required to review and comment on test procedures and to confirm that test results satisfy the acceptance criteria.

Supply System Response

The Supply System Power Generation organization, which includes the WNP-2 plant staff and the WNP-2 Test and Startup organization, is responsible for the WNP-2 Test and Startup program. This includes preparation, review and approval of test procedures, execution of the testing program, evaluation of the test results, preparation of test reports and documenting the satisfactory completion of the testing program. In carrying out this responsibility, the Supply System utilizes the services of the AE and NSSS vendor to assist in the preparation and review of procedures, execution of the tests and evaluation of the results. The following excerpts from Chapter 14 of the FSAR describe the AE and NSSS support of the WNP-2 Test and Startup program.

14.2.2.8 Architect-Engineer Support of the Test and Startup Program

Burns and Roe, Inc. is responsible to provide information required to assure timely completion of construction testing and equipment turnover for provisional acceptance. Burns and Roe also provides system oriented engineers to assist the WPPSS Test and Startup Department, as required by WPPSS, in the provision of system boundary definitions, a preoperational test index prepared by WPPSS and technical direction and/or advice and consultation during system and component testing through preoperational testing.

14.2.2.9 General Electric Company Support of the Test and Startup Program

The General Electric Company (GE) is the supplier of the BWR nuclear steam supply system (NSSS) for WNP-2. GE is responsible for generic and specific WNP-2 designs and for the supply of the NSSS. During the construction phase of the plant cycle the GE Resident Site Manager is responsible for all NSSS equipment disposition. When the testing phase of the project begins, the responsibility of GE-NSSS activities are assigned to Preoperational and Startup Group. The GE Preoperational and Startup staff responsibilities are outlined below.

14.2.2.9.1 Staff Responsibilities

14.2.2.9.1.1 GE Operations Manager

The GE Operations Manager is the senior NSSS vendor representative onsite at or near official fuel loading, and is the official site spokesman for GE for preoperational and startup testing. He coordinates with the Startup Superintendent for the performance of his duties which are as follows:

a. reviewing all NSSS test procedures, including changes to test procedures, and test results as a conditional member of TWG.

b. providing technical direction to the station staff;

c. managing the activities of the GE site personnel in providing technical direction to WNP-2 personnel in the testing and operation of GE supplied systems;

d. providing liaison between the site and the GE San Jose home office to provide rapid and effective solution to problems which cannot be solved onsite; and

e. participating as a conditional member of the Test Work Group when required.

14.2.2.9.1.2 GE Operations Superintendent

The GE Operations Superintendent is responsible to the GE Operations Manager for supervising the activities of GE Shift Superintendents. He works directly with the WNP-2 Operations Supervisor in providing GE technical direction to the operating organization.

14.2.2.9.1.3 GE Shift Superintendents

The GE Shift Superintendents provide technical direction to WNP-2 shift personnel in the testing and operation of GE supplied systems. They provide 24-hour per day shift coverage as required beginning with fuel loading. They report to the GE Operations Superintendent.

14.2.2.9.1.4 GE Lead Engineer - Startup Test, Design, and Analysis

The GE Lead Engineer - Startup Test, Design, and Analysis is responsible to the GE Operations Manager for supervising the GE shift engineers and for verifying core physics parameters and characteristics and documenting that performance of the NSSS and components conform to test acceptance criteria. He works with the WNP-2 Technical Supervisor to coordinate and effect implementation of the Startup Test Program instrumentation including special test equipment required to confirm these acceptance criteria.

The test program is controlled through the Test and Startup Program manual and the WNP-2 Plant Procedures. The participation of General Electric in the program is as described in the FSAR. The participation of Burns and Roe, Inc. in the program as it is being implemented is more extensive than described in the FSAR. In the preoperational test program, Burns and Roe receives all test procedures for review, participates in the Test Working Group (TWG) as a conditional member and will receive all test reports. The purpose of this additional Burns and Roe participation is to confirm that the acceptance criteria related to their scope of design responsibility are correct and, through participation in the TWG review of test results, confirm that the results satisfy the acceptance criteria. In addition, several Burns and Roe test engineers have been assigned to the Test and Startup organization to assist in the conduct of the preoperational test program. A representative of the Supply System Project Engineering also participates as a member of the TWG. He has the responsibility of assuring an adequate engineering review of documents submitted to the TWG and maintaining a functional interface between TWG and the AE.

During the Power Ascension testing program, the plant is administratively and technically controlled by the Plant Manager with all procedures, tests and test results received by the Plant Operations Committee. Most of the testing during the Power Ascension program relates to the NSSS scope of design. The participation of General Electric in this portion of the program is as described in the FSAR. Burns and Roe participation, as identified at this time, includes technical assistance plus review of test procedures and test results within their scope of design responsibility to confirm that the acceptance criteria are correct and that the results satisfy the acceptance criteria.

TAA Recommendation on QA Overview of Bechtel (page 6)

8. The Supply System places considerable reliance on Bechtel's expertise and performance record in construction management and QA/QC and is therefore providing normal QA/QC surveillance of Bechtel's activities. In view of the early history of WNP-2 construction and the late date of Bechtel's assumption of its present responsibility, the team recommends that the Supply System conduct intensive surveillance of Bechtel's QA/QC activities and construction maintenance performance until the Supply System is satisfied that these factors have been adequately compensated. This surveillance pattern should be explained in the PVP plan.

Supply System Response

The Supply System has recently taken the following steps to enhance the effectiveness of the WNP-2 Project QA surveillance program as described in Appendix C, pages C-5 and C-9 of the revised report.

- Assigned Corporate QA the total responsibility for site audits. This change will permit the WNP-2 Project QA organization to focus on in-process surveillances.

- WNP-2 Project QA has replaced four of the individuals in the group responsible for in-process surveillances with more experienced Senior QA engineers from WNP-1.

- The program for surveillance of in-process construction has been revised to:

  - Provide for the performance of in-depth, limited-scope and unscheduled surveillances. In-depth surveillances will be performed to provide a comprehensive analysis of the capability of a specific function to yield quality work. The plan requires the performance of about five in-depth surveillances per month. Limited-scope surveillances will be used to provide routine overview of ongoing work and unscheduled surveillances will be performed to cover specific problem areas as they arise.

  - increase the number of surveillances from the average of about 9 per month since June 1981 to 12 or more per month.

- focus the surveillances on areas of complex or critical work and in areas where adverse trends are indicated based on the analysis of trend reports and current problem areas.

o Added special surveillance programs in two areas. These surveillances are scheduled separately from the routine surveillances, and are used to assess critical or complex work.

  - RPV Hydro preparation and performance. This includes the contractor and Bechtel work in preparation for RPV Hydro, the identification and review of documentation for components within the Hydro boundary and the performance of the Hydro.

  - Documentation review and turnover process. This includes the review of the documentation by the contractors prior to their turnover of documents to Bechtel plus the Bechtel review and processing in their vault in support of the system turnover and contract closeout activities.

TAA Recommendation on Augmented System Turnover Inspections (pages 6 and 7)

9. The team was told that the Project Test and Startup Section is conducting an extensive open-and-inspect program for major plant components because it has found evidence that some early construction maintenance programs were defective. We recommend that the Supply System emphasize their recognition of this problem, explain their criteria for selecting components to inspect, and give it greater prominence in the PVP. In this connection it would add to other evidences of primary system construction integrity if it could be confirmed (as we were told) and stated in the PVP that none of the stainless steel primary system has been filled with water since installation.

Supply System Response

In the revised report the description of the component inspections by the Test and Startup organization has been given greater prominence (see Section IV pages 14 and 29). This section also contains a discussion of the process by which components are selected for inspection by Test and Startup plus a confirmation that the stainless steel portions of the reactor pressure boundary have not come in contact with water as a result of construction and testing activities. This confirmation is based on follow-up discussions with knowledgeable project personnel plus the system configuration. The pumps in which corrosion was observed were at the low point in carbon steel systems which are remote from the stainless steel portion of the reactor pressure boundary.

TAA Recommendations to Strengthen Engineering and Design Verification (pages 8, 19, 10)

1. Prepare a detailed definition, estimate and schedule of the engineering effort required for requirements and system design verifications as described in the PVP, and for transition of design responsibility to the Supply System.

2. Identify clearly the organizational units responsible for performing these engineering functions, and fix the timing of the transfer of responsibility from one to the other.

3. Burns and Roe effort in support of the PVP and transition to Supply System design control should be contracted so as to permit Central Engineering to obtain the necessary support from Burns and Roe.

4. Define more clearly what is to be accomplished by an independent design review and by system document assembly, and develop means to insure that deficiency findings are resolved.

5. Assign Burns and Roe responsibility to help assemble suitable system information packages, allowing Central Engineering to give increased attention to the system design verification program.

6. Define in more detail the level of independent design reverification to be required for the systems chosen. Verify complete systems rather than partial systems. We believe that review in depth of a smaller number of systems is more useful for verification purposes than a larger number done in less detail.

7. Plan the transfer of design control responsibility from Burns and Roe to Central Engineering so that control of an entire system is transferred at one time, avoiding a situation where, for an interval, control of a single system is divided between organizations. As each system is turned over, obtain assurance from Burns and Roe that all required changes have been incorporated, or obtain status reports on those which have not.

8. Because of the intense interest in pipe hangers, describe prominently in the PVP what the Supply System has done to assure that WNP-2 hangers are satisfactory.

Supply System Response

The TAA recommendations in this area deal with two somewhat separate subjects, (1) the transition in engineering responsibility from Burns and Roe to the Supply System and (2) the Supply System activities related to the design reverification reviews as discussed in Section IV of the revised report. At the time of the TAA site visit, both of these activities were assigned to Systems Engineering (Technology Organization) with no defined support from Burns and Roe which raised questions about the ability of Systems Engineering to complete both tasks in a timely manner. Since that time the planning for Burns and Roe support of the engineering transition activity has progressed to the point where a separate task, under the direction of the Technology Organization, is expected to be defined by mid July including a level I schedule. This plan as it evolves is expected to be responsive to the TAA recommendations related to engineering transition. However, since the engineering transition is not a part of the WNP-2 Plant Verification Program, those aspects of the TAA recommendations related to engineering transitions will not be addressed in this report. Our response to the recommendations related to the design reverification activities described in Section IV of the revised report are discussed below.

- (TAA Recommendations 1, 4 and 6 - see Section IV pages 14-28 plus Figures 6 and 7 of Rev. 0.)

  The revised report contains a more detailed description of the Requirements and Design reverification reviews, the review of the engineering record, the processing of findings and a level I schedule. As indicated on page 20 of Section IV, we have selected three complete systems for review rather than six partial systems as originally considered. The detailed scope of the review for each selected system will be defined in the Design Verification Plan for each system. The minimum scope for each Design Verification Plan has been set at 100 key points to be checked (see Section IV page 21). TAA should review the Design Verification Plans during the program implementation audits.

- (TAA Recommendation 5)

  The Systems Design Engineering personnel are proceeding with the collection and review of the engineering record as before. Burns and Roe assistance in this area is being considered as part of the transition planning; however, the definition of the scope and the direction of the activity would remain a Supply System responsibility.

- (TAA Recommendation 8 - see Appendix B pages B-16 through B-19 of Rev. 0.)

  The revised report describes the review of pipe hanger criteria and procedures performed by EDS Nuclear, the Bechtel Engineering Management Group reviews and the ASME piping and hanger reviews which are presently underway.

<u>TAA Recommendations to Improve the Presentation (pages 12, 13 and 14)</u>

1. Provide a summary as the first section of the report. This summary should define the PVP in the context of the Plant Completion Plan, identify the PVP component parts, explain the plan's logic, and lay the groundwork for the presentation sequence to follow.

2. In the next section describe how a baseline of acceptability is achieved. Present and discuss briefly the adequacy of the design process, referring to appendices for details. Present the problem of unsatisfactory construction quality in the late 1970's and briefly describe the remedial programs. Details of Restart and QVP should be put in appendices. This section should show that WNP-2 is establishing a baseline of adequate design and construction quality, and a management system to assure its continuation.

3. In the following section, highlight the extraordinary actions which the Supply System Management is taking to give additional assurance of quality, over and above that which would result from normal good design and construction practices as established in the preceding section.

4. Conclude with a section for reporting findings and correction of deficiencies. Demonstrate that a complete PVP program will give a basis for concluding that the plant was designed and built to meet original commitments.

5. Put in appendices: the detailed justification to show that Burns and Roe and GE design processes have been satisfactory (Section IV); that pre June 1980 construction quality has been upgraded (Restart and QVP); that post June, 1980 and present construction management and QA/QC practices are satisfactory; that present Supply System Project Management and QA/QC are satisfactory (Section IV); and that Performance Testing will be effectively conducted (VF).

<u>Supply System Response</u>

The draft report has been completely restructured. In our view the revised report is responsive to the TAA recommendations in this area.

TECHNICAL AUDIT ASSOCIATES, INC.
589 OENOKE RIDGE
NEW CANAAN, CT 06840

FRANK B. JEWETT, JR.
PRESIDENT

(203) 966-0383

August 6, 1982
Ref. 98-2761

Mr. R. L. Ferguson
Washington Public Power Supply System
P.O. Box 968
3000 George Washington Way
Richland, Washington 99352

COMPLETION REPORT, PHASE IA
WPPSS Contract C-0878 - TAA Assignment 1126

Dear Mr. Ferguson:

The first phase of our assignment for Washington Public Power Supply System involved an audit of your written Plant Verification Program plan. The object of this phase was to satisfy our Review Team that the charter, organization, personnel, scope and methodology of the PVP plan would, if properly implemented, achieve the desired end: namely, to give credible assurance that WNP-2 has been designed and built to meet committed requirements. This letter reports our conclusions on that subject.

We have examined the Supply System "WNP-2 Plant Verification Report," dated June, 1982, and various supporting documents, including an earlier version of the plan on which we submitted written comments May 28, 1982. We later received and reviewed "Supply System Response to the May 28, 1982 Evaluation of the WNP-2 Plant Verification Program by Technical Audit Associates, Inc." and "Criteria for Assessing the Independence of the Technical Personnel Assigned to the WNP-2 Reverification Reviews", June 30, 1982.

We have interviewed a number of managers, engineers, and other personnel of the Supply System and its contractors in order to understand their views of the documents and how they intend to carry out the tasks set forth. We have visited and toured the WNP-2 construction site. Our examination was conducted by a Review Panel composed of independent experts who are experienced in the reviews needed to validate nuclear design and construction in order to assure that both have been performed to committed requirements.

The June report is much improved as compared with the April version. Although we offer a number of detailed comments in the attachments hereto, which you may wish to use, the June report, as it stands and with the modifications referred to in the second paragraph above, sets forth the WNP-2 verification program adequately. It is our opinion that, if properly implemented, the Plant Verification Program will provide convincing evidence that WNP-2 has been designed and constructed to meet committed requirements.

Our Review Panel for this assignment consisted of Mr. Robert V. Laney, Chairman; Mr. Louis H. Roddis, Jr. and Dr. Herman E. Sheets. Dr. Salomon Levy served as a consultant to the Review Panel. The statements herein reflect the unanimous opinions of TAA's Review Panel.

With this letter and its attachments TAA completes Phase I of its assignment. We look forward to working with you and your staff in the Implementation Phase of the WNP-2 Plant Verification Program.

Sincerely yours,

Frank B. Jewett, Jr.

Frank B. Jewett, Jr.

FBJ:fj
Attachments

cc R. V. Laney
L. H. Roddis, Jr.
H. E. Sheets
S. Levy

Attachment A

to Mr. R. L. Ferguson letter

August 6, 1982

WNP-2 PLANT VERIFICATION REPORT, JUNE 1982

SUMMARY OF DETAILED COMMENTS

by

TAA REVIEW PANEL and CONSULTANT

Attachment A

DETAILED COMMENTS

Comments with respect to:

I "WNP-2 Plant Verification Report, June 1982"

Title Page - Managing Director's approval of PVP should be shown in some manner.

page 1. A comment from almost all team members is that page 1 requires editing for clarity. Rather than make a lot of editorial comments, we have prepared a redraft of page 1 which utilizes those comments. See Attachment B.

page 2. Same comment as page 1. A suggested redraft of page 2 appears in Attachment B.

page 3. Substitute the following for the second sentence, page 3: "As a part of this transition, and in response to recent design quality problems experienced elsewhere in the industry, the Supply System decided to focus the requirements and design reverification program upon a complete recheck of all safety system engineering documents and an in-depth review of three systems to ascertain that all design requirements were carried through to construction across the various design and construction interfaces. The three systems to be reverified are:

"Residual heat removal system, suppression pool cooling mode,

"High pressure core spray system, and

"Reactor feedwater system, from condensate valves COND-V-142 A and B (condensate side of reactor feed pumps) to the reactor vessel nozzles."

page 6, ¶ 3. Refer to additional actions which would be taken if excessive errors are disclosed by the QVP program.

page 6, ¶ 5. Insert as a final sentence: "While this program's primary objective was to correct construction problems which occured prior to 1980, it provides extra assurance of correct construction through review of equipment maintenance records and inspection of installed equipment. Such actions give added construction insight which is unique to WNP-2."

page 8. Is Q. C. involved in Tech. Spec. preparation? What actions would be taken if large or generic errors were found in procedures or Tech. Specs.?

page 9. Final ¶: Insert after In-plant testing, "and operating envelope verification"; after the testing programs insert, "and preparation and independent review of Technical Specifications."

page 10. A suggested rewrite of this page, revised to reflect the teams' comments, is presented in Attachment B.

Figures 3 and 4 - Supply suitable titles. Explain dotted lines. Show where equipment suppliers report on the chart. By rearrangement, the chart could better emphasize the organizational separation of Technology from Project.

Figure 5 - Supply title. Clarify that "Safety Issues" are reviewed by FRC.

page 14, ¶ 1, second sentence to read "Over and above such considerations, the Supply System has....etc."

page 14. Insert between ¶'s 1 and 2: "The verification activities being conducted by the Supply System which are considered unique to WNP-2 and beyond normal industry practice are listed here, together with references to pages in this report which present details:

a. Independent reverification of the design requirements of all safety systems. (Section IV, pages 17-19)

b. Independent reverification of the design of three selected safety systems. (Section IV, pages 20-24)

c. Formal evaluation and disposition of findings from the above two activities. (Section IV, pages 25-27)

d. Extensive program to disassemble and inspect components and correct any deficiencies uncovered before system test.

page 14, ¶ 2, first sentence. Make read, an <u>in-depth</u> "independent" <u>design review</u> . . . .etc.

page 14, ¶'s 2 and 3. In each instance where the term Design Reverification is used, insert "Requirements and" before it.

page 14, ¶ 3. If the two numbered reviews described are beyond normal practice, the text should emphasize this fact.

page 15. This page needs editing for clarity and directness. For example, " . . . will be taken credit for . . ." is not good usage.

page 15. The number 39,000 is startling to say the least. Is it exaggerated?

page 16. Add at the end of ¶ A, "Any anomoly noted during the engineering record review will be reported to those involved in the Plant Verification Program, but resolved through the normal design and construction process."

page 19, ¶ 4, final sentence - In view of FRC's interest in discovering generic problems, should not they be informed of all problems and deficiencies found in Requirements Reverification process?

page 22, ¶ 3. The extent of modification of ANSI N45.2.11 should be indicated.

pages 22, 23, 24. The following review subjects should be considered for inclusion under system or component design review where appropriate:

single failure criterion
in-service inspection requirements
maintenance and maintenance accessibility

- material specifications
- weld specifications
- environmental qualification
- training, maintenance and repair manuals
- test acceptance criteria

Figure 7. This schedule shows requirements and design reverification only. Presumably there are schedules for other critical PVP activities, such as Quality Verification Program, Performance Verification, and Operating Envelope Verification. It would strengthen the credibility of the PVP program if these schedules were included or referred to in the report.

page A-3. Can the Supply System comment on performance by B&R before and after reorganization? Such comment, if favorable, would strengthen Burns & Roe design credibility.

page A-12. What resulted from NRC's review of FSAR? Discussion of design documents would be strengthened by relating them to the process of design development, showing how design quality is influenced.

page A-18, final ¶. What was the effect of introducing PED's rather than PCN's in August, 1978? Is this significant?

page A-25, ¶ 2. Were QC organizational changes described significant in terms of performance? What was the occasion for the changes and what were the results?

Appendix A, page A-28. The conclusion stated in the first sentence of ¶ 3 concerning "adequate design verification" is weakly supported by information presented in the report. More evidence is required. Also, the Supply System should exert whatever pressure is necessary to obtain access to suppliers' records; as written, the Supply System has apparently acquiesced (see ¶ 2, page A-28).

Appendix B, Attachments 8 and 11 - Obsolete documents should not be used.

Appendix B, Attachment 16 - What was final result of problem reported?

page C-5. Fourth ¶ states that the Supply System has increased its surveillance of Bechtel in critical areas. Suggest that this same point be mentioned on page 6 of the main report, for emphasis.

page E-1. Are there any objective measurements or data which compare construction quality before and after the construction suspension? Such data might verify the effectiveness of Restart Management improvements.

Appendix E, Figure 8 - Staff planning for operators should show 1) number on hand, 2) provision for adequate training and retraining time, and 3) provision for dealing with possible large turnover rate.

Appendix E - There should be some statement showing how Supply System is tracking and utilizing industry experience.

General - The report would benefit from editing for clarity, titles, figures, etc. (see proposed rewrites of Pages 1, 2 and 10, Attachment B); but this comment can be carried too far. When the intent has been clarified and approved, time is better spent getting on with the job.

* * * * *

Comment with respect to:

II "Criteria for Assessing the Independence of the Technical Personnel Assigned to the WNP-2 Reverification Reviews, June 30, 1982"

Page 2, ¶ 3, last sentence. As written, the use of "etc." leaves open ended the list of areas which do not disqualify Supply System personnel. The Criteria would be improved if the list were made definitive and the "etc." omitted. If this were done any additional areas raised would require management interpretation rather than individual engineer's interpretation.

Attachment B

to Mr. R. L. Ferguson letter

August 6, 1982

WNP-2 PLANT VERIFICATION REPORT, JUNE 1982

SUGGESTED REWRITE OF PAGES 1, 2 and 10,

I. BACKGROUND AND PURPOSE
II. OVERVIEW OF PLANT VERIFICATION
III. INDEPENDENT ADMINISTRATION OF THE PROGRAM

(for clarity in presenting WPPSS intent)

I. BACKGROUND AND PURPOSE: (suggested rewrite of Page 1.)

This report presents in a single document the bases for confidence that WNP-2 has been designed and constructed to meet applicable regulatory requirements and Safety Analysis Report commitments. The Plant Verification Program described herein is part of a broader WNP-2 Plant Completion Plan, as shown in Figure 1.

Plant Verification was first conceived as a response to the Supply System Managing Director's request for a "...well documented basis for acceptance of plant completion, safety and technical adequacy." (See Attachment 1.) This request, issued in January, 1981, six months after he assumed the Directorship, came during a one year's construction suspension required to correct prior quality problems of several construction contractors.

The report describes programs which were conducted or begun during the suspension to correct deficiencies and reestablish a firm, documented construction baseline. It also describes the changes in management practices which the Supply System adopted to correct these early construction problems, including the employment of a more experienced construction and startup contractor to assist in maintaining a high level of quality following construction restart in July, 1981.

In addition to verifying the construction baseline and describing methods for assuring that it will be continued to completion, the report also describes the bases for confidence in the design as developed by the architect-engineer and the reactor steam supply system contractor. When both are complete, these design and construction verification activities would, under normal circumstances, be sufficient to satisfy the most exacting requirements for confidence in WNP-2's technical adequacy.

However, the Supply System management, noting the design quality problems which have recently been observed at Diablo Canyon and elsewhere, has decided to take several additional verifying steps which go beyond normal practice, and which address NRC's concerns for strengthening quality assurance for nuclear plants under construction. These include a reverification that valid design requirements were used in the design of all safety systems and, by independent design reviews of three selected systems, that those requirements were correctly reflected in the detailed design documents used in construction. Any deficiencies noted in these reviews will be submitted to a formal "findings review process" for evaluation and disposition. The Plant Verification Program plan and the

implementation of several of its critical steps will be subjected to independent technical audit.

The Supply System believes that the verification program described herein will, when complete, provide confidence that WNP-2 is designed and constructed in accordance with committed requirements.

II OVERVIEW OF PLANT VERIFICATION: (suggested rewrite of page 2)

Plant Verification is accomplished through proper implementation of design, construction, and testing practices; an appropriate level of checking and auditing against suitable standards; and a thorough evaluation and disposition of defects found. A number of the verification activities are standard practice in the course of designing and constructing a nuclear power plant. They are documented and controlled for WNP-2 through quality assurance manuals, design and construction procedures, and test and startup manuals and procedures. These activities are summarized in this section and presented in detail in Appendices.

In the following paragraphs, the WNP-2 verification activities are identified. Those which go beyond normal industry practice are underlined for differentiation. (Refer to Figure 2.)

- Design Verification - The WNP-2 design development process, including design reviews and audits, is described in Appendices A and B. These meet the standards of normal good industry practice. <u>Design requirements and design reverification and the formal processing of findings, both of which are considered to go beyond normal industry practice, are discussed in Section IV.</u>

- Construction Verification - The Quality Verification Program, designed to reestablish a firm construction quality base during and after the one year's construction suspension, is described in Appendix E. Even though this program is aimed at reestablishing an adequate baseline and not a quality level significantly above the industry norm, it still provides a unique opportunity at WNP-2 to recheck construction shortly before plant operation. The Restart Program and the improved quality assurance program, designed to assure an adequate level of quality following resumption of construction, are described in Appendices C and E. <u>An extensive program of opening and inspecting components, which we believe goes beyond normal industry practice, is described in Section IV.</u>

- Performance Verification - The testing program to ensure that components and systems perform in accordance with design requirements is described in Appendix E.

- Operating Envelope Verification - The process for assuring that the technical specifications and plant operating, maintenance, and emergency procedures are consistent with the design, industry experience, and regulatory requirements is discussed in Appendix E.

Each of the four elements of Plant Verification is discussed briefly in this section and more fully in other parts of the report as noted.

III INDEPENDENT ADMINISTRATION OF THE PROGRAM: (suggested rewrite of page 10)

As noted in the preceding Section II, verification is achieved through proper implementation of design and construction, combined with tests, reviews, audits and inspections conducted by qualified individuals who had no part in the original work being verified.

The Supply System has conducted such reviews as part of its basic design and construction programs in accordance with 10CFR50, Appendix B, and ANSI N45.2. The Supply System conducted additional technical and quality reviews to correct construction problems which arose prior to July, 1980. These basic verification programs, equivalent to best industry practices, will, when complete, provide an acceptable level of confidence in WNP-2 as constructed and tested. These programs are described in Appendices A through E.

Going beyond this, the Supply System has taken particular care to assure the independence and objectivity of several unique verification activities which are over and above normal industry practices. This section describes explicit steps to insure the credibility of the Requirements and Design Reverification reviews, the evaluation and disposition of findings, and the Quality Verification Program.

These include the direct involvement of the Managing Director and his principal managers (see Attachment 2); internal organizational separations; careful selection of review personnel for objectivity; and a formal procedure for reviewing and disposing of findings. The Supply System has retained an independent technical auditing firm to review the verification program plan and the implementation of its key features.

8211020590

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 TYPE:

1. UTILITY: Washington Public Power Supply System PWR ______

2. NSSS: GE 3. A/E: Burns & Roe BWR 5, Mark II

II. COMPONENT NAME: Hydraulic Control Unit COMPONENT NO: CRD-HCU-(See Note 1)

1. SCOPE: [X] NSSS [ ] BOP

2. MODEL NUMBER: 761E500 G1 QUANTITY: 185

3. VENDOR: GE

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

N/A

5. PHYSICAL DESCRIPTION: a. APPEARANCE: Hardware mounted on tubular frame.

b. DIMENSIONS: 102" high x 21.5" wide x 20" deep

c. WEIGHT: 785 lb. approx.

6. LOCATION: BUILDING: Reactor Building

ELEVATION: 522'

7. FIELD MOUNTING CONDITIONS: [ ] BOLT (NO. ______, SIZE ______)

[ ] WELD (LENGTH ______)

[X] tubular structure

8. a. SYSTEM IN WHICH LOCATED: CRD

b. FUNCTIONAL DESCRIPTION: Inserts and withdraws CRD and Scrams the CRD for Rx shutdown

c. IS THE EQUIPMENT REQUIRED FOR: [ ] HOT STANDBY [ ] COLD SHUTDOWN

[X] BOTH [ ] NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: Seismic Design 383HA 745

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: [XX] YES [ ] NO

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

☐ TEST ☐ ANALYSIS ☒ COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: MPL No. C12-D001

(NO., TITLE & DATE): 384HA183, Hydraulic Control Unit, 7/21/75

COMPANY THAT PREPARED REPORT: G. E. using Test Report by Wyle Lab.

COMPANY THAT REVIEWED REPORT: Nutech

V. VIBRATION INPUT:

1. LOADS CONSIDERED: a. ☐ SEISMIC ONLY
   b. ☐ HYDRODYNAMIC ONLY
   c. ☒ COMBINATION OF (a) and (b)

   Hydrodynamic accelerations were included in test although no hydrodynamic loads reach the HCU.

2. METHOD OF COMBINING RRS: ☒ ABSOLUTE SUM ☐ SRSS ☐ OTHER (SPECIFY) ________

3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): TRS vs. SSE RRS

4. DAMPING CORRESPONDING TO RRS: ☐ OBE ________ ☐ SSE 1%

5. REQUIRED ACCELERATION IN EACH DIRECTION: ☒ ZPA ☐ OTHER (SPECIFY) ________

	S/S =	F/B =	V =
OBE			
SSE	0.6g	0.6g	0.4g

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 THROUGH VII FOR EACH REPORT.

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. [ ] SINGLE FREQUENCY [ ] MULTI-FREQUENCY [XX] RANDOM

2. [X] SINGLE AXIS [ ] MULTI-AXIS [XX] SINE BEAT [X] Resonant search- 1 to 50 Hz. @0.5g's
(3 directions)-See Note 2

3. NO. OF QUALIFICATION TESTS: OBE 2 SSE 1 OTHER (SPECIFY) 1 SSE with superimposed sine beat (horizontal)

4. FREQUENCY RANGE: 1-100Hz. Vertical, 1-38Hz. horizontal

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = 2.75, 5.0, 8.5, 14Hz. F/B = 2, 4.2, 7.5, 12.5 Hz. V = 10, 38, 41, 49.5Hz.

6. METHOD OF DETERMINING NATURAL FREQUENCIES:

[X] LAB TEST [ ] IN-SITU TEST [ ] ANALYSIS

7. TRS ENVELOPING RRS USING MULTI-FREQUENCY TEST: [X] YES (ATTACH TRS & RRS GRAPHS) (See Note 3) [ ] NO

8. INPUT g-LEVEL TEST: OBE S/S = 5.0g 5g(no sine B) F/B = 4.0g 5g (no sine B) V = 3.6g
SSE S/S = 5.8g (with sine B) F/B = 7g (with sine B) V = 6.5g

9. LABORATORY MOUNTING:

1. [X] BOLT (NO. 4 , SIZE 1/2") [ ] WELD (LENGTH ____) [ ] ____

10. FUNCTIONAL OPERABILITY VERIFIED: [XX] YES [ ] NO [ ] NOT APPLICABLE

11. TEST RESULTS INCLUDING MODIFICATIONS MADE:

The SCRAM sequence was performed successfully during each test. No physical damage occurred during the qualification test.

12. OTHER TEST PERFORMED (SUCH AS AGING OR FRAGILITY TEST, INCLUDING RESULTS):

Fragility test-8 oscillation of sinebeat from.5g's to 1.26g's major resonance frequencies in each direction.

* NOTE: IF QUALIFICATION BY A COMBINATION OF TEST AND ANALYSIS, ALSO COMPLETE ITEM VII:

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VII. IF QUALIFICATION BY ANALYSIS, THEM COMPLETE:

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 = 13.29 F/B = 10.42 V = 22.71

3. MODEL TYPE:

☒ 3D ☐ 2D ☐ 1D ☒ FINITE ELEMENT ☐ BEAM ☐ CLOSED FORM SOLUTION

4. ☒ COMPUTER CODES: SAMIS

FREQUENCY RANGE AND NO. OF MODES CONSIDERED: 1-100Hz, 10 modes

☐ HAND CALCULATIONS

5. METHOD OF COMBINING DYNAMIC RESPONSES: ☐ ABSOLUTE SUM ☒ SRSS ☐ OTHER (SPECIFY) ____

6. DAMPING: OBE 1% SSE 1% BASIS FOR THE DAMPING USED: Meets Req. Guide 1.61

7. SUPPORT CONSIDERATIONS IN THE MODEL: Beam Arrangement-Top Horizontal H-beam provides main stiffness (see Note 4)

8. CRITCAL STRUCTURAL ELEMENTS: at RRS:

A.

IDENTIFICATION	LOCATION	Direction	Frequency	Acceleration	Allowable Acceleration	Based on Stress Allowable
Frame	Element 5	side-side	13.29Hz	0.60	7.43	37,500psi
Bracket	Element 39	vertical	22.71Hz	0.47	1.88	37,500psi
Frame	Element 5	front-back	10.42Hz	0.60	4.88	37,500psi

B.

MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY

COMPLETED BY: P W Heckman DATE: 10-29-82

REVIEWED BY: Dennis A Armstrong DATE: 10/29/82

Note 1:

The following Seismic Qualification Review Team audit equipment items are components of the control rod drive hydraulic control units. (HCU)

NSSS 2	CRD-HCU-0235	Hydraulic Control Unit
NSSS 1	CRD-V-127/5043	Scram Exhaust Valve
NSSS 5	CRD-F-134/0227	Drive Water Inlet Filter
NSSS 6	CRD-AO-127/1427	Exhaust Valve Operator
NSSS 9	CRD-POS-1260239	V-126 Position Switch
NSSS A	CRD-PI-131/5839	Accumulator Pressure Indicator
NSSS B	CRD-SV-122/5035	Withdraw Drive Solenoid Valve

The four last digits of the equipment piece number identifies the control rod that is inserted by the HCU.

The identical HCUs were tested and analyzed as a system. All HCUs are located in two areas of the Reactor Building and are available for inspection. Each HCU contains all of the listed types of components which are qualified as a part of that system. Therefore, only one Qualification Summary Form is being provided for these components.

Note 2:

Cross-coupling accounted for by large margin between TRS and RRS. Also see attached table of modal participation factors (Table VI 1.B) computed for the analysis covered on pg. 4 of this form. Due to the added stiffeners in WNP-2, cross-coupling should be minimal.

Note 3:

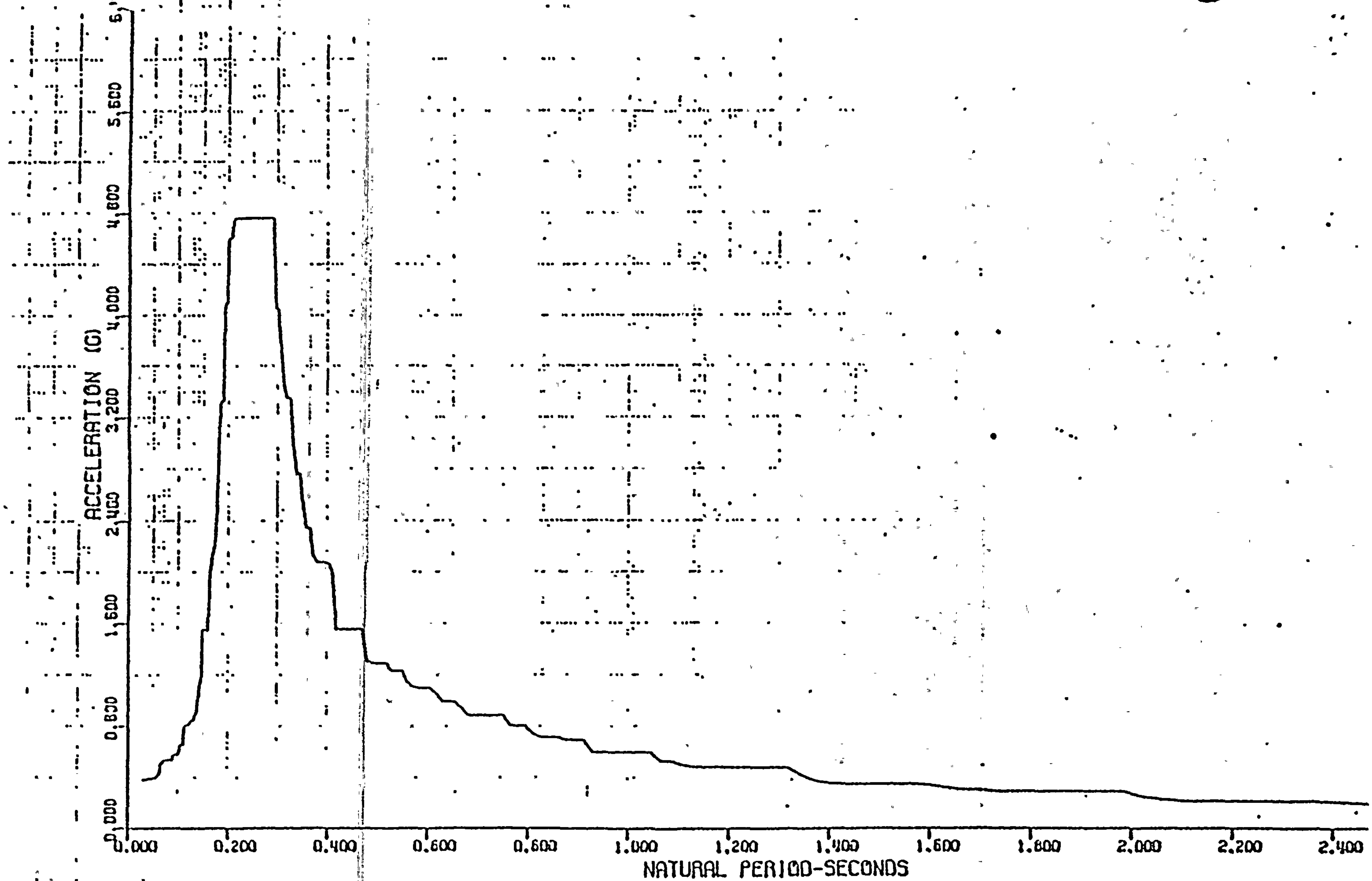
The WNP-2 mounting (see page 4 and Note 4) is considerably stiffer than this test configuration.

Note 4:

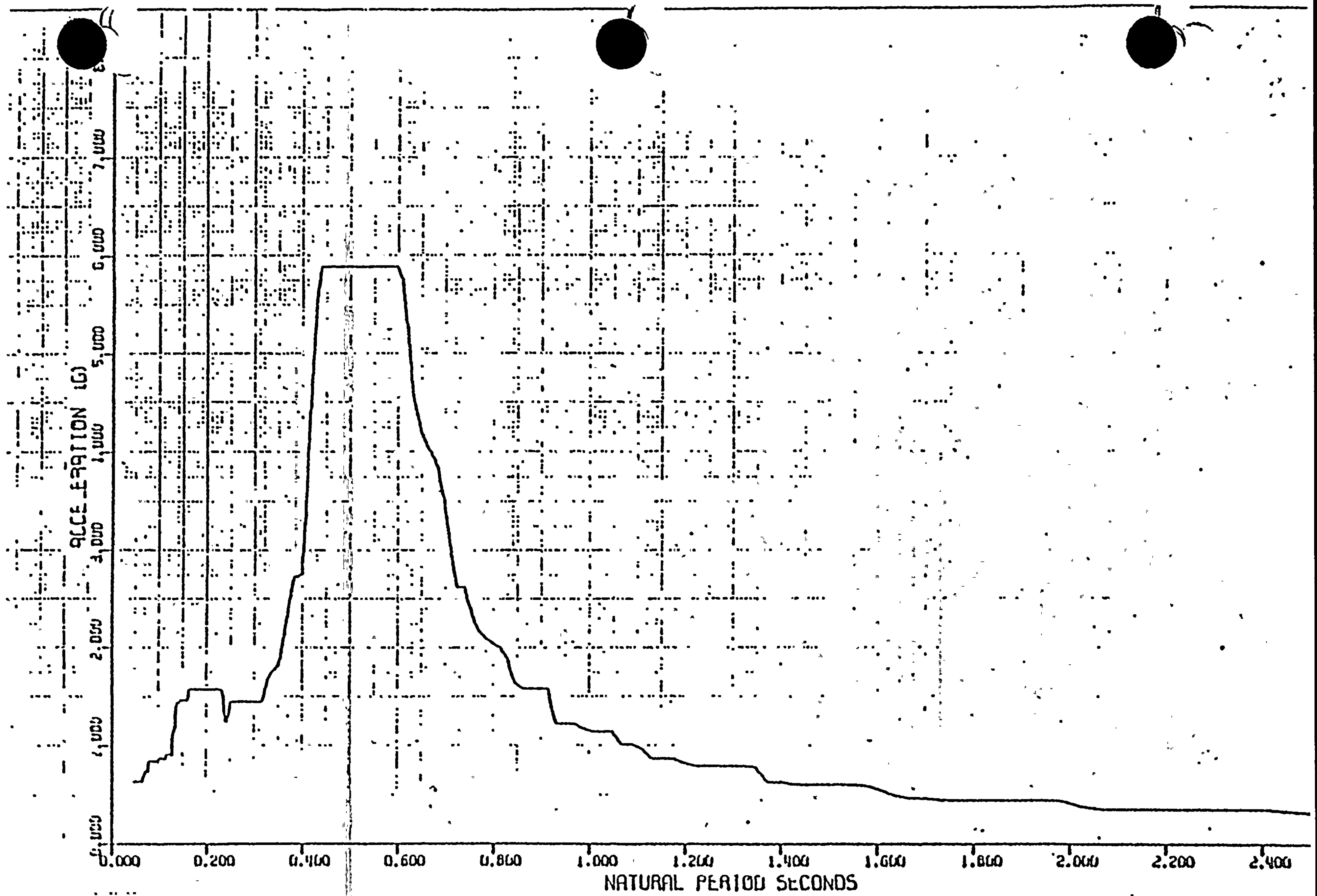
This comes closest to WNP-2 mounting conditions. WNP-2 HCU have a top horizontal stiffner that ties into all the HCUs in a given row. The horizontal stiffner has cross bracing which would move the side-to-side resonance considerably above the 13Hz. shown above. In addition, each HCU has an angle brace to stiffen it front-to-back which would push the fundamental mode for this direction well above the 10Hz. shown above.

The following safety-related equipment items are components of a typical hydraulic control unit (HCU).

EPN #	MFG	Model #	Description
CRD-AO-126	R290	83470-A1	AIR OP CRD-V-126 SCRAM INLET
CRD-AO-127	R290	83470-B2	AIR OP CRD-V-127 SCRAM EXHST
CRD-F-134	G080	117C4216G	.5" Filter Drive WRT Inlet to HCU
CRD-F-135	G080	117C4216G	.5" Filter EXHST WRT Return to HCU
CRD-F-136	G080	117C4216G	.5" Filter from Over-Piston Port
CRD-LS-129	G050	- - -	Liquid Level 60CC Accum Water Leak
CRD-PI-131	R290	117C2254P1	0-2500 Accumulator Pressure
CRD-POS-126	M302	- - -	Position Switch
CRD-POS-127	M302	- - -	Position Switch
CRD-PS-130	B069	B1T-GH32SS	Accum Press 970-940 PSIG Decreas
CRD-RD-132	F103	- - -	N2 Accum Rupt Disc 1900-2100 PSI
CRD-SV-117	A610	HVA904052-J	Scram Solenoid pilot CRD-V-126 and -127
CRD-SV-118	A610	HVA904052-J	" " " " " " "
CRD-SV-120	A610	HVA1709662A	.5" Solenoid Withdraw Exhaust Valve
CRD-SV-121	A610	HVA1709662A	.5" Solenoid Insert Exhaust Valve
CRD-SV-122	A610	HVA1709662A	.5" Solenoid Withdraw Drive Valve
CRD-SV-123	A610	HVA1709662A	.5" Solenoid Insert Drive Valve
CRD-TK-125	G080	921D595G1	HCU Scram Water Accumulator
CRD-TK-128	L237	920D852P3-PPD	HCU N2 Scram Accumulator
CRD-V-101	P232	P10649-5	1" Gate Insert Isol at HCU
CRD-V-102	D232	P10649-3	.75" Gate WDRAW Isol at HCU
CRD-V-103	V135	E-46031	.5" Gate Drive WRT Inlet ISOL @ HCU
CRD-V-104	V135	E-46031	.5" Cooling WRT Isol to HCU
CRD-V-105	V135	E-46031	.5" Gate Exhaust WRT Outlet ISOL
CRD-V-107	H037	5530W-1-XOSH9	.5" Angle H2O Accum Drain to QDC
CRD-V-111	C487	117C4272P1-PPD	Cartridge Valve N2 Gas Charge Inlet
CRD-V-112	V135	E-46032	.75" Gate HCU ISOL to Scram DIS HDR
CRD-V-113	V135	E-46031	.5" Gate Charge WTR Inlet to HCU
CRD-V-114	G080	730E112P15	.75" Check Ethst to Scram Disc HDR
CRD-V-115	G080	730E112P4	.5" Check Charging WTR in at HCU
CRD-V-116	C257	125	.5" Gate Air Isol. for Scram Sol
CRD-V-126	R290	83470-A1	1" Globe Scram Inlet Valve (AO)
CRD-V-127	R290	83470-B2	1" Globe Scram Exhaust Valve (AO)
CRD-V-137	G080	730E112P9	.5" Check Drive WTR in at HCU
CRD-V-138	G080	730E112P11	.5" Check Cooling WTR in at HCU

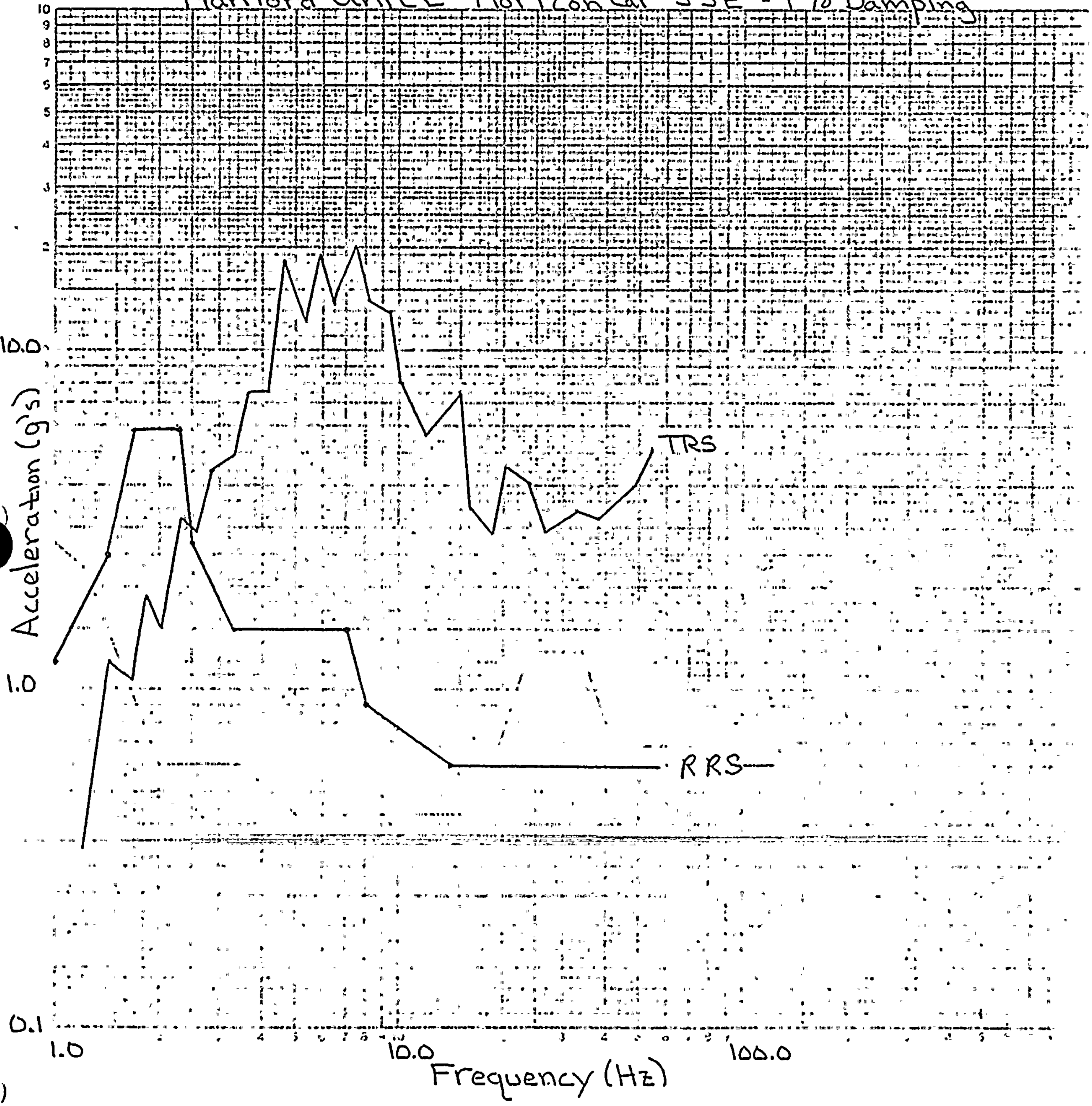


WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (OBE) FLOOR SPECTRUM - VERTICAL
MASS NO.5, EL. 521'-0", DAMPING=0.01



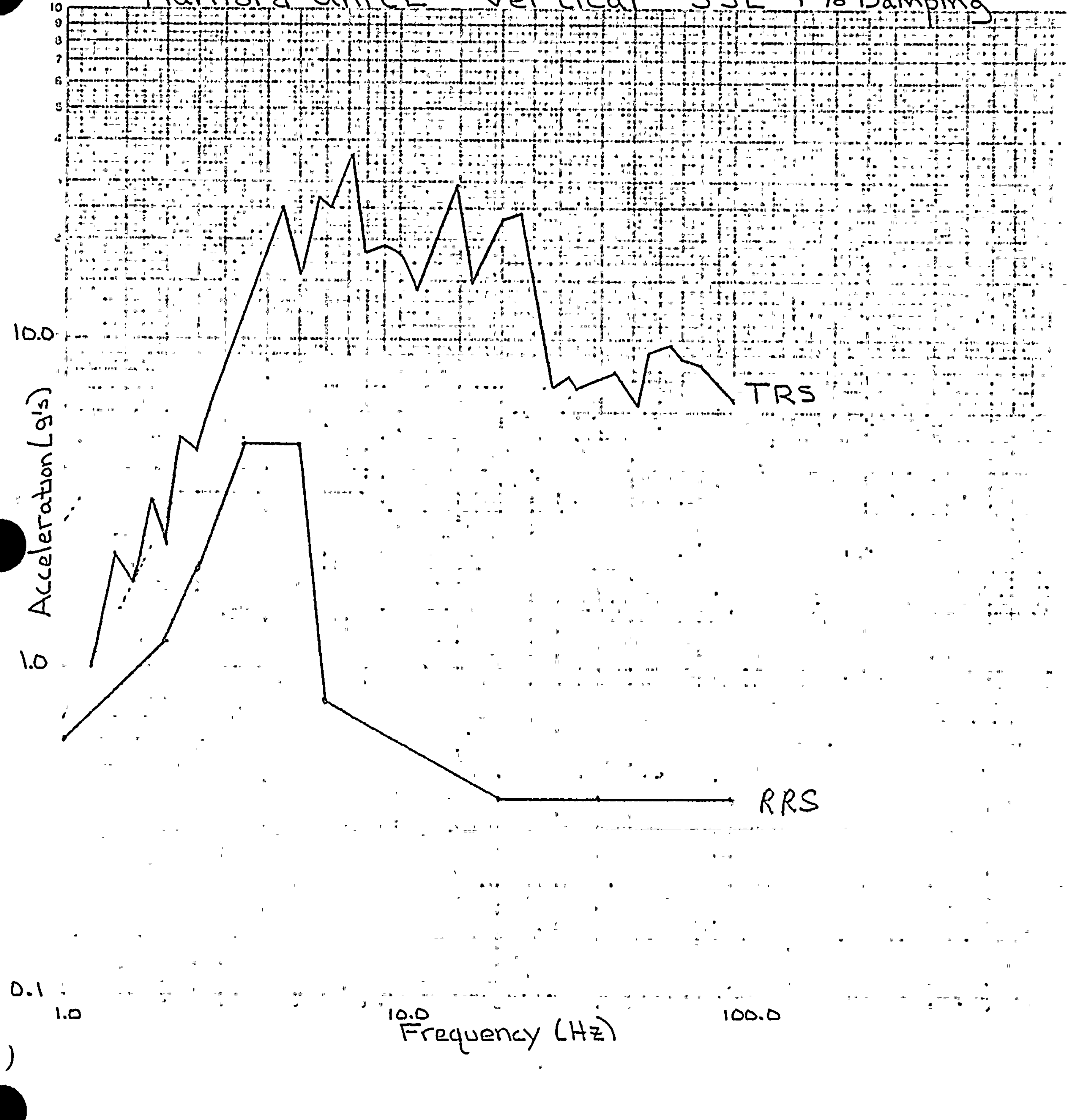
WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE . (OBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.5, EL. 521'-0", DAMPING=0.01

Hanford Unit 2 - Horizontal SSE - 1% Damping



TRM
2/26/81

Hanford Unit2 - Vertical SSE 1% Damping



TRM
2/26/81

GENERAL ELECTRIC COMPANY PROPRIETARY INFORMATION

HANFORD

GENERAL ELECTRIC

ATOMIC POWER EQUIPMENT DEPARTMENT

ENGINEERING FORM

SEISMIC ANALYSIS OF THE HYDRAULIC CONTROL UNIT

Table VI 1.B

Natural Frequencies and Mode Participation Factors when the HCU is attached to the Beam Arrangement.

Mode No.	Frequency (Hz)	Period (Sec)	Mode Participation Factors X-Excit.	Mode Participation Factors Y-Excit.	Mode Participation Factors Z-Excit.
1	10.42	.096	.276	.212	1.082
2	13.28	.075	.098	.088	.037
3	22.71	.044	.103	.987	.599
4	23.56	.042	.104	.276	.225
5	26.46	.038	.573	.035	.089
6	28.56	.035	.106	.118	.068
7	30.41	.031	.038	.160	.008
8	39.01	.026	.053	.141	.058
9	43.47	.023	.057	.223	.527
10	46.14	.022	.102	.073	.195

BY	APPROVALS	REV NO. 0
ISSUED		383HA853
		CONT ON SHEET 17 SH NO. 16

NSSS-3

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 TYPE:

1. UTILITY: WASHINGTON PUBLIC POWER SUPPLY SYSTEM PWR ______

2. NSSS: GE 3. A/E: BURNS & ROE BWR 5 MARK II

II. COMPONENT NAME: 24" M.O. WEDGE VALVE COMPONENT NO: RRC-V-23A RRC-V-23B

1. SCOPE: [X] NSSS [ ] BOP

2. MODEL NUMBER: 24 IN - 678 # DRAWING 921D875 V QUANTITY: 2

3. VENDOR: ATWOOD AND MORRIL CO, INC

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

N/A

5. PHYSICAL DESCRIPTION: a. APPEARANCE: LARGE MOTOR OPERATED VALVE

b. DIMENSIONS: 123" HIGH X 62" WIDE (ASSEMBLY)

c. WEIGHT: 8700 Lb (DRY), 9330 Lb (WET) ASSEMBLY

6. LOCATION: BUILDING: CONTAINMENT

ELEVATION: 503'

7. FIELD MOUNTING CONDITIONS: [ ] BOLT (NO. ______, SIZE ______)

[ ] WELD (LENGTH ______)

[X] WELDED IN PIPE

8. a. SYSTEM IN WHICH LOCATED: REACTOR RECIRCULATION SYSTEM (RRC)

b. FUNCTIONAL DESCRIPTION: RECIRCULATION SUCTION VALVE

c. IS THE EQUIPMENT REQUIRED FOR: [ ] HOT STANDBY [ ] COLD SHUTDOWN

[ ] BOTH [X] NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 21A1840

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: [X] YES [ ] NO

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

☐ TEST ☒ ANALYSIS ☐ COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: VPF No 3167-63-6

(NO., TITLE & DATE): 12336-203-07, DESIGN CALC. REV 6 2/7/74

COMPANY THAT PREPARED REPORT: ATWOOD AND MORRIL

COMPANY THAT REVIEWED REPORT: NUTECH / 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 ☐ OTHER (SPECIFY) ______
3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): PIPE MOUNTED
4. DAMPING CORRESPONDING TO RRS: ☑ OBE 1/2% ☑ SSE 1% (PIPING ANAL)
5. REQUIRED ACCELERATION IN EACH DIRECTION: ☐ ZPA ☒ OTHER (SPECIFY) PIPING RESULTS

	S/S	F/B	V
OBE	1.128g	1.128g	0.568g
SSE	4.4 g SSE + HYDRO	4.4g	1.7 g

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:

SEISMIC

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*: N/A

1. ☐ SINGLE FREQUENCY ☐ MULTI-FREQUENCY ☐ RANDOM

2. ☐ SINGLE AXIS ☐ MULTI-AXIS ☐ SINE BEAT ☐ ________

3. NO. OF QUALIFICATION TESTS: OBE ________ SSE ________ OTHER (SPECIFY) ________

4. FREQUENCY RANGE: ________

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = ________ F/B = ________ V = ________

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:

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VII. IF QUALIFICATION BY ANALYSIS, THEM COMPLETE:

1. METHOD OF ANALYSIS:

[X] STATIC ANALYSIS [ ] EQUIVALENT STATIC ANALYSIS

[ ] DYNAMIC ANALYSIS [ ] TIME-HISTORY [ ] RESPONSE SPECTRUM

2. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):
UPPER STRUCTURE = 37 HZ. VALVE ASSUMED RIGID.
S/S = ______ F/B = ______ V = ______

3. MODEL TYPE:

[ ] 3D [ ] 2D [ ] 1D [ ] FINITE ELEMENT [X] BEAM [ ] CLOSED FORM SOLUTION

4. [ ] COMPUTER CODES: N/A

FREQUENCY RANGE AND NO. OF MODES CONSIDERED: N/A

[X] HAND CALCULATIONS

5. METHOD OF COMBINING DYNAMIC RESPONSES: [ ] ABSOLUTE SUM [ ] SRSS [X] OTHER (SPECIFY) SEISMIC COEF BY ABS.SUM

6. DAMPING: OBE — SSE — BASIS FOR THE DAMPING USED: ACTUAL PIPE LOADS

7. SUPPORT CONSIDERATIONS IN THE MODEL: FIXED AT PIPE

8. CRITCAL STRUCTURAL ELEMENTS:

A. IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS (PSI)	STRESS ALLOWABLE (PSI)
MAX STRESS	YOKE ROD NECK	BENDING		17,750	21,000
* MAX FLANGE MOMENT	BODY-BONNET, API			1,156,398 IN.LB	2506130 IN-LB.

B. MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY
** NEGLIGIBLE		

C. SEISMIC COEFFICIENTS USED WERE 3g HORIZONTAL AND 2g VERTICAL ADDED FOR A TOTAL OF 5g.

* NOTE: MOMENT CALCULATED FROM STATIC ANALYSIS = 2,506,130 INCH-POUND RESULTED IN ACCEPTABLE STRESS LEVELS, THEREFORE, MOMENT FOUND FROM PIPING ANALYSIS RESULTS (ATTACHED) = 1,156,398 INCH-LB IS ACCEPTABLE.

** FOR OPERABILITY, SEE ATTACHMENT

COMPLETED BY	DATE
RW Hickman	10/29/82
REVIEWED BY	**DATE**
Dennis R. Armstrong	10/29/82

RRC-V-23A and -23B

Assignment of the EC code for RRC-V-23A and -23B was in error on the submittal issue of the safety-related equipment list and will be changed from A to P on the next revision to the data base.

These valves are used only for isolating the recirculation pump for maintenance and are not used during normal plant operation. The only possible circumstances in which this valve could compound an accident would be if a break occurred in the recirculation loop and both this valve and the discharge isolation valve RRC-V-67A or -67B were closed, thereby isolating the break and causing void collapse. Since both valves are normally open, "fail as is" on loss of electrical power, and since their breakers are locked open, the only safety function for these isolation valves is pressure boundary integrity.

An EC code of "P" will be consistent with the rest of the valve information such G Safety Function and 20 Use Code.

NSSS-4

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 TYPE:

1. UTILITY: WASHINGTON PUBLIC POWER SUPPLY SYSTEM PWR

2. NSSS: G E 3. A/E: BURNS & ROE BWR 5, MARK II

II. COMPONENT NAME: RECIRCULATION PUMP COMPONENT NO: RRC-P-1A RRC-P-1B

1. SCOPE: ☒ NSSS ☐ BOP

2. MODEL NUMBER: 24X24X34 TYPE R QUANTITY: 2

3. VENDOR: BINGHAM & WILLAMETTE PUMP CO

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

N/A

5. PHYSICAL DESCRIPTION: a. APPEARANCE: LARGE VERTICAL PUMP

b. DIMENSIONS: 128" Φ X 253" HIGH

c. WEIGHT: PUMP 38,000# WET MOTOR 60,000#

6. LOCATION: BUILDING: CONTAINMENT

ELEVATION: 501'

7. FIELD MOUNTING CONDITIONS: ☐ BOLT (NO. ____, SIZE ____)

☐ WELD (LENGTH ____)

☒ SUPPORTED BY CONSTANT FORCE HANGERS

LATERAL SUPPORT NOT YET INSTALLED

8. a. SYSTEM IN WHICH LOCATED: REACTOR RECIRCULATION SYSTEM

b. FUNCTIONAL DESCRIPTION: COOLANT BOUNDARY

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN

☐ BOTH ☒ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 21A 1826, 21A 9379,

PROJECT SHEET 731E724E

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES ☐ NO

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

EQUIPMENT QUALIFICATION METHOD:

☐ TEST ☒ ANALYSIS ☐ COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: VPF #3152-23-3

(NO., TITLE & DATE): ① PRESSURE VESSEL CODE CALCULATION AND SEISMIC CALCULATIONS 2-23-72

COMPANY THAT PREPARED REPORT: BINGHAM & WILLAMETTE

COMPANY THAT REVIEWED REPORT: GE/NUTECH

② ALSO GE REPORT NLDAE, NEW LOADS SUMMARY REPORT, SEPT 25, 1981

V. VIBRATION INPUT:

1. LOADS CONSIDERED: a. ☒ SEISMIC ONLY ①

   b. ☐ HYDRODYNAMIC ONLY

   c. ☒ COMBINATION OF (a) and (b) ②

2. METHOD OF COMBINING RRS: ☒ ABSOLUTE SUM ☒ SRSS ☐ OTHER (SPECIFY) ____

3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): PIPE MOUNTED,

4. DAMPING CORRESPONDING TO RRS: ☐ OBE 1/2% ☐ SSE 1% (PIPING ANALYSIS)

5. REQUIRED ACCELERATION IN EACH DIRECTION: ☐ ZPA ☒ OTHER (SPECIFY) PIPING RESULTS **

OBE	S/S = .19 g	F/B = .19 g.	V = 1.401 g.
SSE	S/S = 1.454 g	F/B = 1.454 g	V = 1.65 g.

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:

** ACCELERATIONS ARE THE PEAK VALUES FROM THE RECIRCULATION PIPING ANALYSIS.

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IF QUALIFICATION BY TEST, THEN COMPLETE*: N/A

1. ☐ SINGLE FREQUENCY ☐ MULTI-FREQUENCY ☐ RANDOM
2. ☐ SINGLE AXIS ☐ MULTI-AXIS ☐ SINE BEAT ☐ ____________
3. NO. OF QUALIFICATION TESTS: OBE ________ SSE ________ OTHER (SPECIFY) ________
4. FREQUENCY RANGE: ____________
5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

   S/S = ________ F/B = ________ V = ________
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:

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VII. IF QUALIFICATION BY ANALYSIS, THEM COMPLETE:

1. METHOD OF ANALYSIS:

[X] STATIC ANALYSIS [ ] EQUIVALENT STATIC ANALYSIS

[ ] DYNAMIC ANALYSIS [ ] TIME-HISTORY [ ] RESPONSE SPECTRUM

2. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = NOT CALCULATED F/B = ________ V = ________

3. MODEL TYPE:

[ ] 3D [ ] 2D [ ] 1D [ ] FINITE ELEMENT [ ] BEAM [ ] CLOSED FORM SOLUTION

4. [ ] COMPUTER CODES: N A

FREQUENCY RANGE AND NO. OF MODES CONSIDERED: ________

[X] HAND CALCULATIONS

5. METHOD OF COMBINING DYNAMIC RESPONSES: [ ] ABSOLUTE SUM [ ] SRSS [X] OTHER (SPECIFY) SUM OF MOMENTS

6. DAMPING: OBE ½% SSE 1% BASIS FOR THE DAMPING USED: PIPING ANALYSIS

7. SUPPORT CONSIDERATIONS IN THE MODEL: CONSTANT LOAD

8. CRITCAL STRUCTURAL ELEMENTS:

A.

IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS (PSI)	TOTAL STRESS (PSI)	STRESS ALLOWABLE (PSI)
MOTOR TO MOTOR STAND	BOLT BENDING	ALL	15,981	15981	45000
PUMP CLOSURE	BOLT BENDING	ALL	1 770	18542	38,062
BEARING STRESS	HANGER LUGS	SUPPORT (CONSTANT)	4500	4500	12 600

B.

MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY
NONE CALCULATED		

COMPLETED BY	DATE
A.W. Heckman	10/29/82
REVIEWED BY	DATE
Dennis A. Armstrong	10/29/82

RRC-P-1A and -1B

Assignment of the EC code for RRC-P-1A and -1B was in error on the submittal issue of the safety-related equipment list and will be changed from A to P on the next revision to the data base.

The recirculation pump and motor are passive components for accident mitigation. They are not required to change state or move to achieve their accident mitigation function.

The LOCA analyses do take credit for continued recirculation pump/motor movement for the first few seconds following a hypothetical LOCA. The coast-down rate is assured by a General Electric specification and tests. The only component required to function for this period is the bearing/shaft for the pump/motor. However, the bearing is not required to perform any special function - other than remain intact.

An EC code of "P" will be consistent with the rest of the pump information such as G Safety Function and 20 Use Code.

NSSS-7

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 TYPE:

1. UTILITY: WPPSS PWR

2. NSSS: GE 3. A/E: BRI BWR X

II. COMPONENT NAME: Battery COMPONENT NO: E-B1-HPCS

1. SCOPE: [X] NSSS ~~[X] BOP~~

2. MODEL NUMBER: 3DCU-9 QUANTITY: 1

3. VENDOR: C & D Batteries Division of ELTRA 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:

b. DIMENSIONS: 20½" x 8¾" x 15¾"

c. WEIGHT: 150 pounds

6. LOCATION: BUILDING: DIESEL GENERATOR BLD.

ELEVATION: EL. 441'

7. FIELD MOUNTING CONDITIONS: [X] BOLT (NO. 40, SIZE 5/16") ~~Not Installed~~ ~~See Open Item~~

This is rack to floor. Batteries are in place on racks, hold down brackets are being fabricated

[ ] WELD (LENGTH ______)

[ ] ______

8. a. SYSTEM IN WHICH LOCATED: HIGH PRESSURE CORE SPRAY

b. FUNCTIONAL DESCRIPTION: H: Emergency Electrical Power Systems AC & DC

c. IS THE EQUIPMENT REQUIRED FOR: [ ] HOT STANDBY [ ] COLD SHUTDOWN

[ ] BOTH [X] NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-02E22

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: [X] YES [ ] NO

EXCEPT AS NOTED IN 7 ABOVE. RWH

					eds nuclear	JOB NO 0740-012
0	Kuboy	9/24/82	[illegible]	5/15/82		CALC NO 031001-5
REV	BY	DATE	CHECKED	DATE		

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

[X] TEST [ ] ANALYSIS [ ] COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: SEISMIC SIMULATED TEST PROGRAM ON AN EMERGENCY GENERATOR STARTING AND CONTROL SYSTEM

(NO., TITLE & DATE): REPORT NO. 42749-1 DATED JUNE 24, 1974

COMPANY THAT PREPARED REPORT: WYLE LABORATORIES

COMPANY THAT REVIEWED REPORT: GE/EDS

V. VIBRATION INPUT:

1. LOADS CONSIDERED: a. [X] SEISMIC ONLY

   b. [ ] HYDRODYNAMIC ONLY

   c. [ ] COMBINATION OF (a) and (b)

2. METHOD OF COMBINING RRS: [ ] ABSOLUTE SUM [ ] SRSS [ ] OTHER (SPECIFY) N/A

3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): DIESEL GENERATOR BLDG EL. 437'-6"

4. DAMPING CORRESPONDING TO RRS: [ ] OBE ______ [X] SSE 2%

5. REQUIRED ACCELERATION IN EACH DIRECTION: [X] ZPA [ ] OTHER (SPECIFY) ______

   OBE S/S = ______ F/B = ______ V = ______

   SSE S/S = .4g F/B = .4g V = .4g

6. WERE FATIGUE EFFECTS OR OTHER VIBRATION LOADS CONSIDERED?

   [ ] YES [X] NO

   IF YES, DESCRIBE LOADS CONSIDERED AND HOW THEY WERE TREATED IN OVERALL QUALIFICATION PROGRAM:

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

					eds nuclear	JOB NO 0740-012
0	KW	10/13/82	[illegible]	10/18/82		CALC NO 03/001
REV	BY	DATE	CHECKED	DATE		

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. [X] SINGLE FREQUENCY [ ] MULTI-FREQUENCY [ ] RANDOM

2. [X] SINGLE AXIS [X] MULTI-AXIS [X] SINE BEAT [X] EXPLORATORY TEST, .2g SINE SWEEP

3. NO. OF QUALIFICATION TESTS: OBE ______ SSE ______ OTHER (SPECIFY) OVER 75 sec of OBE and 15 sec of SSE see p13 & 14

4. FREQUENCY RANGE: 1 - 33 Hz for frequency search

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = > 33 Hz F/B = > 33 Hz V = > 33 Hz

6. METHOD OF DETERMINING NATURAL FREQUENCIES:

[X] 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 = 1.5 F/B = 1.5 V = 1.5

9. LABORATORY MOUNTING:

1. [X] BOLT (NO. STANDARD, SIZE ______) [ ] WELD (LENGTH ______) [ ] ______

10. FUNCTIONAL OPERABILITY VERIFIED: [X] YES [ ] NO [ ] NOT APPLICABLE

11. TEST RESULTS INCLUDING MODIFICATIONS MADE:

The specimens were able to withstand the seismic input w/o loss of electrical function and structural degradation

12. OTHER TEST PERFORMED (SUCH AS AGING OR FRAGILITY TEST, INCLUDING RESULTS):

N/A

*NOTE: IF QUALIFICATION BY A COMBINATION OF TEST AND ANALYSIS, ALSO COMPLETE ITEM VII:

REV	BY	DATE	CHECKED	DATE		
0	K.L.[illegible]	10/15/82			eds nuclear	JOB NO 0740-012
						CALC NO 06-2001-5

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

I. IF QUALIFICATION BY ANALYSIS, THEM 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: ______

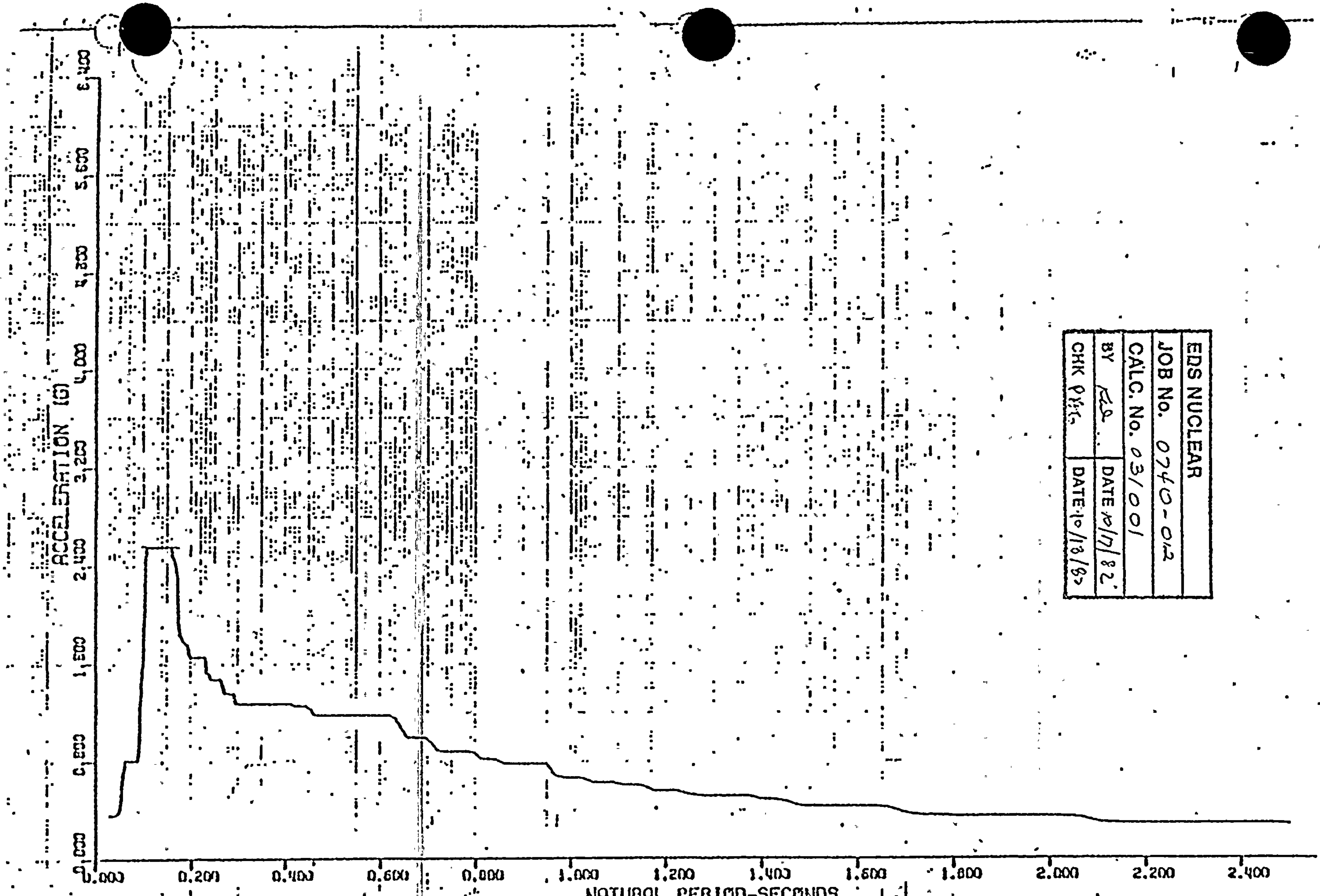
7. SUPPORT CONSIDERATIONS IN THE MODEL: ______

8. CRITCAL 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 OPERABILITY

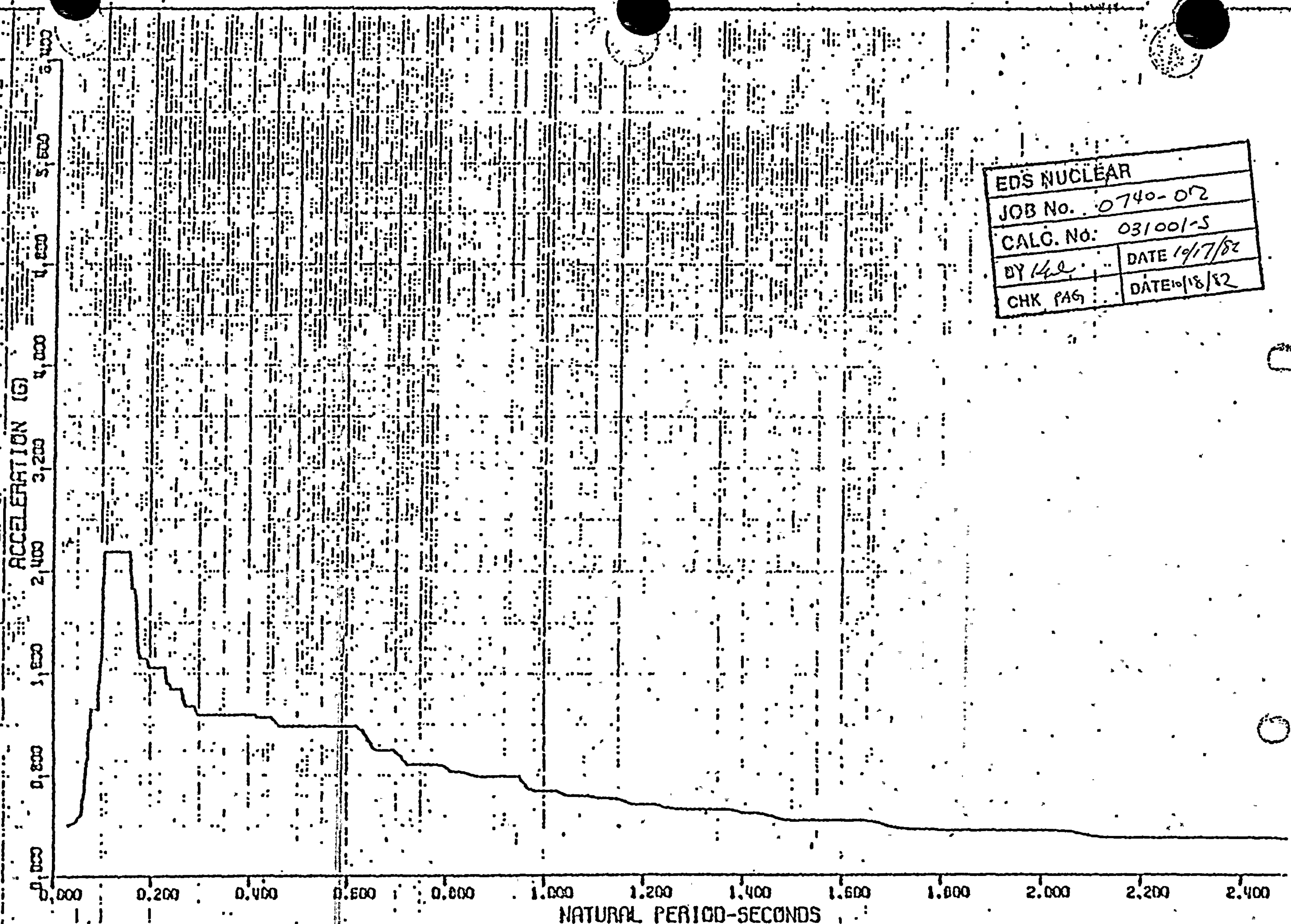
					eds nuclear	JOB NO 0740-012
0	KAL	10/13/82				CALC NO 062001-S
REV	BY	DATE	CHECKED	DATE		



WPPSS, HANFORD NO. 2, DIESEL-GENERATOR BLDG., REV.1
SSE (DBE) FLOOR SPECTRUM (N-S) - HORIZONTAL
MASS 9, EL. 437' - 6", DAMPING=0.020

EDS NUCLEAR	
JOB No. 0740-012	
CALC. No. 03/001	
BY [illegible]	DATE 10/17/82
CHK [illegible]	DATE 10/18/82

7 1/01

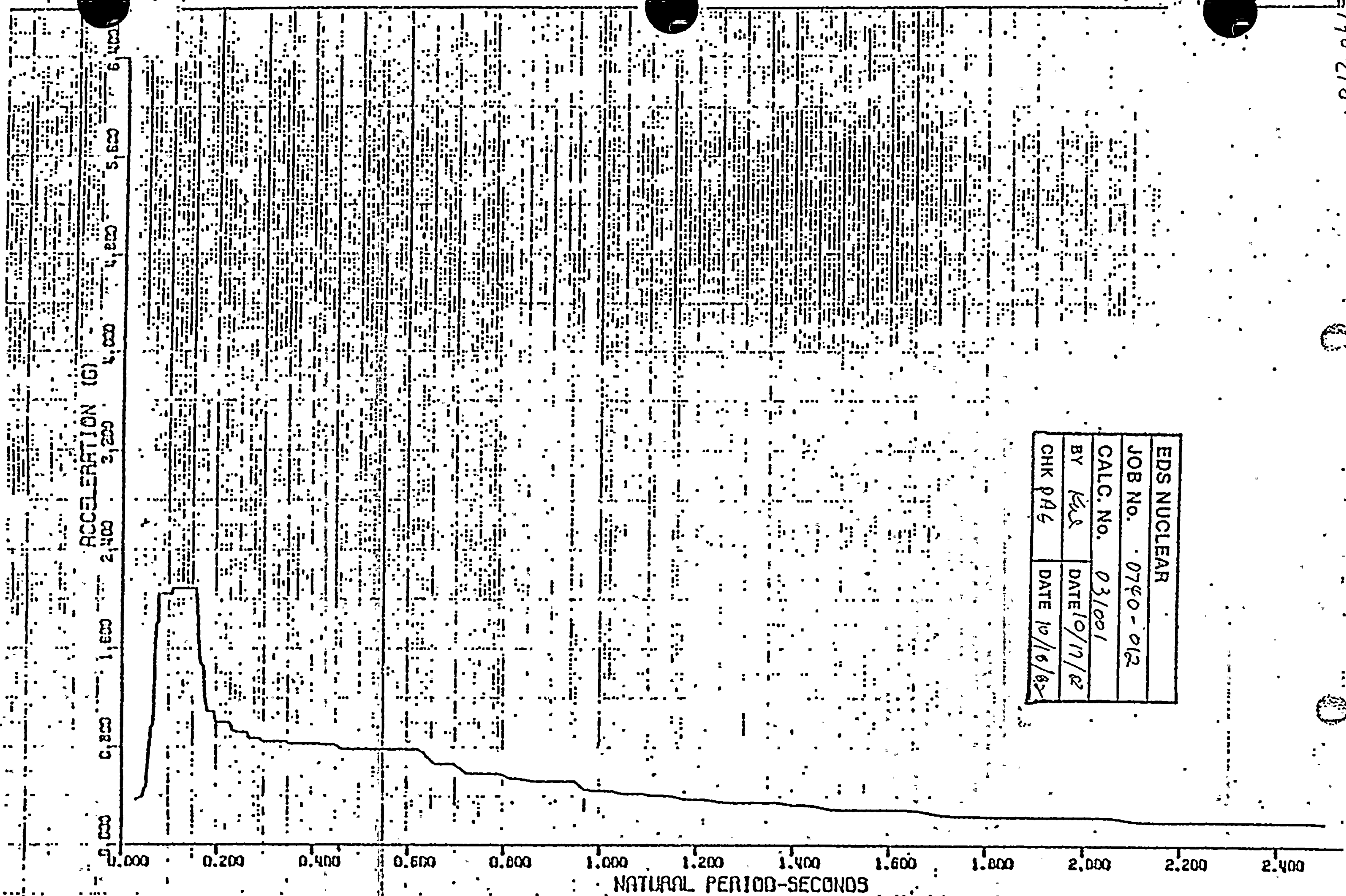


WPPSS, HANFORD NO. 2, DIESEL-GENERATOR BLDG., REV.1
SSE (OBE) FLOOR SPECTRUM (E-W) - HORIZONTAL
MASS 3, EL. 437' - 6", DAMPING=0.020

EDS NUCLEAR	
JOB No. 0740-02	
CALC. No: 031001-S	
BY [illegible]	DATE 10/17/82
CHK PAG	DATE 10/18/82

711/11

p12 of 13



EDS NUCLEAR	
JOB No. 0790-012	
CALC. No. 03/001	
BY [signature]	DATE 10/17/82
CHK PAG	DATE 10/18/82

WPPSS, HANFORD NO. 2, DIESEL-GENERATOR BLDG., REV.1
SSE (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS 3, EL. 437' - 6", DAMPING=0.020

4.0 Supporting Documentation / Calculation

a. The battery was tested on its rack and bolted to the floor. There was no resonance below 33 Hz in all 3 directions. Accelerometers were mounted to measure the Vertical and F-R response since the F-R axis is the weaker axis.

b. Biaxial sine beat tests were performed at 5, 7, 12, 27, 33 Hz with a minimum vertical and horizontal input of 1.5g. Accelerations recored on the battery ranges from 3.5g to 5g in the vertical direction and 3.3 to 3.9 in the horizontal direction. The required response at this elevation is 4g. Therefore the battery is qualified.

c. The battery was subjected to the following tests:

1) Horizontal (S-S) at 3g at 5 & 27 Hz
   Duration = 41.8 sec
2) Horizontal (F-R) at 3g at 7, 33 Hz
   Duration = 47.6 sec
3) Biaxial (S-S) at 1.5g at 5 & 27 Hz
   Duration = 41.8 sec
4) Biaxial (F-R) at 1.5g at 7, 12, 33 Hz
   Duration = 65.1 sec
5) Vertical (S-S) at 5 & 27 Hz, 1g input, 41.8 sec
6) Vertical (F-R) 1g input at 7, 12, 33 Hz, 65.1 sec

REV	BY	DATE	CHECKED	DATE		
0	KJ	10/15/82	PAC	10/18/82	C & D Battery WNP-2 EQ eds nuclear	JOB NO 0740-012 CALC NO 062001-5 PAGE 13 OF 14

4.0 Supporting Calculation

c. Since the battery has seen greater acceleration than required, the above duration of testing satisfy the 5 OBE / 1 SSE criteria.

					CE D Battery
					WNP Unit 2
					JOB NO 0740-012 — PAGE 14
12	KAO	10/5/82	PAG	10/19/82	eds nuclear — CALC NO 062001-5 — OF 14
REV	BY	DATE	CHECKED	DATE	

NSSS-10

Qualification Summary of Equipment

MPL: H22-P018

I. Plant Name: Hanford No. 2

Type:

1. Utility: WPPSS

PWR

2. NSSS: GE   3. A/E: Burns & Roe

BWR- 5 MK II

II. Component Name 72" Local Rack

1. Scope: [X] NSSS   [ ] BOP

2. Model Number: H22-P018   Quantity: 1

3. Vendor: General Electric

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

5. Physical Description a. Appearance Open Rack

b. Dimensions 72" x 84" x 30"

c. Weight 1500 lbs

6. Location: Building: Reactor Building

Elevation: 501

7. Field Mounting Conditions [X] Bolt (No. 12, Size 5/8)
[ ] Weld (Length)
[ ] on 12" centers

8. a. System in which located: Residual Heat Removal

b. Functional Description: Instrument Support

c. Is the equipment required for [ ] Hot Standby [ ] Cold Shutdown
[X] Both [ ] Neither

9. Pertinent Reference Design Specifications:

G.E. Drawing # 22A3746; Design Spec, Local Instrument Panel

EDL#328X276TC Rev. 8   Ass'y # 127D1836TC Rev. 3

12/80

III. Is Equipment Available for Inspection in the Plant: [X] Yes [ ] No

IV. Equipment Qualification Method:

[X] Test [ ] Analysis [ ] Combination of Test and Analysis

Qualification Report*: Zimmer/LaSalle Local Instrument Panel Vibration Test to IEEE 344-1975

(No., Title and Date) G.E. DRF#H22-12 Vol. 1-November 2, 1978

Company that Prepared Report: Nutech

Company that Reviewed Report: General Electric

V. Vibration Input:

1. Loads considered: a. [ ] Seismic only

   b. [ ] Hydrodynamic only

   c. [X] Combination of (a) and (b)

2. Method of Combining RRS: [ ] Absolute Sum [X] SRSS [ ] ________ (other, specify)

3. Required Response Spectra (attach the graphs): Figures 6 thru 9, Appendix 4, DRF-A00 01279

4. Damping Corresponding to RRS: OBE 3% SSE 3%

5. Required Acceleration in Each Direction: [X] ZPA [ ] Other ________ (specify)

OBE	S/S = NA	F/B = NA	V = NA
SSE	S/S = 0.5 g	F/B = 0.5 g	V = 0.5 g

6. Were fatigue effects or other vibration loads considered?

   [ ] Yes [X] 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.

12/80

VI. If Qualification by Test, then Complete*:

1. [ ] Single Frequency [X] Multi-Frequency: [X] random [ ] sine beat [ ] ______

2. [ ] Single Axis [X] Multi-Axis

3. No. of Qualification Tests: OBE 5 SSE 1 Other ______ (specify)

4. Frequency Range: 1-62-HZ

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

S/S = 10.6 Hz F/B = 18.5 Hz V = 25.5 Hz

6. Method of Determining Natural Frequencies

[X] Lab Test [ ] In-Situ Test [ ] Analysis

7. TRS enveloping RRS using Multi-Frequency Test [X] Yes (Attach TRS & RRS graphs) [ ] No

8. Input g-level Test: OBE S/S = NA F/B = NA V = NA

SSE S/S = 3.66g F/B = 1.4g V = 2.46g

9. Laboratory Mounting:

1. [X] Bolt (No. 12, Size 5/8) [ ] Weld (Length ______) [ ] ______

10. Functional operability verified: [X] Yes [ ] No [ ] Not Applicable

11. Test Results including modifications made: The tested panel successfully maintained its integrity during the test

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

Class 1E devices were tested separately for determining seismic capability.

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

12/80

VII. If Qualification by Analysis, then complete: NA

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 Operability

SEISMIC QUALIFICATION REEVALUATION
LOCAL PANEL CLASS 1E EQUIPMENT

Panel MPL Ref: H22-P018

Panel Dimensions: 72"x 84"x 30"

Location, Elevation: Reactor Building, 501

System: Residual Heat Removal
Div. 1

HANFORD 2

Seismic Evaluation Summary	Equipment MPL No.	Description	Purchase Part Dwg.	Essential Code	MALFUNCTION LIMIT f-b	s-s	vert.	Remarks
1.0 NATURAL FREQUENCIES	E12-N007A	Diff. Press. Xmtr.	163C1561P572203	P	10	6	3	
f-b: 18.5	E12-N010A	Switch	145C3008P029	A	15	15	15	
s-s: 10.6	E12-N015A	Diff. Press. Xmtr.	163C1561P572203	P	10	6	3	
v: 25.5	E12-N016A	Press. Switch	145C3011P001	A	15	15	15	
2.0 MAX TRANSMISSIBILITY	E12-N019A	Press. Switch	145C3011P001	A	15	15	15	
f-b: 5.9	E12-N022A	Diff. Press. Switch	145C3009P016	P	5	10	10	
s-s: 9.0	E12-N026A	Press. Xmtr.	163C1186P003	P	10	10	10	
v: 4.7	E12-N029A	Diff. Press. Switch	145C3009P014	A	5	10	10	
3.0 ZPA FROM RRS AT 522 ELEVATION	E12-N032A	Press. Switch	164C5359P001	A	15	15	15	
f-b: 0.5g	E12-N033A	Press. Switch	164C5359P001	A	15	15	15	
s-s: 0.5g	E12-R002A	Press. Ind.	163C1184P019	P	15	15	15	
v: 0.5g	E31-N012A	Diff. Press. Switch	145C3009P004	A	5	10	10	
4.0 MAXIMUM EXPECTED PEAK ACCELERATION								
f-b: 3.0g								
s-s: 4.5g								
v: 2.4g								

NSSS-11

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

3.0 QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 TYPE:

1. UTILITY: WPPSS PWR

2. NSSS: GE 3. A/E: Burns+Roe BWR X

II. COMPONENT NAME: Motor COMPONENT NO: SLC-M-1A SLC-M-1B

1. SCOPE: ☒ NSSS ☐ BOP

2. MODEL NUMBER: 5K324AK2120/324T ✓ QUANTITY: 2 ✓

3. VENDOR: GE ✓

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

N/A ✓

5. PHYSICAL DESCRIPTION: a. APPEARANCE: Motor ✓

b. DIMENSIONS:

c. WEIGHT:

6. LOCATION: BUILDING: Reactor ✓ M.2/3.6 ✓

ELEVATION: 548' ✓

7. FIELD MOUNTING CONDITIONS: ☒ BOLT (NO. 4, SIZE ½"ϕ)

☐ WELD (LENGTH ____)

☒ Std: bolted to skid ✓

8. a. SYSTEM IN WHICH LOCATED: Standby Liquid Control ✓

b. FUNCTIONAL DESCRIPTION: 40HP/52A motor / Drives Standby Liquid Control Pump ✓

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN ☐ BOTH ☒ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-02-C41 ✓

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES ☐ NO

REV	BY	DATE	CHECKED	DATE		
						JOB NO 0746-012
0	JME	10/8/82	SJZ	10/19/82	eds nuclear	CALC NO 213030-5

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

[X] TEST [ ] ANALYSIS [ ] COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: AETL: Two Reports. Report Dated Nov 10/76 gives test procedure
Report Dated Jun 28/77 gives test results

(NO., TITLE & DATE): No. 5430-6958. "Seismic Qualification Test Procedure" Dated 11/10/76
"Seismic Qualification Test Report" Dated 1/28/77

COMPANY THAT PREPARED REPORT: AETL ✓

COMPANY THAT REVIEWED REPORT: EDS ✓

V. VIBRATION INPUT:

1. LOADS CONSIDERED: a. [X] SEISMIC ONLY ✓

b. [ ] HYDRODYNAMIC ONLY

c. [ ] COMBINATION OF (a) and (b)

2. METHOD OF COMBINING RRS: [ ] ABSOLUTE SUM [ ] SRSS [X] OTHER (SPECIFY) N/A

3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): Yes - see attached sheets.

4. DAMPING CORRESPONDING TO RRS: [X] OBE 2% [X] SSE 2%

5. REQUIRED ACCELERATION IN EACH DIRECTION: [X] ZPA [ ] OTHER (SPECIFY)

OBE	S/S = 0.45g ✓	F/B = 0.45g ✓	V = 0.30g ✓	ZPA (33 Hz) ✓
SSE	S/S = 0.70g ✓	F/B = 0.70g ✓	V = 0.60g ✓	

6. WERE FATIGUE EFFECTS OR OTHER VIBRATION LOADS CONSIDERED?

[ ] YES [X] NO ✓

IF YES, DESCRIBE LOADS CONSIDERED AND HOW THEY WERE TREATED IN OVERALL QUALIFICATION PROGRAM:

N/A

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

REV	BY	DATE	CHECKED	DATE		
0	[illegible]	10/18/82	SE	10/19/82	eds nuclear	JOB NO 0740-012 CALC NO 213030-S

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

I. IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. [X] SINGLE FREQUENCY [ ] MULTI-FREQUENCY [ ] RANDOM

2. [ ] SINGLE AXIS [X] MULTI-AXIS [ ] SINE BEAT [X] Continuous Sine

3. NO. OF QUALIFICATION TESTS: OBE ______ SSE ______ OTHER (SPECIFY) 40sec OBE 120 Sec SSE See attached sheet.

4. FREQUENCY RANGE: ______

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = rigid (>33Hz) F/B = rigid (>33Hz) V = rigid (>33Hz)

6. METHOD OF DETERMINING NATURAL FREQUENCIES:

[X] 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 = 1.4g F/B = 1.4g V = 1.4g

SSE S/S = 2.0g F/B = 2.0g V = 2.0g

ZPA at 33Hz

9. LABORATORY MOUNTING:

1. [X] BOLT (NO. 4, SIZE 1/2"ϕ) [ ] WELD (LENGTH ______) [ ] see attached.

10. FUNCTIONAL OPERABILITY VERIFIED: [X] YES [ ] NO [ ] NOT APPLICABLE

11. TEST RESULTS INCLUDING MODIFICATIONS MADE:

Motor operated perfectly before, during + after all tests.

12. OTHER TEST PERFORMED (SUCH AS AGING OR FRAGILITY TEST, INCLUDING RESULTS):

- Motor was pre-aged, and pre-radiated, before all seismic tests.
- After all seismic tests, the motor was tested operationally at rated hp (40hp) for 125 minutes, and worked perfectly

* NOTE: IF QUALIFICATION BY A COMBINATION OF TEST AND ANALYSIS, ALSO COMPLETE ITEM VII:

REV	BY	DATE	CHECKED	DATE		
0	Gme	10/18/82	SIS	10/19/82	eds nuclear	JOB NO 0740-012 CALC NO 213030-3

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

I. IF QUALIFICATION BY ANALYSIS, THEM COMPLETE:

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. CRITCAL STRUCTURAL ELEMENTS:

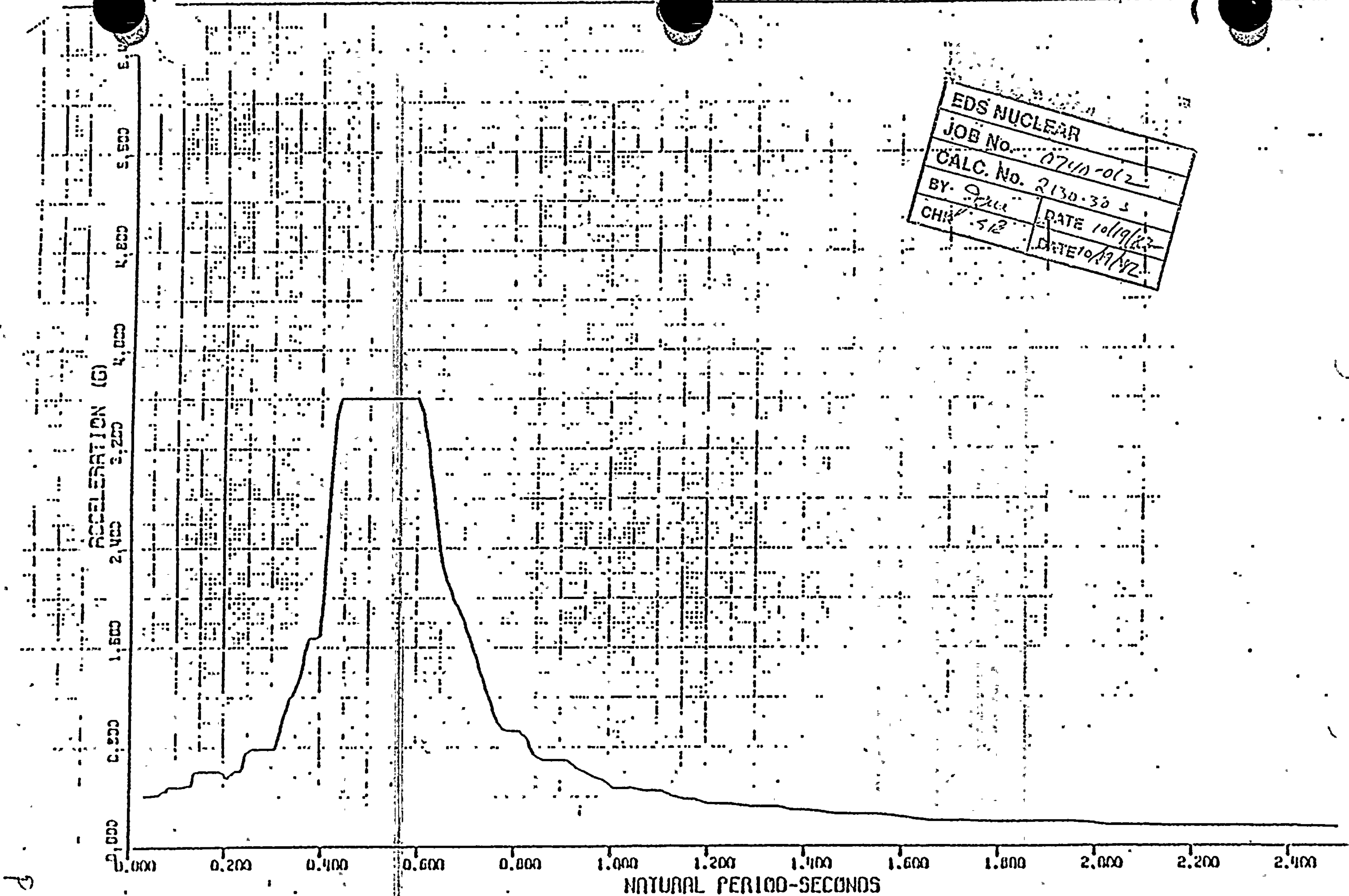
A. IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS	STRESS ALLOWABLE

B. MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY

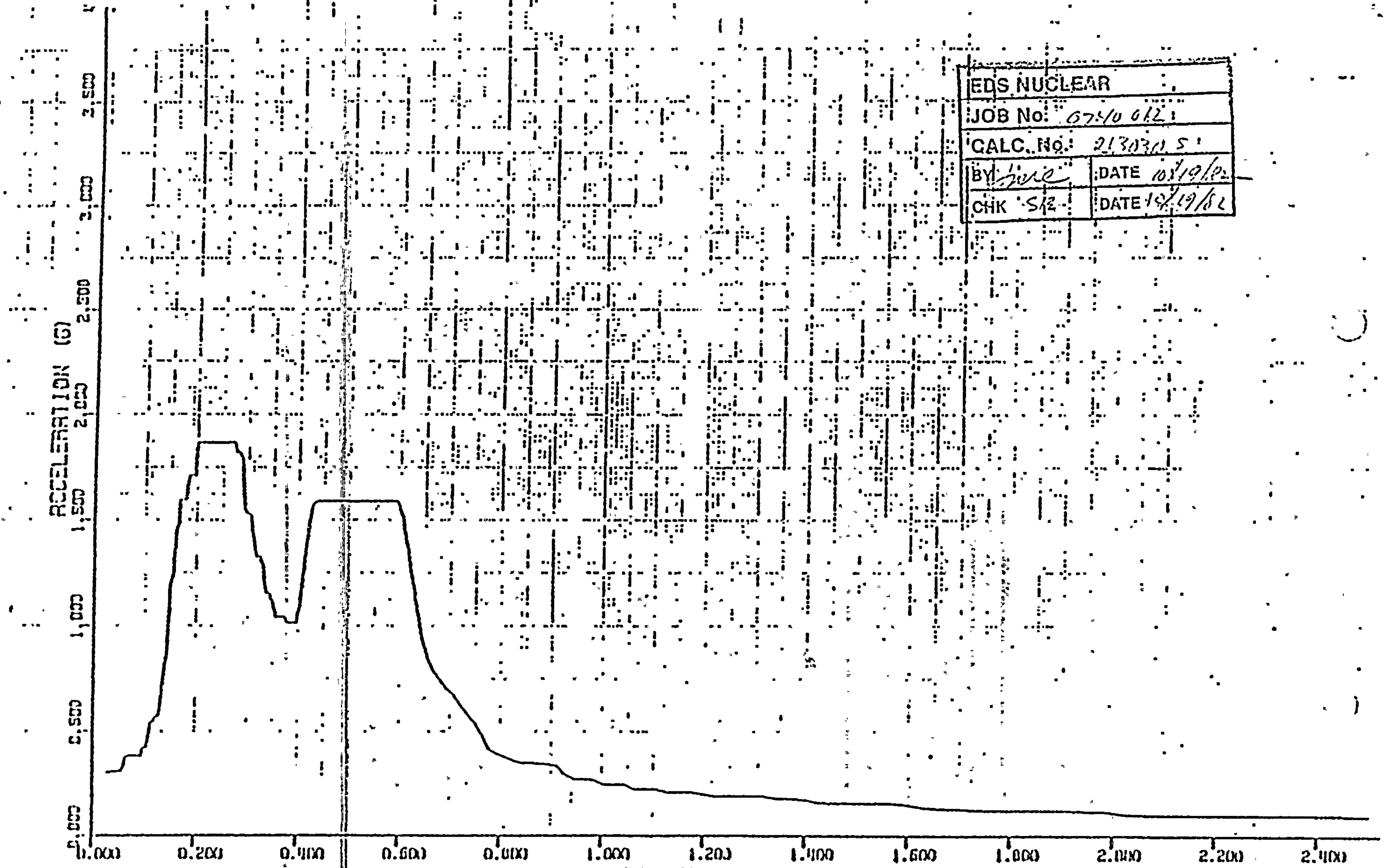
REV	BY	DATE	CHECKED	DATE		
0	JMC	10/19/82	SIZ	10/19/82	eds nuclear	JOB NO 0740-012
						CALC NO 213030-S

2130-D

EDS NUCLEAR
JOB No. 0740-012
CALC. No. 2130-38 3
BY: DATE 10/19/82
CHK: DATE 10/19/82



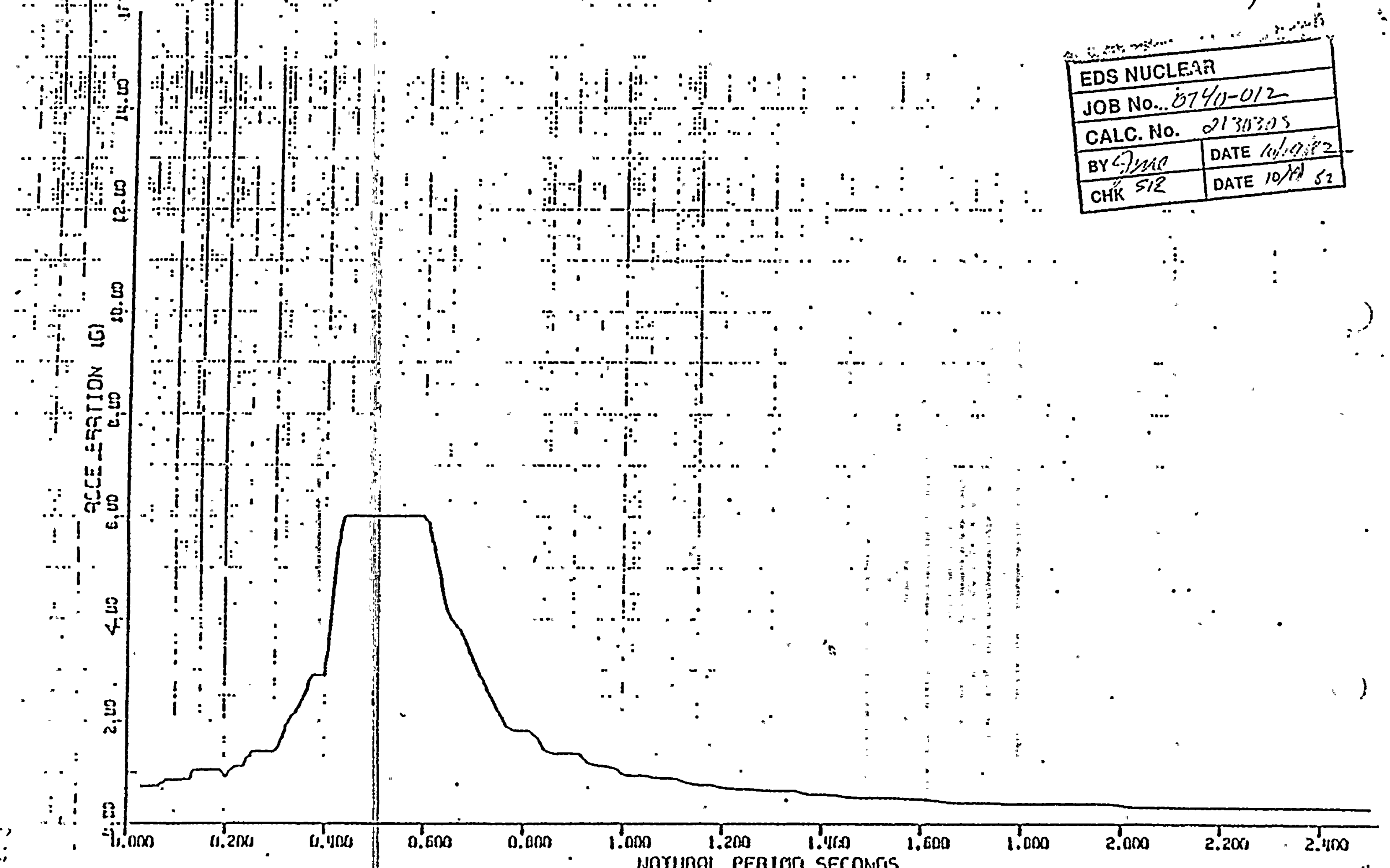
WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE/2 (OBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.4, EL. 547'-0", DAMPING=0.02



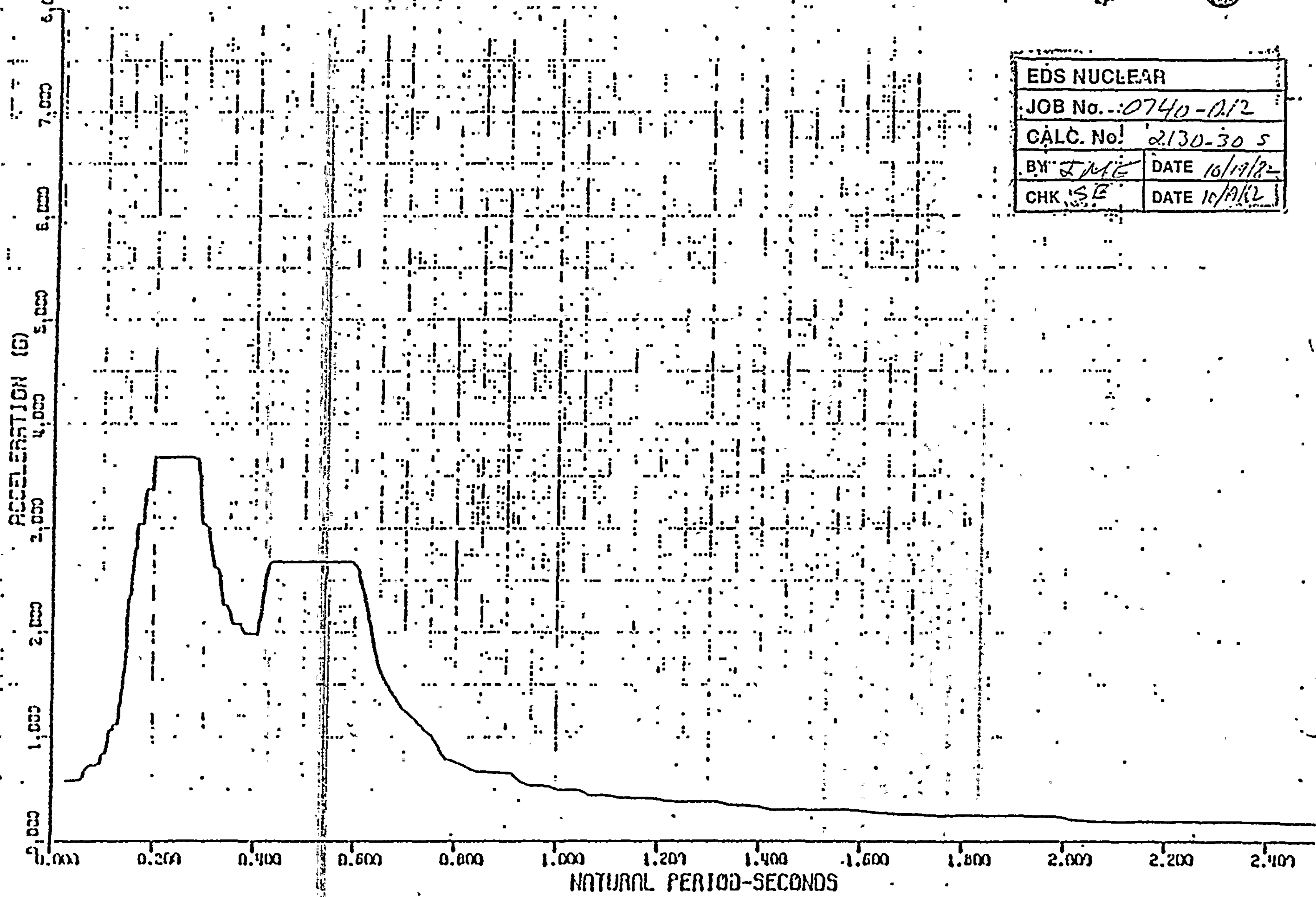
EDS NUCLEAR	
JOB No: 0740 012	
CALC. No. 213030 S	
BY [illegible]	DATE 10/19/82
CHK S/Z	DATE 10/19/82

WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE/2 (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO.4, EL. 547'-0", DAMPING=0.02

EDS NUCLEAR
JOB No. 0740-012
CALC. No. 213030S
BY [illegible] DATE 10/19/82
CHK SIZ DATE 10/19/82



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE . (OBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.4, EL. 547'-0", DAMPING=0.02



WPPSS. HANFORD NO. 2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO.4, EL. 547'-0", DAMPING=0.02

BOP-1

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

Qualification Summary of Equipment

Ref. No.

I. PLANT NAME: WNP-2 TYPE

PWR

1. NSSS: GE 2. A/E: Burns & Roe BWR 5, Mark II

II. COMPONENT NAME: 18" Elec. Oper. Butterfly Valve COMPONENT NO. SGT-V-3A-1, 3A-2, 3B-1, 3B-2, 4A-1, 4A-2, 4B-1, 4B-2, 5A-1, 5A-2, 5B-1, 5B-2 1

1. SCOPE: ☐ NSSS ☒ BOP 1

2. MODEL NUMBER: A-206761 QUANTITY: 12 1

3. VENDOR: BIF

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

NA

5. PHYSICAL DESCRIPTION: a. APPEARANCE: Butterfly Valve and Operator Assembly

b. DIMENSIONS: 18" Nom. Dia. 2

c. WEIGHT: 750 lbs. 2

6. LOCATION: BUILDING: Reactor 1

ELEVATION: 576', 586' 1

7. FIELD MOUNTING CONDITIONS: ☒ BOLT (NO. ____ SIZE ____)

☐ WELD (LENGTH ____)

☐ ____ 1

8. a. SYSTEM IN WHICH LOCATED: Standby Gas Treatment 1

b. FUNCTIONAL DESCRIPTION: Containment Atomosphere Control Radioactive Material Release Barrier

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN

☐ BOTH ☒ NEITHER 1

9. PERTINENT REFERENCE DESIGN SPECIFICATION: WPPSS Spec. 2808-68

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES ☐ NO

Qualification Summary of Equipment (Continued)

Ref.

IV. EQUIPMENT QUALIFICATION METHOD:

[ ] TEST [X] ANALYSIS. [ ] COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT: Contract 68, Trans. 24
TR-74-6, Design & Seismic
(NO., TITLE & DATE): Analysis, Rev. 1, 12/31/75

COMPANY THAT PREPARED REPORT: McPherson Associates, Inc.

COMPANY THAT REVIEWED REPORT: Cygna Energy Services (Equipment Seismic & Hydrodynamic Requalification , Calc. OR.01/F, Rev. 1, 8/19/82

V. VIBRATION INPUT: (Information from Requal. Calc.)

1. LOADS CONSIDERED: a. [X] SEISMIC ONLY
   b. [ ] HYDRODYNAMIC ONLY
   c. [ ] COMBINATON OF (a) AND (b)
2. METHOD OF COMBINING RRS: [ ] ABSOLUTE SUM [X] SRSS [ ] OTHER (SPECIFY) ______ 3
3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): Elev. 605', 10.5", Reactor Bldg. 3
4. DAMPING CORRESPONDING TO RSS: [ ] OBE ______ [X] SSE 2% 3
5. REQUIRED ACCELERATION IN EACH DIRECTION: [ ] ZPA [X] OTHER (SPECIFY) for fn=8hz 4

   OBE S/S = ______ F/B = ______ V = ______

   SSE S/S = 1.95g F/B = 1.95g V = 1.88g 4
6. WERE FATIGUE EFFECTS OR OTHER VIBRATION LOADS CONSIDERED?

   [X] YES [ ] NO 5

   IF YES, DESCRIBE LOADS CONSIDERED AND HOW THEY WERE TREATED IN OVERALL QUALIFICATION PROGRAM:
   For Class 2 components the allowable stress limits given in ASME Code, Section III, are frequency independent. Further, the total number of fatigue cycles are expected to be 60, which will not have an effect on the allowable stress limits used for AISC components per Appendix B of AISC Manual. 4

*NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT

Qualification Summary of Equipment (Continued)

Ref. No.

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*: NA

1. ☐ SINGLE FREQUENCY ☐ MULTI-FREQUENCY ☐ RANDOM
2. ☐ SINGLE AXIS ☐ MULTI-AXIS ☐ SINE BEAT ☐ ________
3. NO. OF QUALIFICATION TESTS: OBE ________ SSE ________ OTHER (SPECIFY) ________
4. FREQUENCY RANGE: ________
5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

   S/S = ________ F/B = ________ V = ________
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:

   ☐ BOLT (NO. ______, SIZE ______) ☐ WELD (LENGTH ______) ☐ ______
10. FUNCTIONAL OPERABILITY VERIFIED: ☐ YES ☐ NO ☐ NOT APPLICABLE
11. TEST REULTS INCLUDING MODIFICATIONS MADE:

    ____

    ____

    ____
12. OTHER TEST PERFORMED (SUCH AS AGING OR FRAGILITY TEST, INCLUDING RESULTS):

    ____

    ____

    ____

    ____

*NOTE: IF QUALIFICATION BY A COMBINTATION OF TEST AND ANALYSIS, ALSO COMPLETE ITEM VII.

Qualification Summary of Equipment (Continued)

	Ref.
VII. IF QUALIFICATION BY ANALYSIS, THEN COMPLETE:	
1. METHOD OF ANALYSIS:	
☐ STATIC ANALYSIS ☒ EQUIVALENT STATIC ANALYSIS	4
☐ DYNAMIC ANALYSIS ☐ TIME-HISTORY ☐ RESPONSE SPECTRUM	
2. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):	
S/S = NA F/B = 150hz V = 394hz System fn = 8hz	4
3. MODEL TYPE:	
☐ 3D ☐ 2D ☐ 1D ☐ FINITE ELEMENT ☐ BEAM ☐ CLOSED FORM SOLUTION	
4. ☐ COMPUTER CODES: ______	
FREQUENCY RANGE AND NO. OF MODES CONSIDERED: ______	
☒ HAND CALCULATIONS	4,5
5. METHOD OF COMBINING DYNAMIC RESPONSES: ☐ ABSOULTE SUM ☒ SRSS ☐ OTHER (SPECIFY) ______	3
6. DAMPING: OBE ______ SSE 2% BASIS FOR THE DAMPING USED: Reg. Guide 1.61	7
7. SUPPORT CONSIDERATIONS IN THE MODEL: Pipe Mounted	1
8. CRITICAL STRUCTURAL ELEMENTS:	

A.

IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS	STRESS ALLOWABLE	Ref.
Bending	Disk	SSE + Dead + Operating Loads	--	12,300psi	15,000psi	4

B.

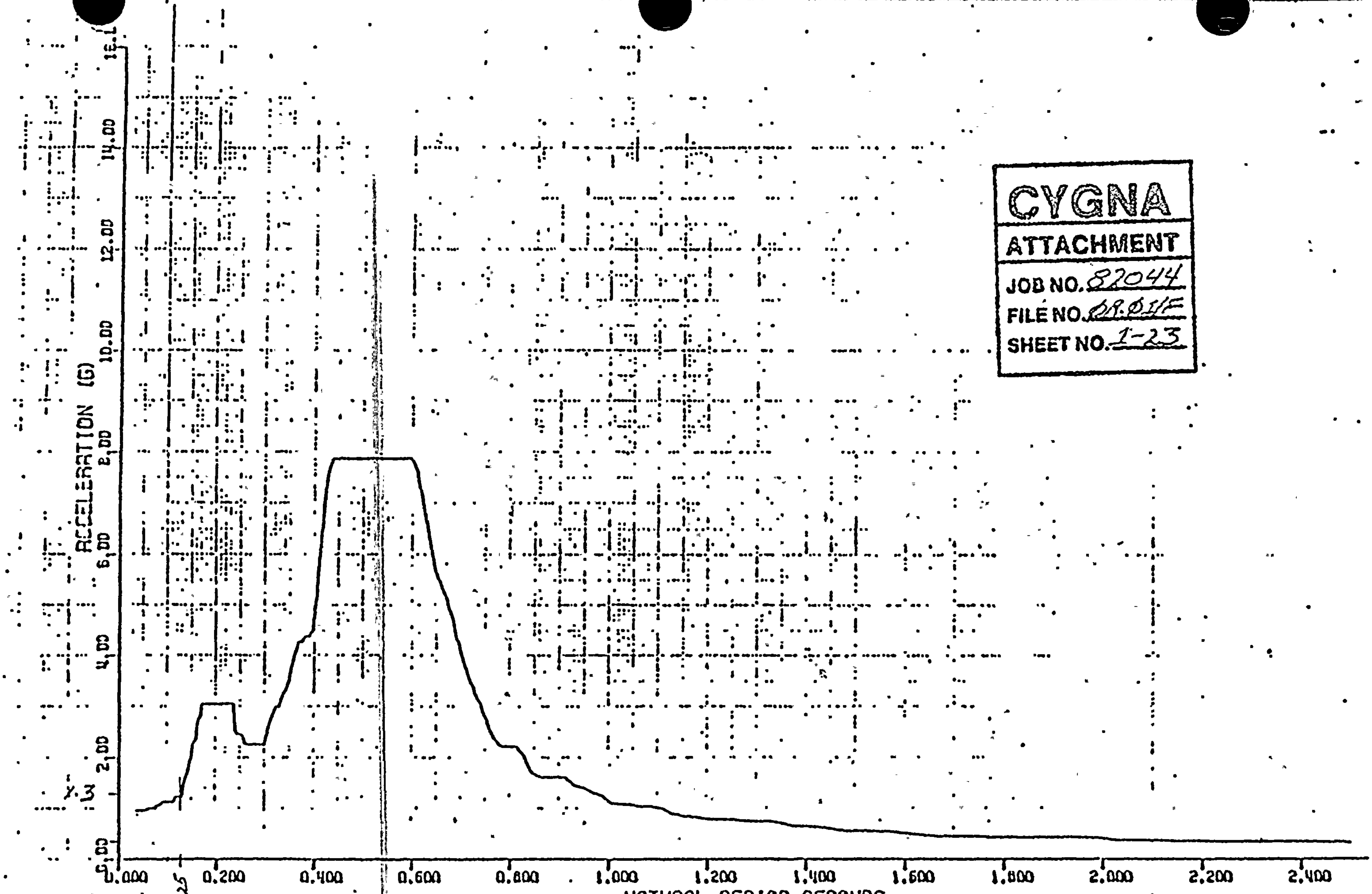
MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM-ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY	Ref.
0.026"	Disk	0.50"	6

Qualification Summary of Equipment (Continued)

VIII. REFERENCES

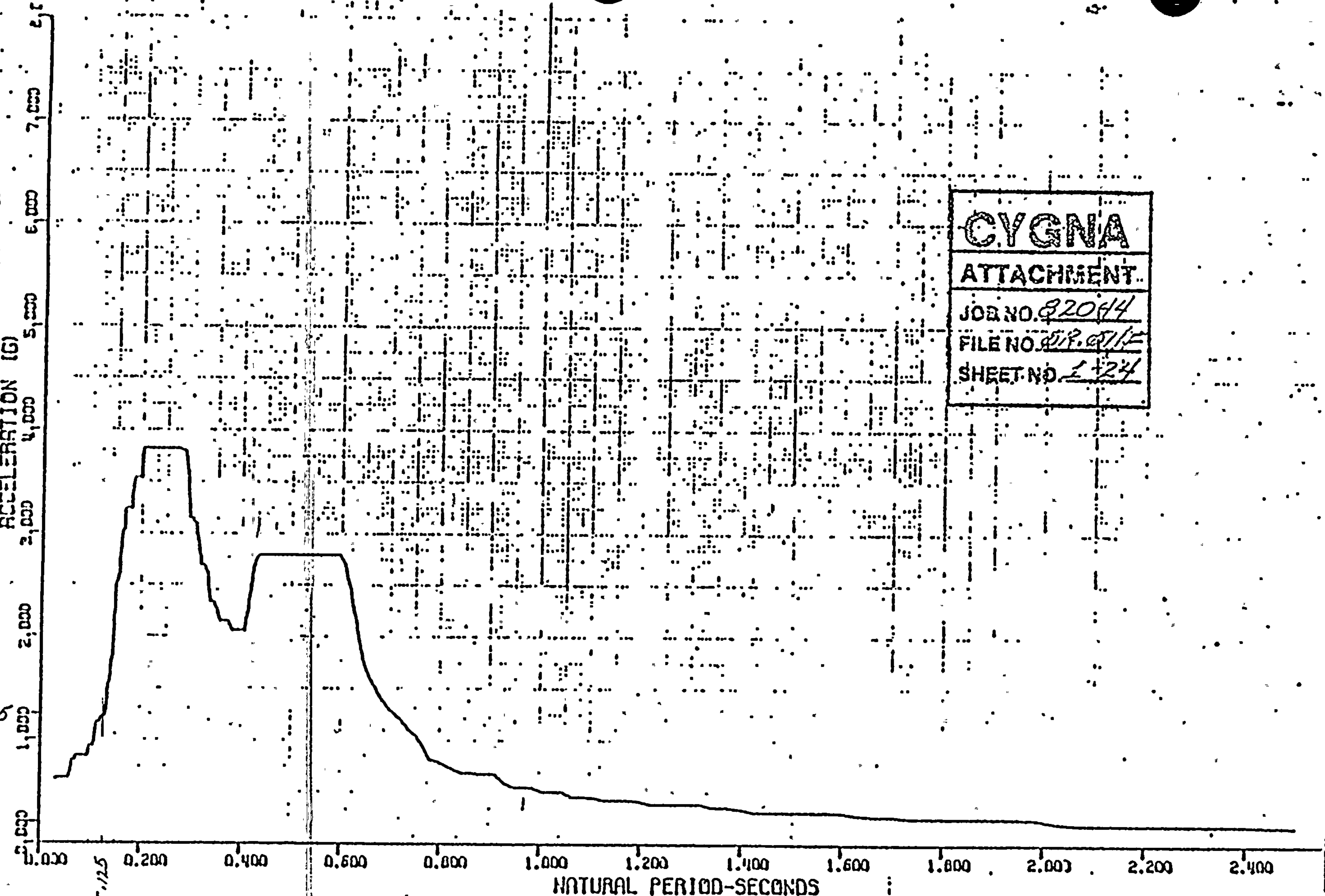
1. WPPSS, WNP-2, CIE-SRM Equipment List, 7/13/82
2. BIF Drawing 206767 , General Arrangement, Rev. E
3. Response Spectra, BRWP-81-248, Burns and Roe, 7/2/81
4. Equipment Seismic & Hydrodynamic Requalification Calculation OR.01/F, Rev. 1, Cygna Energy Services , 8/20/82
5. Design & Seismic Analysis, TR-74-6, Rev. 1, McPherson Assoc., 12/31/75
6. Deflection Analysis of Butterfly Valves, Dynatech RID Company, Project No. BIF-14, 4/12/76
7. Damping Values for Seismic Design of Nuclear Power Plants, Regulatory Guide 1.61, U. S. Atomic Energy Commission, Oct., 1973.

Completed By	P. R. Curry PR Curry	Date	8/20/82
Reviewed By	Hal Rees	Date	8-23-82



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (DBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.02
Generated by Burns & Roe

CYGNA
ATTACHMENT
JOB NO. 82044
FILE NO. 08.01F
SHEET NO. 1-23

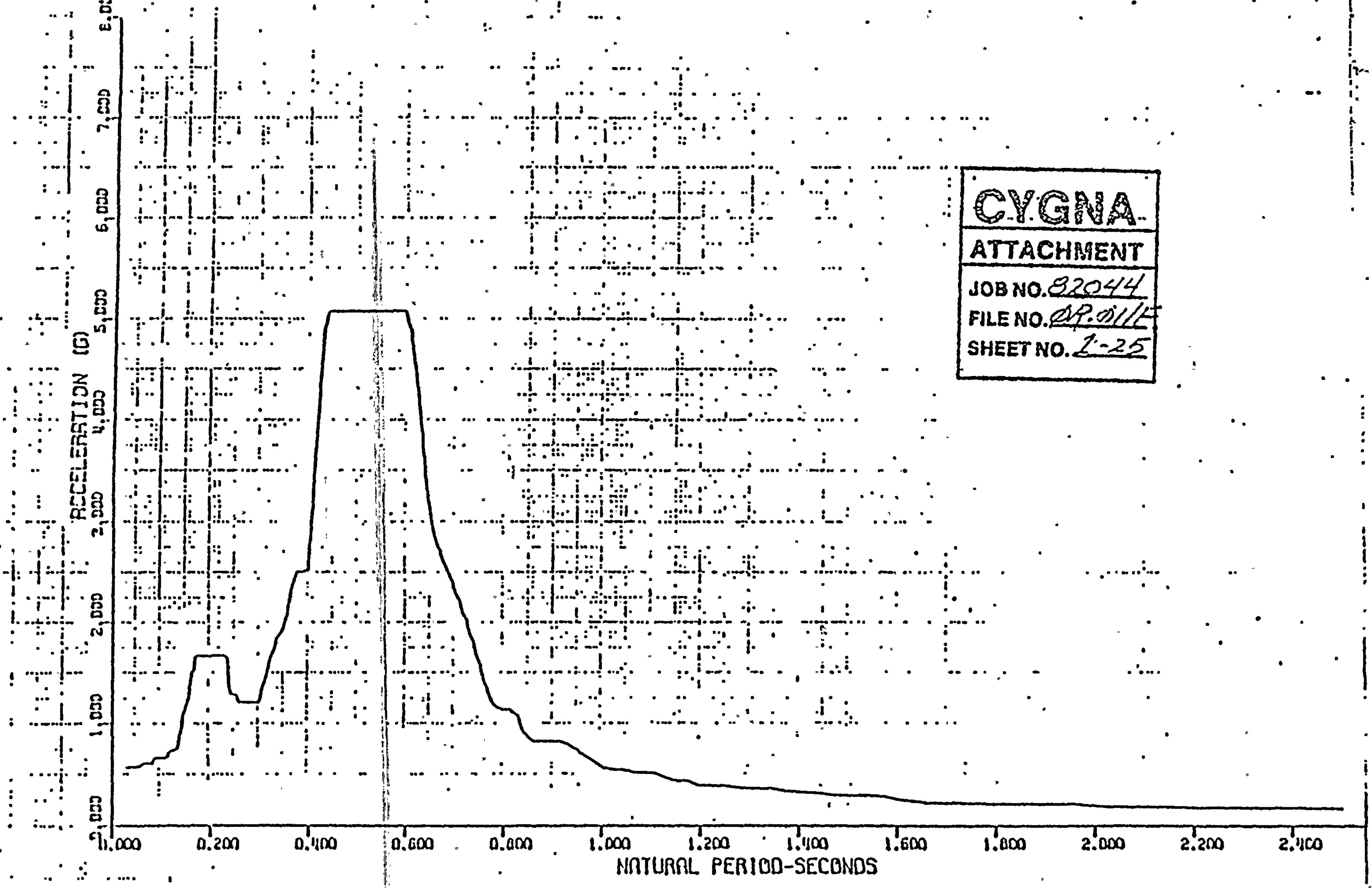


CYGNA
ATTACHMENT
JOB NO. 82014
FILE NO. [illegible]
SHEET NO. 1 / 24

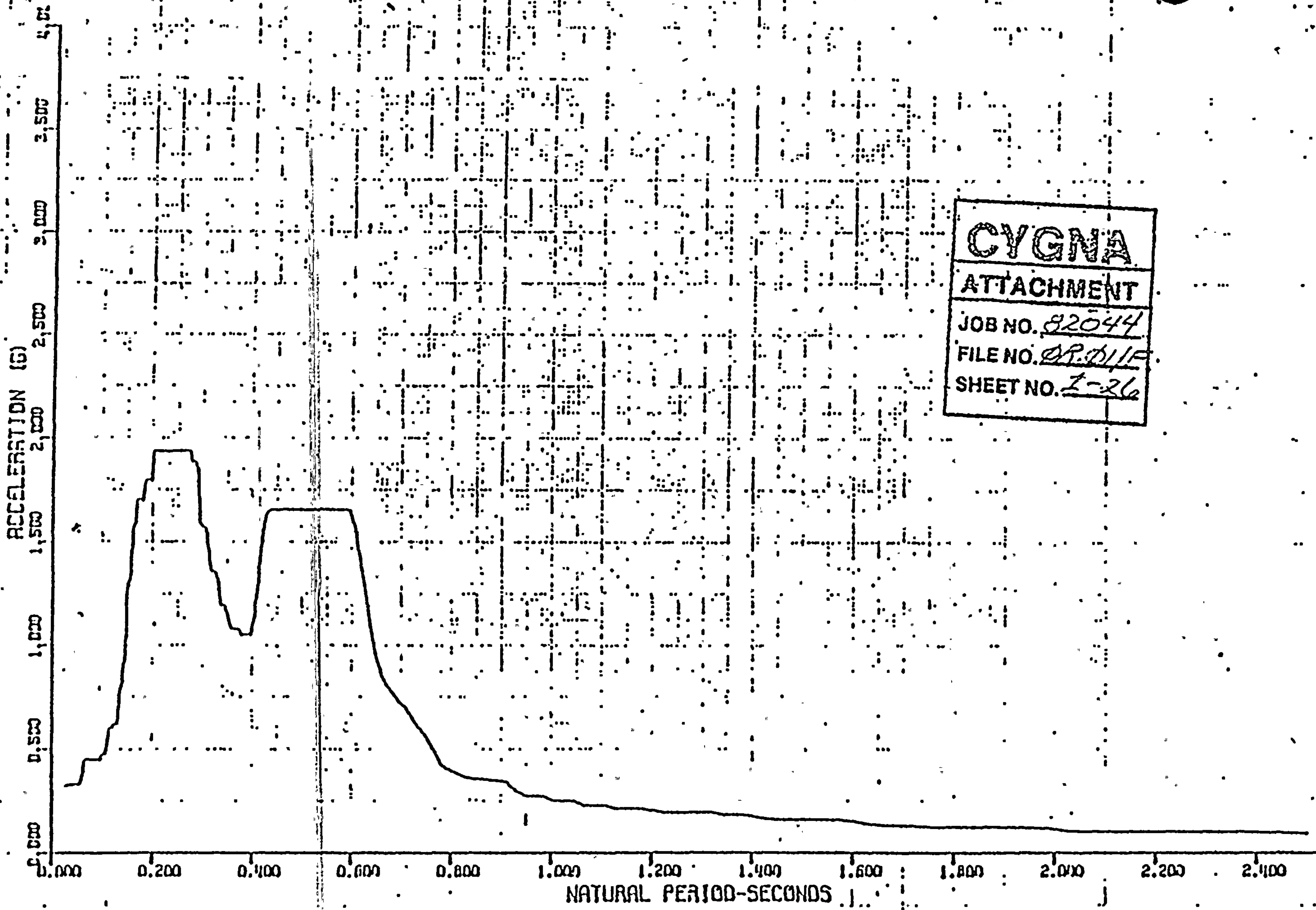
WPPSS, HANFORD NO. 2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO. 2, EL. 605'-10.5", DAMPING=0.02

Generated by Burns & Roe

CYGNA
ATTACHMENT
JOB NO. 82044
FILE NO. QR.011F
SHEET NO. 2-25



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE/2 (OBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.02
Generated by Burns & Roe



CYGNA
ATTACHMENT
JOB NO. 82044
FILE NO. 82.011F
SHEET NO. I-26

WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE/2 (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.02
Generated by Burns & Roe

BOP 2

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

QID 145002

I. PLANT NAME: WNP - 2 TYPE:

1. UTILITY: WASHINGTON PUBLIC POWER SUPPLY SYSTEM PWR

2. NSSS: GE 3. A/E: BURNS & ROE BWR 5, MARK 2

II. COMPONENT NAME: RECIRCULATION FAN COMPONENT NO: CRA-FN-3A, 3B, 3C, 5A, 5B, 5C, 5D

1. SCOPE: ☐ NSSS ☒ BOP

2. MODEL NUMBER: (42-17-860) 138009-8 QUANTITY: 7

3. VENDOR: JOY MANUFACTURING CO.

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

N/A

5. PHYSICAL DESCRIPTION: a. APPEARANCE: AXIAL HORIZONTAL FAN

b. DIMENSIONS: DIAMETER 42.25"

c. WEIGHT: 1348 LB

6. LOCATION: BUILDING: CONTAINMENT

ELEVATION: ATTACHMENT I

7. FIELD MOUNTING CONDITIONS: ☐ BOLT (NO. ______, SIZE ______)

☐ WELD (LENGTH ______)

☒ WELDED FRAME STRUCTURE

8. a. SYSTEM IN WHICH LOCATED: PRIMARY CONTAINMENT COOLING SYSTEM

b. FUNCTIONAL DESCRIPTION: PROVIDE AIR TURBUENCE & ELIMINATE HOT AIR POCKETS

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN

☒ BOTH ☐ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-22A

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES* ☐ NO

* See ATTACHMENT II

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

EQUIPMENT QUALIFICATION METHOD:

☐ TEST ☐ ANALYSIS ☒ COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: ATTACHMENT III

(NO., TITLE & DATE):

COMPANY THAT PREPARED REPORT:

COMPANY THAT REVIEWED REPORT:

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) CONSERVATIVE G-LEVEL FROM PURCHASE SPEC.

3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): ATTACHMENT IV

4. DAMPING CORRESPONDING TO RRS: ☐ OBE 1 % ☐ SSE 2 %

5. REQUIRED ACCELERATION IN EACH DIRECTION: ☐ ZPA ☒ OTHER (SPECIFY) PEAK

OBE S/S = 7.2 F/B = 7.2 V = 3.4

SSE S/S = 4.75 F/B = 4.75 V = 2.00

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:

4500 SRV EVENTS AND 1000 CHUGGING EVENTS AT 3 CYCLES PER EVENT. METHOD FOLLOWS AISC, 8TH EDITION, APPENDIX B WITH COMMENTARY

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*: N/A

1. ☐ SINGLE FREQUENCY ☐ MULTI-FREQUENCY ☐ RANDOM

2. ☐ SINGLE AXIS ☐ MULTI-AXIS ☐ SINE BEAT ☐ ____________

3. NO. OF QUALIFICATION TESTS: OBE ________ SSE ________ OTHER (SPECIFY) ________

4. FREQUENCY RANGE: ____________

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = ________ F/B = ________ V = ________

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:

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IF QUALIFICATION BY ANALYSIS, THEM COMPLETE:

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 = 12.5 (ASSY) F/B = 53.8 (SHAFT) V = 53.8 (SHAFT) (HERTZ)

3. MODEL TYPE:

☐ 3D ☐ 2D ☒ 1D ☐ FINITE ELEMENT ☒ BEAM ☒ CLOSED FORM SOLUTION

4. ☐ COMPUTER CODES: NONE

FREQUENCY RANGE AND NO. OF MODES CONSIDERED: 1-54 HZ, 1-MODE

☒ HAND CALCULATIONS

5. METHOD OF COMBINING DYNAMIC RESPONSES: ☐ ABSOLUTE SUM ☐ SRSS ☒ OTHER (SPECIFY) N/A

6. DAMPING: OBE 1% SSE 2% BASIS FOR THE DAMPING USED: REG. GUIDE 1.61

7. SUPPORT CONSIDERATIONS IN THE MODEL: SUPPORT FRAMES AND FAN ASSY MOUNTING PLATES

8. CRITCAL STRUCTURAL ELEMENTS:

A.

IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS	STRESS ALLOWABLE
FAN ASSY SUPPORT BOLTS	FANS CRA-FN-3A&C	SSE+SRV+LOCA+DW at 1% DAMPING FOR UPSET		35.5 KSI	55 KSI FOR GRADE 2 BOLT.

B.

MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY
.01191 IN.	FANS CRA-FN-5A, B, C & D	.050 IN (RADIAL FAN TIP CLEARANCE)
.0159 IN.	"	.047 IN (MOTOR AIR GAP)

COMPLETED BY J. E. Rakowski	DATE
REVIEWED BY Dennis A. Armstrong	DATE 10/29/82

BURNS & ROE TAG NO.	BUILDING	ELEVATION	SYSTEM	SAFETY FUNCTION
CRA-FN-3A	Primary Containment	534 ft.	Containment Return Air System	Containment Ventilation
CRA-FN-3B	Primary Containment	538 ft.	Containment Return Air System	Containment Ventilation
CRA-FN-3C	Primary Containment	534 ft	Containment Return	Containment Ventilation
CRA-FN-5A	Primary Containment	576 ft.	Containment Return Air System	Containment Ventilation
CRA-FN-5B	Primary Containment	576 ft.	Containment Return Air System	Containment Ventilation
CRA-FN-5C	Primary Containment	576 ft.	Containment Return Air System	Containment Ventilation
CRA-FN-5D	Primary Containment	576 ft.	Containment Return Air System	Containment Ventilation

ATTACHMENT I, 1/1

Q1D 145-502

CYGNA

Calculation Sheet

ATTACHMENT II

Project: WNP-2 Equipment Requalification		Prepared By: J. Rakowski	Date: 10/28/82
Subject: JOY RECIRC. FANS - QID 145002		Checked By:	Date:
System:		Job No.:	File No.:
Analysis No.:	Rev. No.:	Sheet No.:	

FANS CRA-FN-5A, 5B, 5C & 5D

These fans are truss-mounted. The mounting details have not been field-verified because the upper containment region has been sealed off for painting. This area is expected to reopen by November 8, 1982, at which time the mounting details of these fans will be verified.

CYGNA

Calculation Sheet

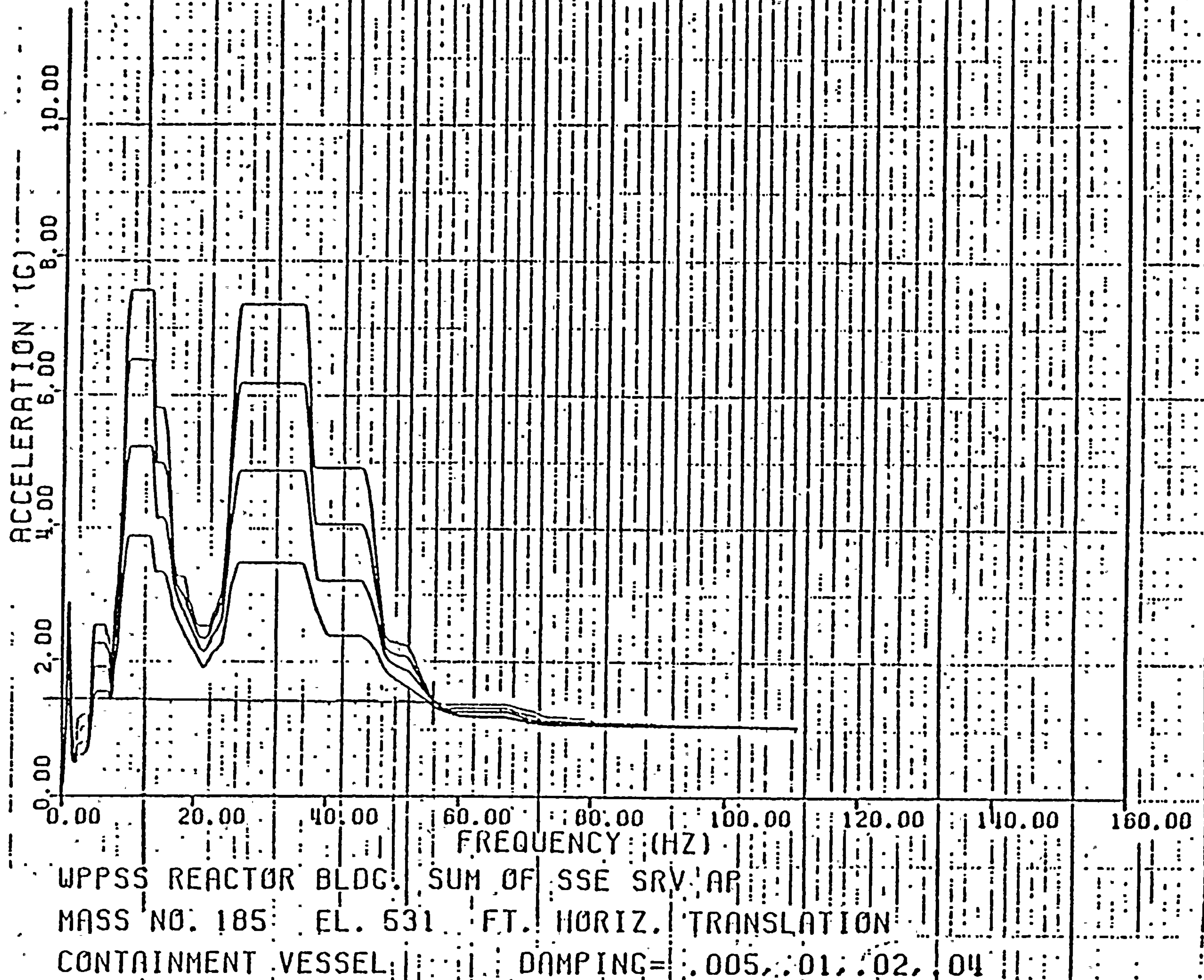
ATTACHMENT III

Project: WNP-2 EQUIP. REQUALIFICATION	Prepared By: J. RAKOWSKI	Date: 10/29/82	
Subject: JOY RECIRC. FANS, QID 145002	Checked By:	Date:	
System:	Job No.:	File No.:	
Analysis No.:	Rev. No.:	Sheet No.: 1/1	

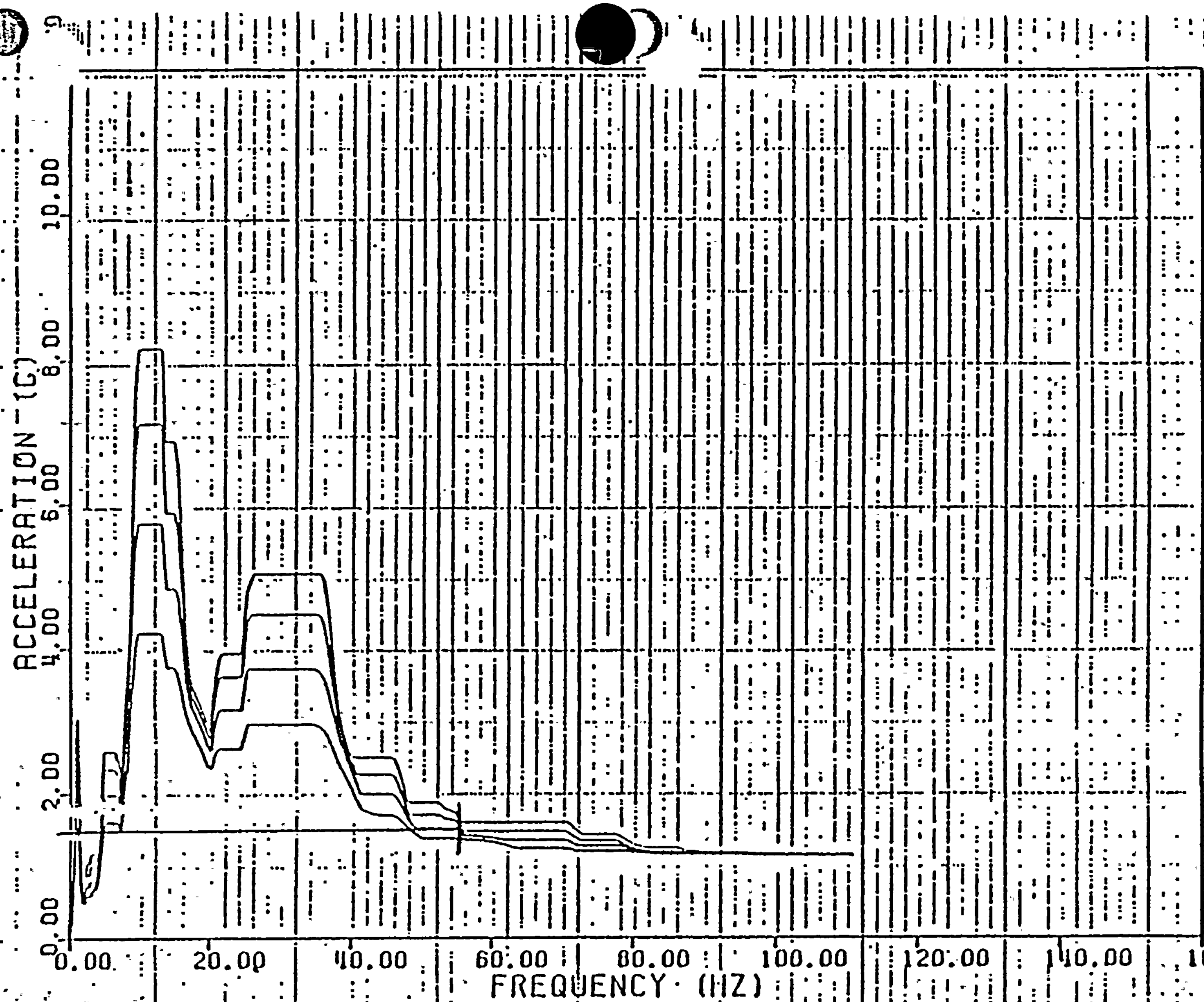
SEISMIC QUALIFICATION REPORTS.
RECIRCULATION FANS, QID 145002

No.	Title	Preparer	Reviewer
22A000050	Burns & Roe Vendor Print - Joy Mfg Co. - Seismic Analyses	Joy Mfg. Co.	WPPSS/Cygna
22A000051	Addenda - Seismic Analyses	"	"
22A000052	Shaft Natural Frequency	"	"
22A000053	Calc. for Inlet Bell	"	"
X-604	Qualification of Joy Axivane Fan & Reliance Electric Motor For Class 1E Containment Nuclear Service	"	"

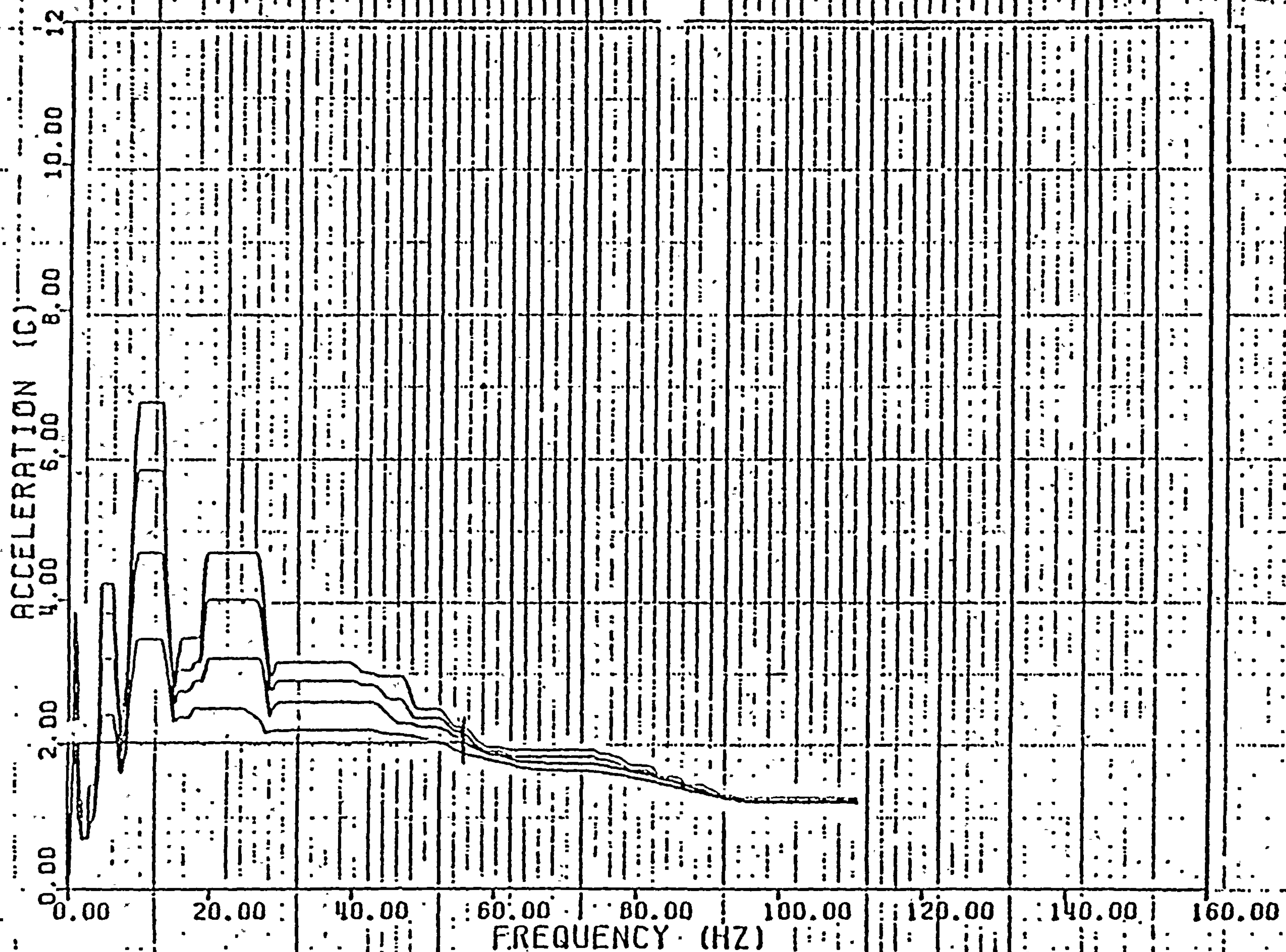
1006.00



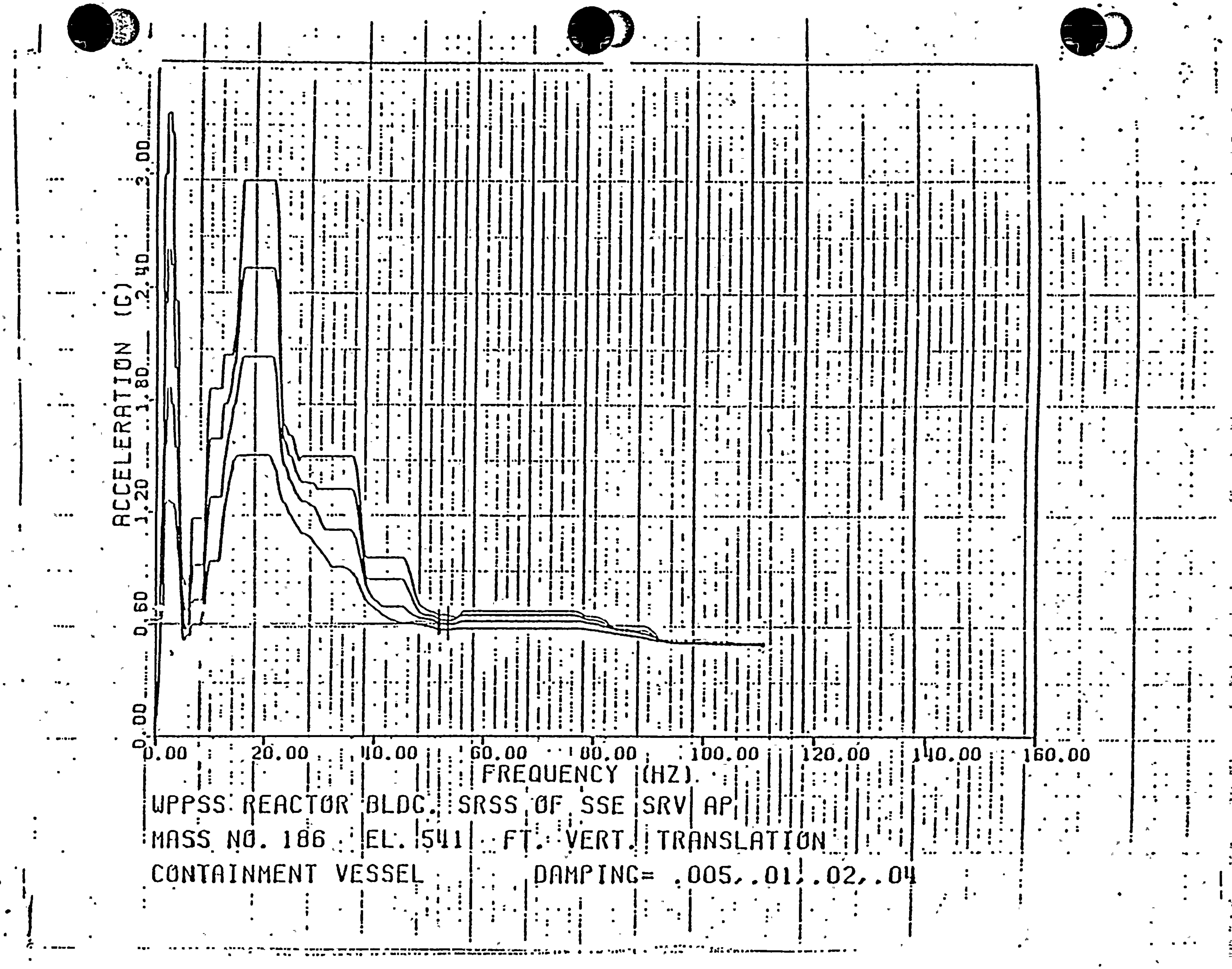
ATTACHMENT IV 1/5

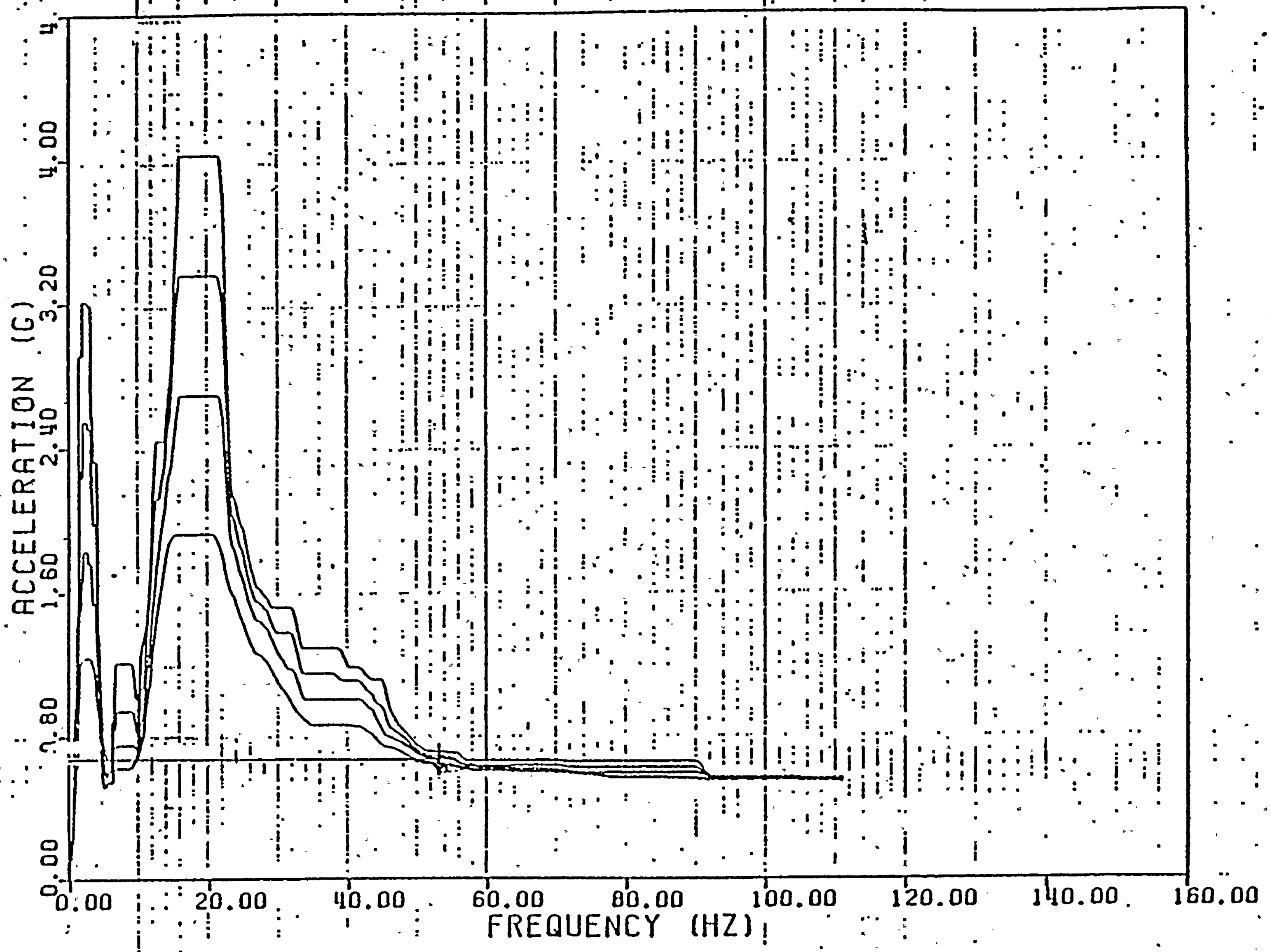


WPPSS REACTOR BLDG. SUM OF SSE SRV AP
MASS NO. 186 EL. 541 FT. HORIZ. TRANSLATION
CONTAINMENT VESSEL DAMPING= .005, .01, .02, .04



WPPSS REACTOR BLDG. SUM OF SSE SRV AP
MASS NO. 189 EL. 583 FT. HORIZ. TRANSLATION
CONTAINMENT VESSEL DAMPING= .005, .01, .02, .04


ACCELERATION (G)
0.00
0.60
1.20
1.80
2.40
3.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
FREQUENCY (HZ)
WPPSS REACTOR BLDG. SRSS OF SSE SRV AP
MASS NO. 186 EL. 541 FT. VERT. TRANSLATION
CONTAINMENT VESSEL DAMPING= .005,.01,.02,.04



WPPSS REACTOR BLDG. SRSS OF SRV SSE AP
MASS NO. 188 EL. 567 FT. VERT. TRANSLATION
CONTAINMENT VESSEL DAMPING= .005,.01,.02,.04

BOP-3 QID# 361102

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 TYPE:

1. UTILITY: WPPSS PWR

2. NSSS: GE 3. A/E: BURNS & ROE BWR 5 MARK II

II. COMPONENT NAME: 72" BUTTERFLY VALVE COMPONENT NO: REA-V-1 REA-V-2

1. SCOPE: ☐ NSSS ☒ BOP

2. MODEL NUMBER: A-206760 QUANTITY: 2

3. VENDOR: BIF (VALVE)

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

N/A

5. PHYSICAL DESCRIPTION: a. APPEARANCE:

b. DIMENSIONS: 72" DIAMETER (PIPE)

c. WEIGHT: 10,800 LB (WITH ACCESSORIES)

6. LOCATION: BUILDING: REACTOR BUILDING

ELEVATION: 597 FT

7. FIELD MOUNTING CONDITIONS: ☐ BOLT (NO. _____, SIZE _____)

☒ WELD (LENGTH FULL CIRCUM)

☒ REA-V-1 PIPE MOUNTED W/SADDLE SUPPORT
REA-V-2 PIPE MOUNTED NEAR WALL

8. a. SYSTEM IN WHICH LOCATED: REACTOR BLDG. EXHAUST AIR (HVAC)

b. FUNCTIONAL DESCRIPTION: REACTOR BLDG. ISOLATION VALVE

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN

☒ BOTH ☐ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-68

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES ☐ NO

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

☐ TEST ☒ ANALYSIS ☐ COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: 1) BURNS AND ROE TRANSMITTALS T-3 & 138 CONTR. 68
2) " " " " 131B

(NO., TITLE & DATE): 1) DESIGN & SEISMIC ANLYSIS OF 72" CYL. OPER. BUTTERFLY VLV TR-74-12 *
2) DEFLECTION ANALYSIS OF BUTTERFLY VALVES No. BIF-14 **

COMPANY THAT PREPARED REPORT: 1) BIF / McPHERSON ASSOCIATES INC
2) DYNATECH R/D COMPANY

COMPANY THAT REVIEWED REPORT: 1) BURNS & ROE / SUPPLY SYSTEM
2) SUPPLY SYSTEM

* REV 0 3/29/74 REV 1 12/31/75
** REV 0 4/12/76

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): ATTACHED
4. DAMPING CORRESPONDING TO RRS: ☒ OBE 1% ☒ SSE 2%
5. REQUIRED ACCELERATION IN EACH DIRECTION: ☐ ZPA ☒ OTHER (SPECIFY) SEISMIC CURVE AT EL 606 AT 17 HZ

OBE	S/S = .6	F/B = .6	V = .35
SSE	S/S = 1.0	F/B = 1.0	V = .625

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 THROUGH VII FOR EACH REPORT.

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. ☐ SINGLE FREQUENCY ☐ MULTI-FREQUENCY ☐ RANDOM

2. ☐ SINGLE AXIS ☐ MULTI-AXIS ☐ SINE BEAT ☐ ____________

3. NO. OF QUALIFICATION TESTS: OBE __________ SSE __________ OTHER (SPECIFY) __________

4. FREQUENCY RANGE: ______________________________

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = __________ F/B = __________ V = __________

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:

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IF QUALIFICATION BY ANALYSIS, THEM COMPLETE:

1. METHOD OF ANALYSIS:

[X] STATIC ANALYSIS [ ] EQUIVALENT STATIC ANALYSIS

[X] DYNAMIC ANALYSIS [ ] TIME-HISTORY [X] RESPONSE SPECTRUM

2. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):
THE FIRST THREE LOWEST FREQUENCIES: 1) 17.2 HZ 2) 21.2 HZ 3) 23.9 HZ

S/S = ______ F/B = ______ V = ______

3. MODEL TYPE:

[X] 3D MODEL [ ] 2D [ ] 1D [X] FINITE ELEMENT [ ] BEAM [ ] CLOSED FORM SOLUTION

4. [X] COMPUTER CODES: STARDYNE

FREQUENCY RANGE AND NO. OF MODES CONSIDERED: 17.2 HZ — 33.0 HZ 6 MODES SUMMED

[ ] HAND CALCULATIONS

5. METHOD OF COMBINING DYNAMIC RESPONSES: [X] ABSOLUTE SUM [ ] SRSS [ ] OTHER (SPECIFY) ______

6. DAMPING: OBE ______ SSE ½% BASIS FOR THE DAMPING USED: WORST CASE

7. SUPPORT CONSIDERATIONS IN THE MODEL: HANGER/SADDLE SUPPORT AND PIPE SUPPORT

8. CRITCAL STRUCTURAL ELEMENTS:

A.

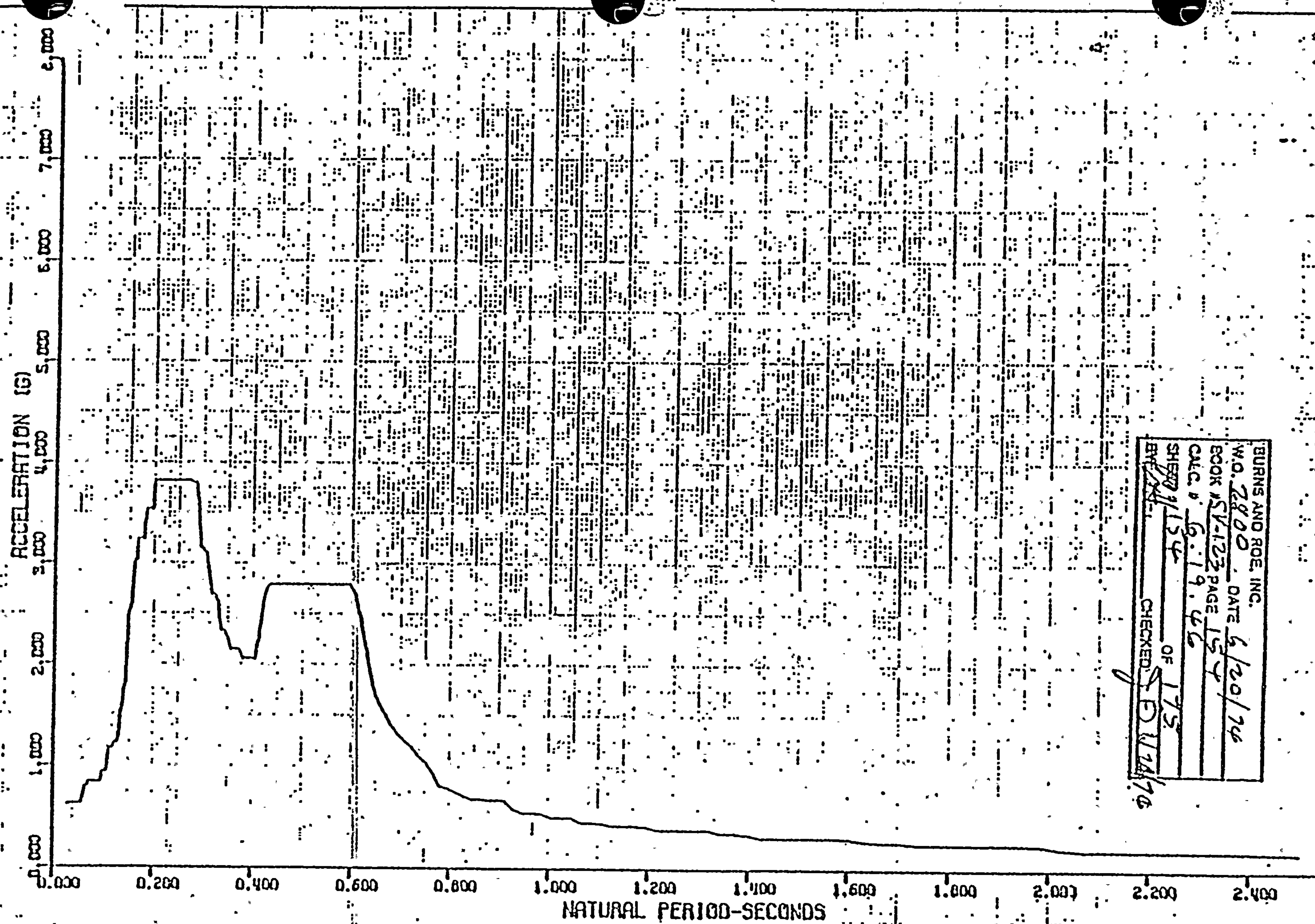
IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS	STRESS ALLOWABLE
STRESS INTENSITY	DISC	SSE + OPER + W		10822	15000
SHEAR	TAPER PINS	SSE + OPER + W		7657	12320
BENDING	SUPPORT BM	SSE + OPER + W		27442	36000
VALVE BODY				tact = 0.5 IN	treqd = .166 IN

B.

MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY
.128 IN.	DISC DEFLECTION	.50 IN

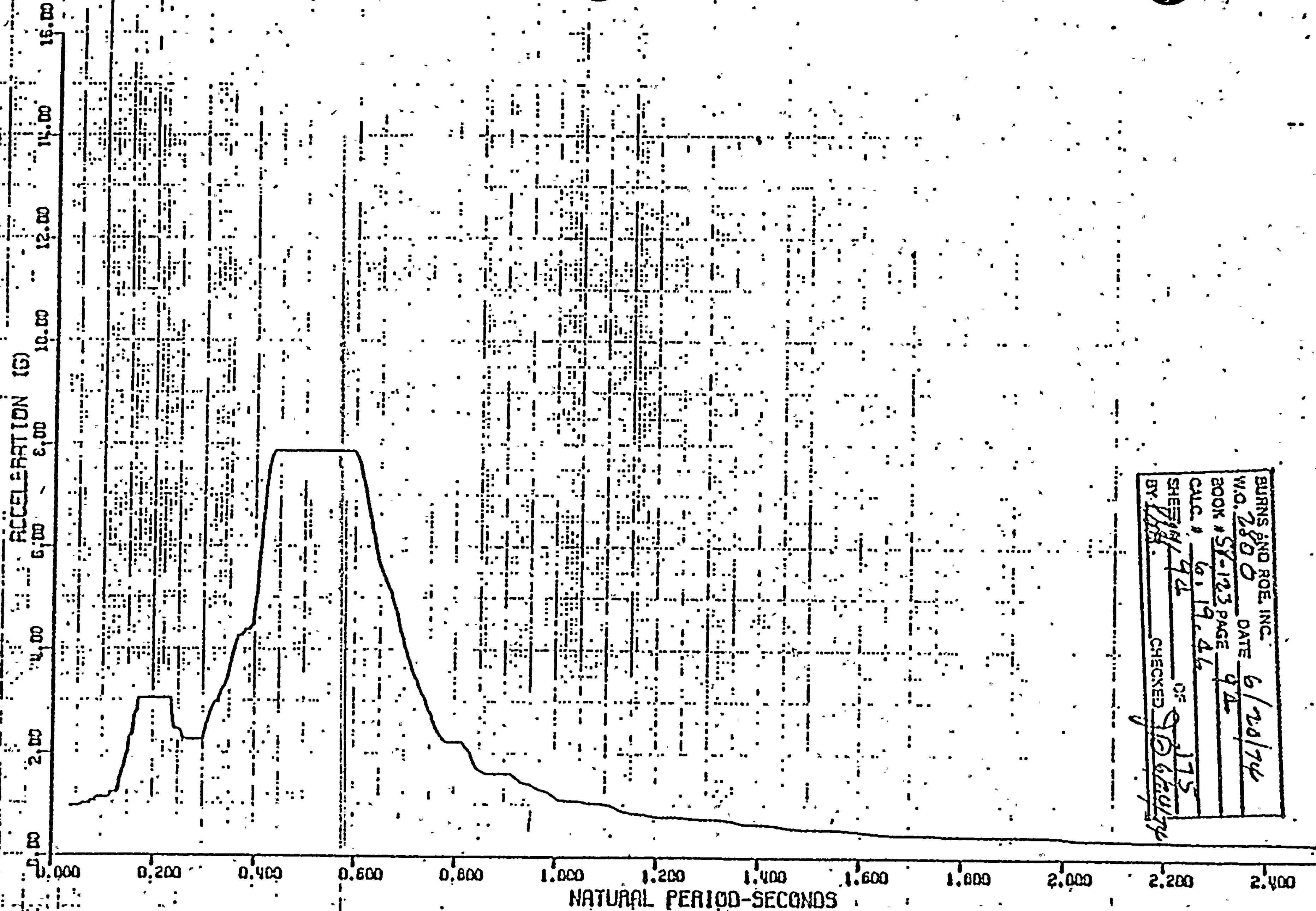
COMPLETED BY [signature] DATE 10/29/82

REVIEWED BY W. Schlaf[signature] DATE 10/29/82



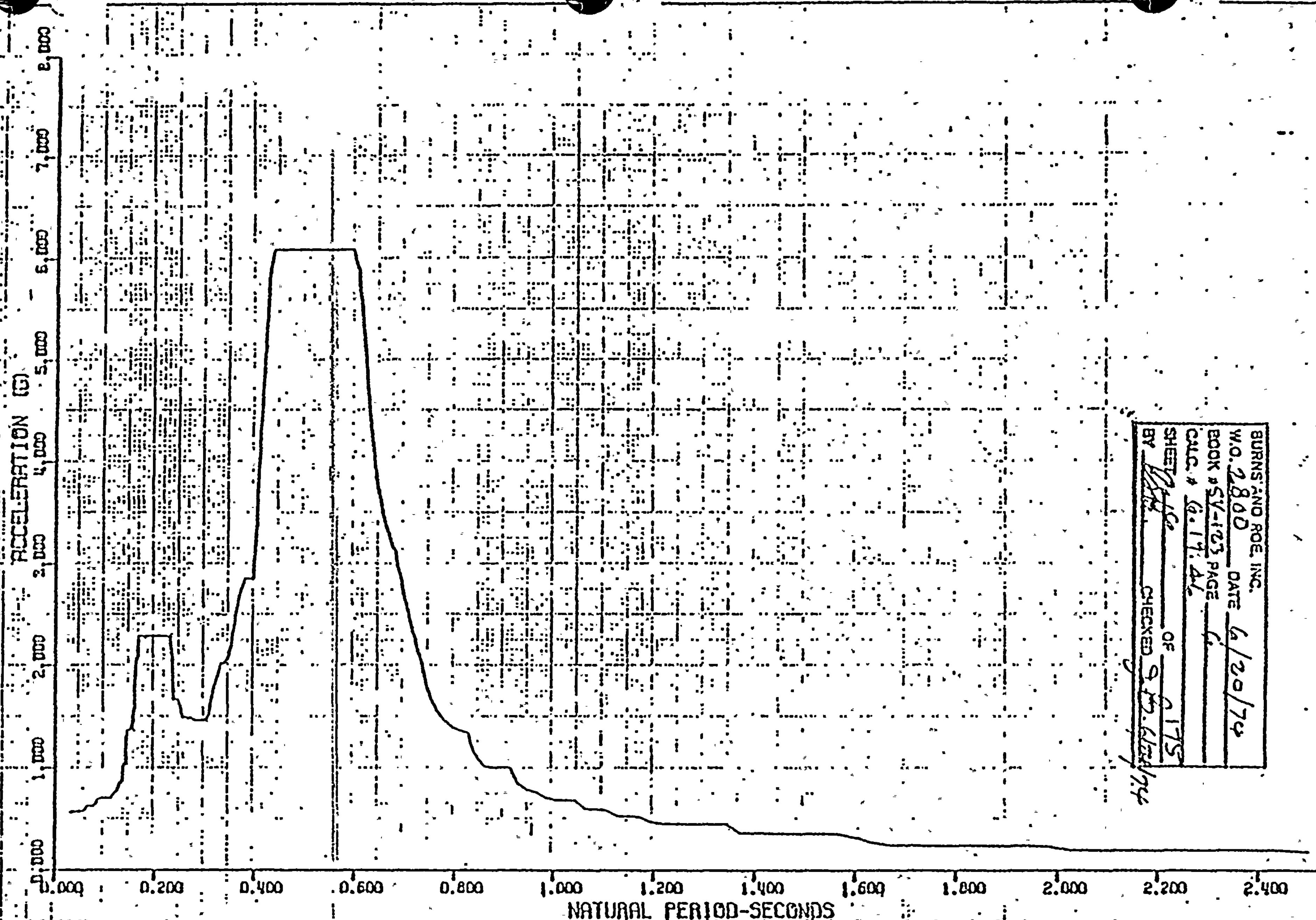
BURNS AND ROE, INC.
W.O. 2800 DATE 6/20/74
BOOK #SV-123 PAGE 154
CALC. # 6.19.46
SHEET 154 OF 175
BY DN CHECKED SD 11/24/76

WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.02



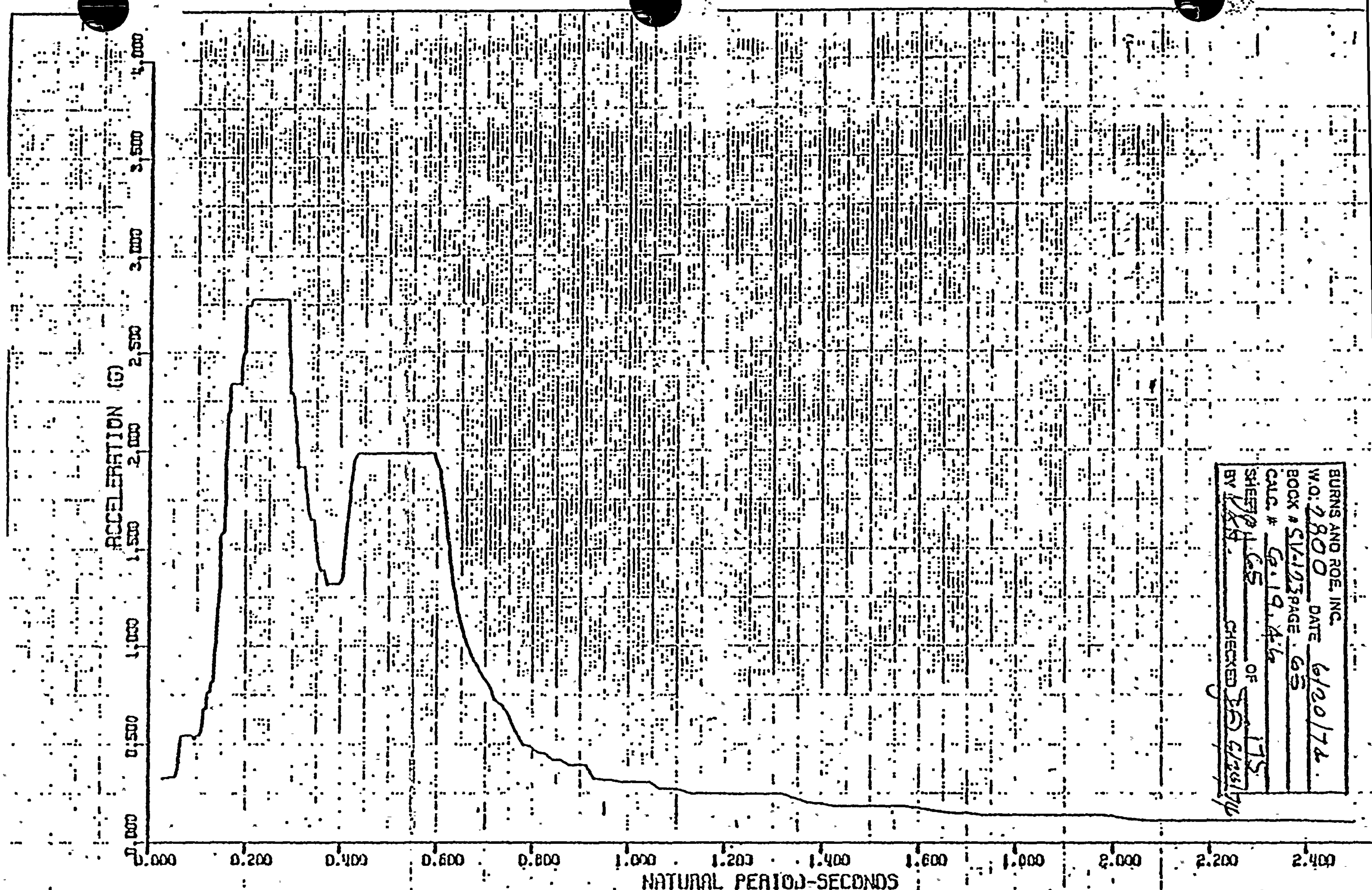
WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (DBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.02

BURNS AND ROE, INC.
W.O. 2800 DATE 6/20/74
BOOK # SY-123 PAGE 92
CALC. # 6.19.4b
SHEET 94 OF 175
BY [illegible] CHECKED [illegible] 6/20/74



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV, 1
SSE/2 (OBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.01

BURNS AND ROE, INC.
W.O. 2800 DATE 6/20/74
BOOK # SV-123 PAGE 6
CALC. # 6.17.4L
SHEET 66 OF 175
BY [illegible] CHECKED S. B. [illegible] 7/74



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE/2 (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.01

BOP-4

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 — TYPE:

1. UTILITY: WPPSS — PWR

2. NSSS: GE — 3. A/E: BURNS & ROE — BWR 5, MARK II

II. COMPONENT NAME: CYLINDER OPERATED BUTTERFLY VALVE, 84" — COMPONENT NO: ROA-V-1 ROA-V-2

1. SCOPE: ☐ NSSS ☒ BOP

2. MODEL NUMBER: A206759 — QUANTITY: 2

3. VENDOR: BIF

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

N/A

5. PHYSICAL DESCRIPTION: a. APPEARANCE: BUTTERFLY VALVE

b. DIMENSIONS: 84" DIAMETER

c. WEIGHT: 11,900 LBS

6. LOCATION: BUILDING: REACTOR BUILDING

ELEVATION: 578 FT.

7. FIELD MOUNTING CONDITIONS: ☐ BOLT (NO. _____, SIZE _____)

☐ WELD (LENGTH _____)

☒ PIPE SUPPORT ROA-V-1
SADDLE SUPPORT ROA-V-2

8. a. SYSTEM IN WHICH LOCATED: REACTOR OUTSIDE AIR

b. FUNCTIONAL DESCRIPTION: 84" R. BLDG ISOLATION VALVE

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN ☐ BOTH ☒ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-68

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES ☐ NO

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

☐ TEST ☒ ANALYSIS ☐ COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: CONTRACT 68 TRANSMITTALS T-3, T-13B, T-131B DESIGN & SEISMIC ANALYSIS TR-74-13 3/15/74 AND 12/31/75 AND DEFLECTION

(NO., TITLE & DATE): ANALYSIS OF BUTTERFLY VALVES 4/12/76 BIF-14.

COMPANY THAT PREPARED REPORT: McPHERSON ASSOC, INC AND DYNATECH R/D CO.

COMPANY THAT REVIEWED REPORT: BURNS & ROE/NUTECH

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) N/A

3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): ATTACHED

4. DAMPING CORRESPONDING TO RRS: ☒ OBE 1% ☒ SSE 2%

5. REQUIRED ACCELERATION IN EACH DIRECTION: ☐ ZPA ☒ OTHER (SPECIFY) RRS AT 13.6 Hz

OBE	S/S = .65g	F/B = .65 g	V = .55 g
SSE	S/S = 1.05g	F/B = 1.05g	V = .85 g

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 THROUGH VII FOR EACH REPORT.

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*: N/A

1. ☐ SINGLE FREQUENCY ☐ MULTI-FREQUENCY ☐ RANDOM

2. ☐ SINGLE AXIS ☐ MULTI-AXIS ☐ SINE BEAT ☐ ______________

3. NO. OF QUALIFICATION TESTS: OBE ____________ SSE ____________ OTHER (SPECIFY) ____________

4. FREQUENCY RANGE: ______________________________

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = ____________ F/B = ____________ V = ____________

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:

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

II. IF QUALIFICATION BY ANALYSIS, THEM COMPLETE:

1. METHOD OF ANALYSIS:

☐ STATIC ANALYSIS ☐ EQUIVALENT STATIC ANALYSIS

☒ DYNAMIC ANALYSIS ☐ TIME-HISTORY ☒ RESPONSE SPECTRUM

$g_H = 1.125g$ $g_V = 1.156g$ (NOT INCLUDING GRAVITY) AT 13.6 Hz. for ½% DAMPING SSE

2. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = 13.6 Hz (MIN) F/B = ________ V = ________

3. MODEL TYPE:

☒ 3D ☐ 2D ☐ 1D ☒ FINITE ELEMENT ☐ BEAM ☐ CLOSED FORM SOLUTION

4. ☒ COMPUTER CODES: STARDYNE

FREQUENCY RANGE AND NO. OF MODES CONSIDERED: 13.602 TO 38.735 Hz; 6 MODES

☒ HAND CALCULATIONS

5. METHOD OF COMBINING DYNAMIC RESPONSES: ☒ ABSOLUTE SUM ☐ SRSS ☐ OTHER (SPECIFY) ________

6. DAMPING: OBE ________ SSE ½% BASIS FOR THE DAMPING USED: WORST CASE

7. SUPPORT CONSIDERATIONS IN THE MODEL: PIPE SUPPORTED AND SADDLE SUPPORT

8. CRITCAL STRUCTURAL ELEMENTS:

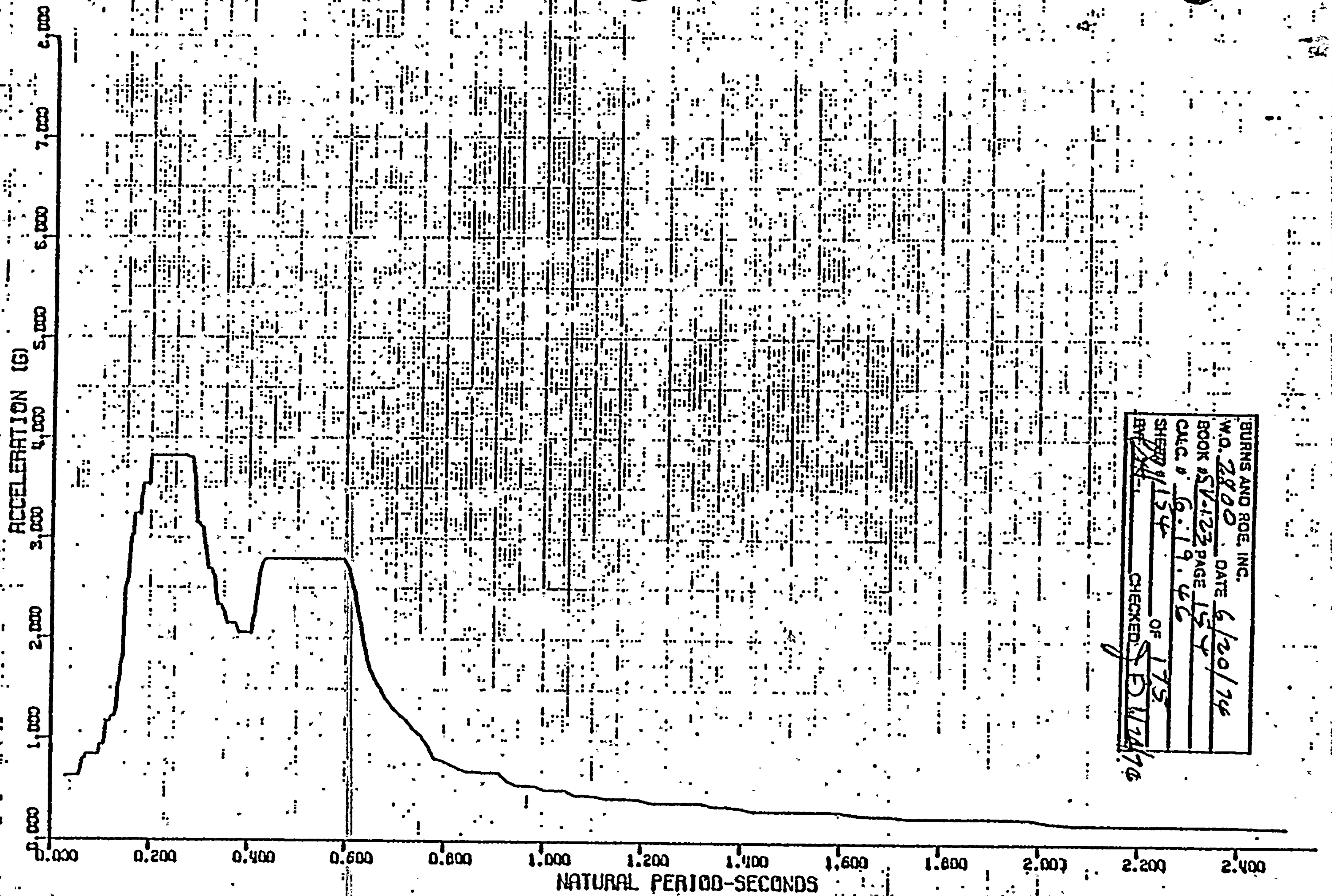
A.

IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS	STRESS ALLOWABLE
DRIVE LEVER		SSE+OPERATING+W		27415	36000 PSI
SHAFT		SSE+OPERATING+W		9763	11322 PSI
VALVE BODY		SSE+OPERATING+W		10722	15000 PSI

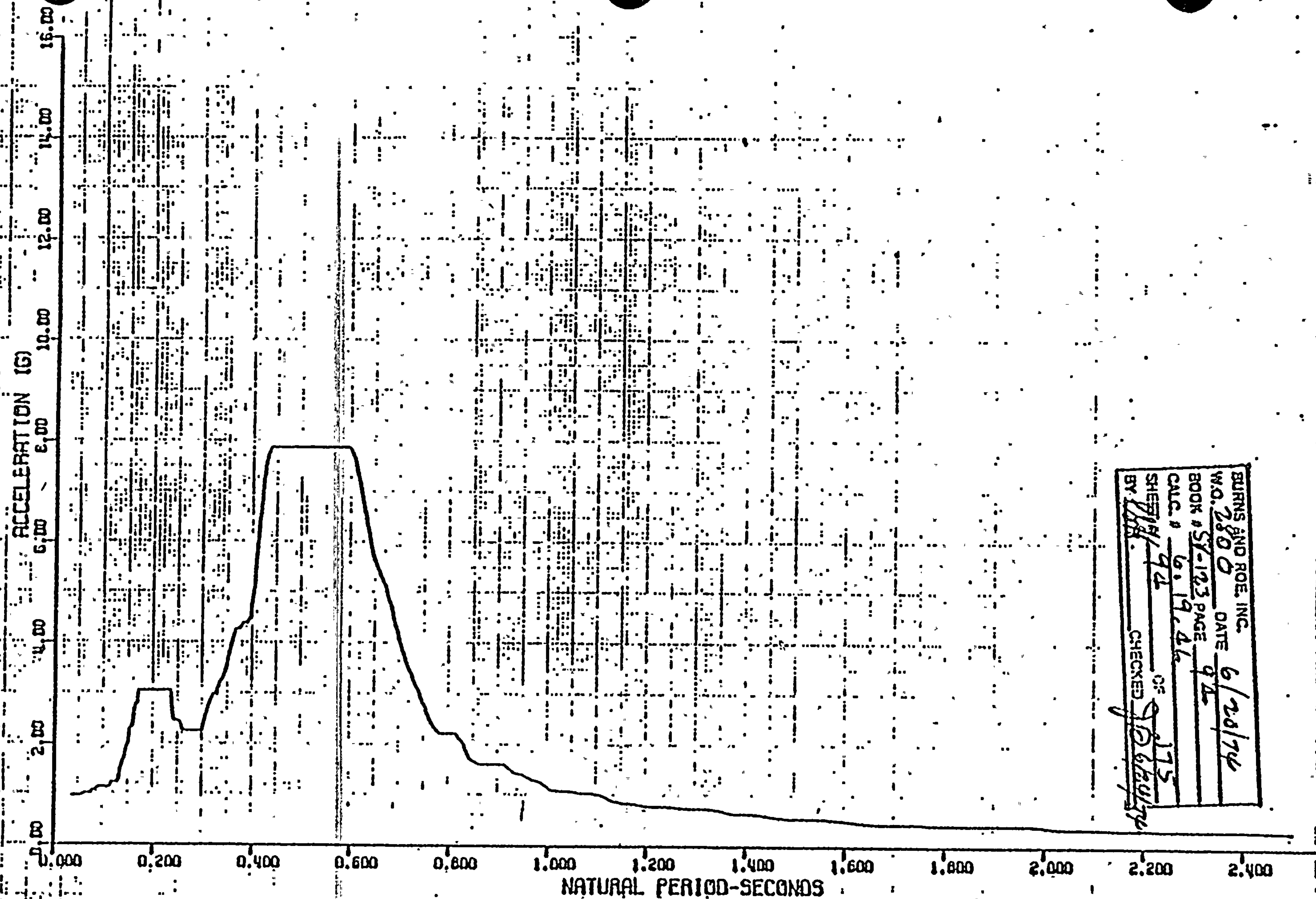
B.

MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY
.239"	TOTAL EDGE DEFLECTION	0.500"

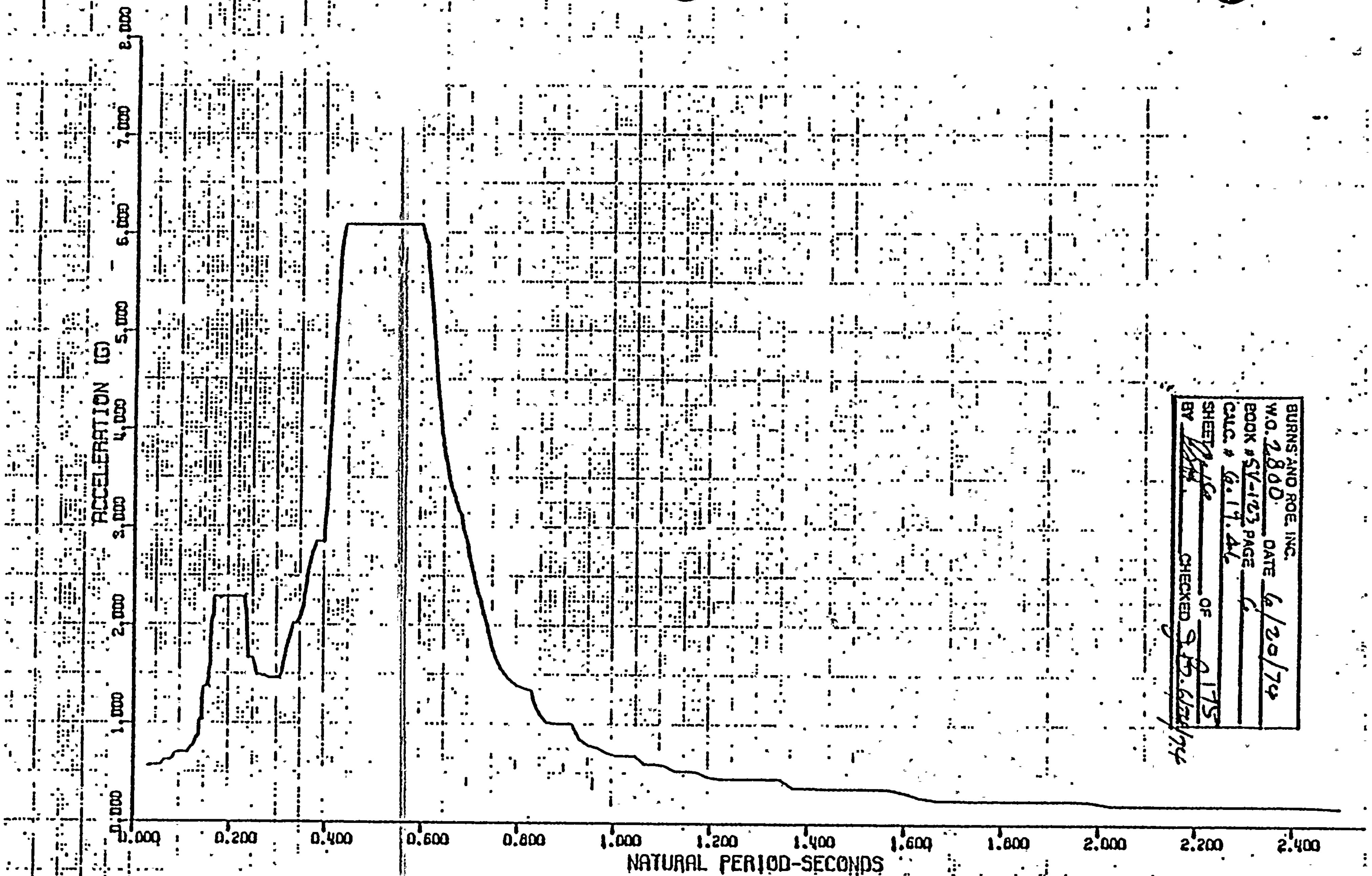
COMPLETED BY William Schlaifer	DATE 10/29/82
REVIEWED BY [signature]	DATE 10/29/82



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.02



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (DBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.02



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE/2 (OBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.01

BURNS AND ROE, INC.
W.O. 2800 DATE 6/20/74
BOOK # SV-123 PAGE 6
CALC. # 6.17.4d
SHEET 2 OF 175
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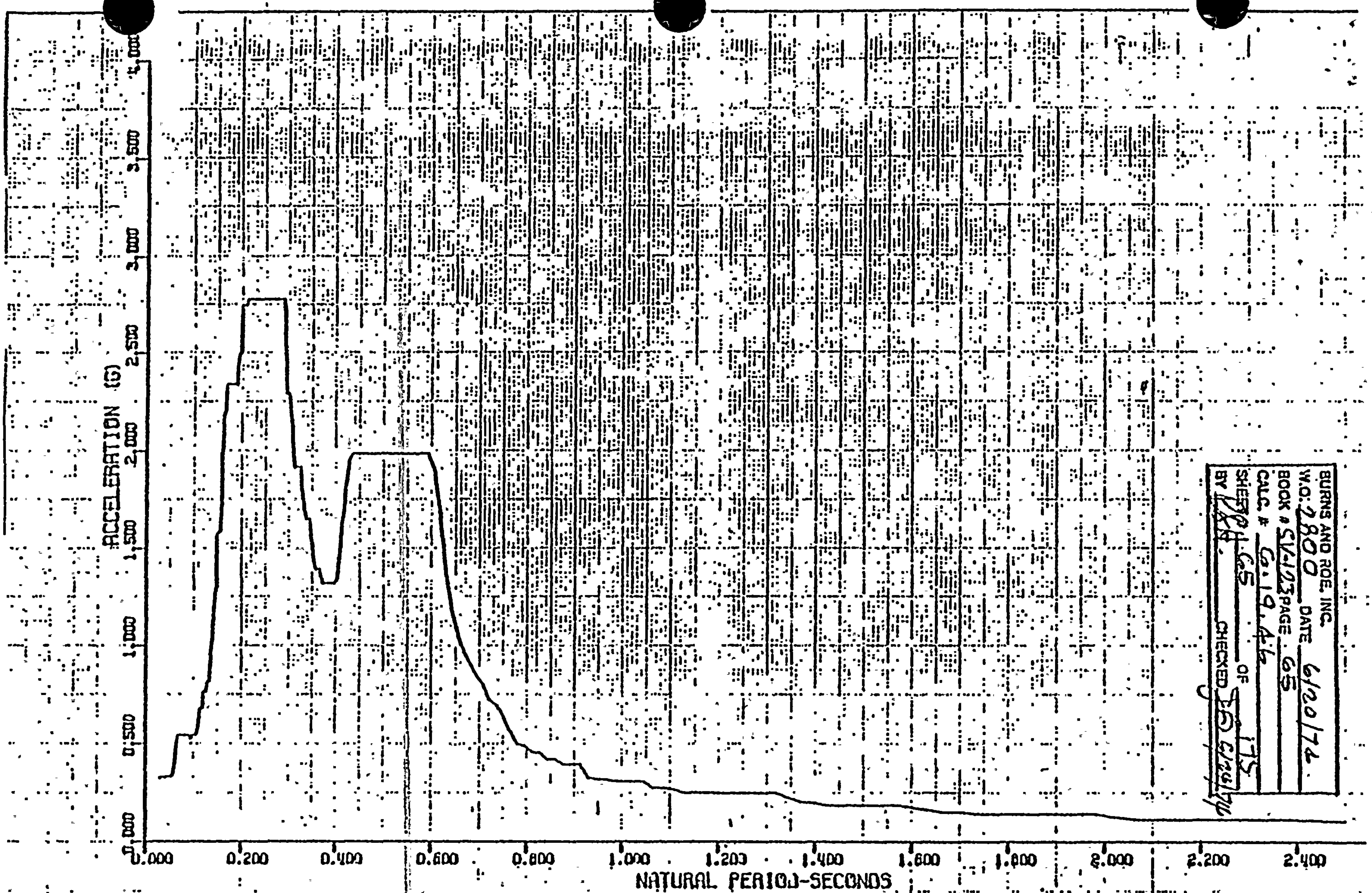


WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE/2 (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.01

BOP-5

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2

TYPE:

1. UTILITY: WPPSS

PWR

2. NSSS: GE

3. A/E: BRI

BWR ✓

II. COMPONENT NAME: Cooling Water Pump, Right Hand

COMPONENT NO: DCW-P-2A1, -2A2, -2B1, -2B2

1. SCOPE: ☐ NSSS ☑ BOP

2. MODEL NUMBER: 8249002

QUANTITY: 4

3. VENDOR: EMD

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

n.a.

5. PHYSICAL DESCRIPTION: a. APPEARANCE: circular metal casting

b. DIMENSIONS: 12" x 12" x 8"

c. WEIGHT: 155 lb.

6. LOCATION: BUILDING: Diesel Generator

ELEVATION: 447'

7. FIELD MOUNTING CONDITIONS: ☐ BOLT (NO. ______, SIZE ______)

☐ WELD (LENGTH ______)

☑ standard

8. a. SYSTEM IN WHICH LOCATED: Diesel Generator

b. FUNCTIONAL DESCRIPTION: Pump cooling water through engine

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN

☑ BOTH ☐ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-53

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☑ YES ☐ NO

						JOB NO 0740-014-361
1	DW	10/26/82	JRW	10-26-82	eds nuclear	CALC NO 233002-S
REV	BY	DATE	CHECKED	DATE		

QUALI.. .CATION SUMMARY OF EQUIPMENT (CON. INUED)

IV. EQUIPMENT QUALIFICATION METHOD:

☐ TEST ☐ ANALYSIS ☑ COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: Seismic Analysis of EMD 645 Engine

(NO., TITLE & DATE): No. E77-1, dated 3-14-77 (in documentation reference 1.1)

COMPANY THAT PREPARED REPORT: EMD.

COMPANY THAT REVIEWED REPORT: EDS Nuclear

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) n.a.

3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): OBE/SSE in 3 directions @ 437'6"

4. DAMPING CORRESPONDING TO RRS: ☑ OBE 1/2 ☑ SSE 1 *

5. REQUIRED ACCELERATION IN EACH DIRECTION: ☑ ZPA ☐ OTHER (SPECIFY)

OBE	S/S = .2g	F/B = .2g	V = .2g
SSE	S/S = .4g	F/B = .4g	V = .4g

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:

* Results independent of damping values since seismic rigidity is demonstrated.

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

REV	BY	DATE	CHECKED	DATE		
1	DW	10/26/82	JRW	10-26-82	eds nuclear	JOB NO 0740-014-361 CALC NO 233002-S

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. ☐ SINGLE FREQUENCY ☐ MULTI-FREQUENCY ☐ RANDOM

2. ☐ SINGLE AXIS ☐ MULTI-AXIS ☐ SINE BEAT ☑ Navy high shock test to MIL-S-901C

3. NO. OF QUALIFICATION TESTS: OBE ______ SSE ______ OTHER (SPECIFY) In accordance with MIL-S-901C

4. FREQUENCY RANGE: not specified

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = 221.46 Hz F/B = > 450 Hz V = 379.3 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 = ______

Horiz. ~~SSE S/S =~~ 45-120 g F/B = ______ V = 100-200 g

9. LABORATORY MOUNTING:

1. ☑ BOLT (NO. ______, SIZE Standard) ☐ WELD (LENGTH ______) ☐ ______

10. FUNCTIONAL OPERABILITY VERIFIED: ☑ YES ☐ NO ☐ NOT APPLICABLE

11. TEST RESULTS INCLUDING MODIFICATIONS MADE:

The combination of analysis to determine seismic rigidity and successful testing to MIL-S-901C meet the requirements of IEEE-344 (1975)

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:

REV	BY	DATE	CHECKED	DATE		
1	DLP	10/26/82	JRW	10-26-82	eds nuclear	JOB NO 0740-014-361 CALC NO 233002-S

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VII. IF QUALIFICATION BY ANALYSIS, THEM COMPLETE:

1. METHOD OF ANALYSIS:

- [ ] STATIC ANALYSIS
- [x] EQUIVALENT STATIC ANALYSIS
- [ ] DYNAMIC ANALYSIS
- [ ] TIME-HISTORY
- [ ] RESPONSE SPECTRUM

2. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = 221.46 Hz F/B = >450 Hz V = 379.3 Hz

3. MODEL TYPE:

- [x] 3D
- [ ] 2D
- [ ] 1D
- [ ] FINITE ELEMENT
- [ ] BEAM
- [ ] CLOSED FORM SOLUTION

4. [x] COMPUTER CODES: not specified

FREQUENCY RANGE AND NO. OF MODES CONSIDERED: "

[x] HAND CALCULATIONS

5. METHOD OF COMBINING DYNAMIC RESPONSES: [ ] ABSOLUTE SUM [ ] SRSS [ ] OTHER (SPECIFY) n.a.

6. DAMPING: OBE n.a. SSE n.a. BASIS FOR THE DAMPING USED: rigidity

7. SUPPORT CONSIDERATIONS IN THE MODEL: standard

8. CRITCAL STRUCTURAL ELEMENTS:

A.

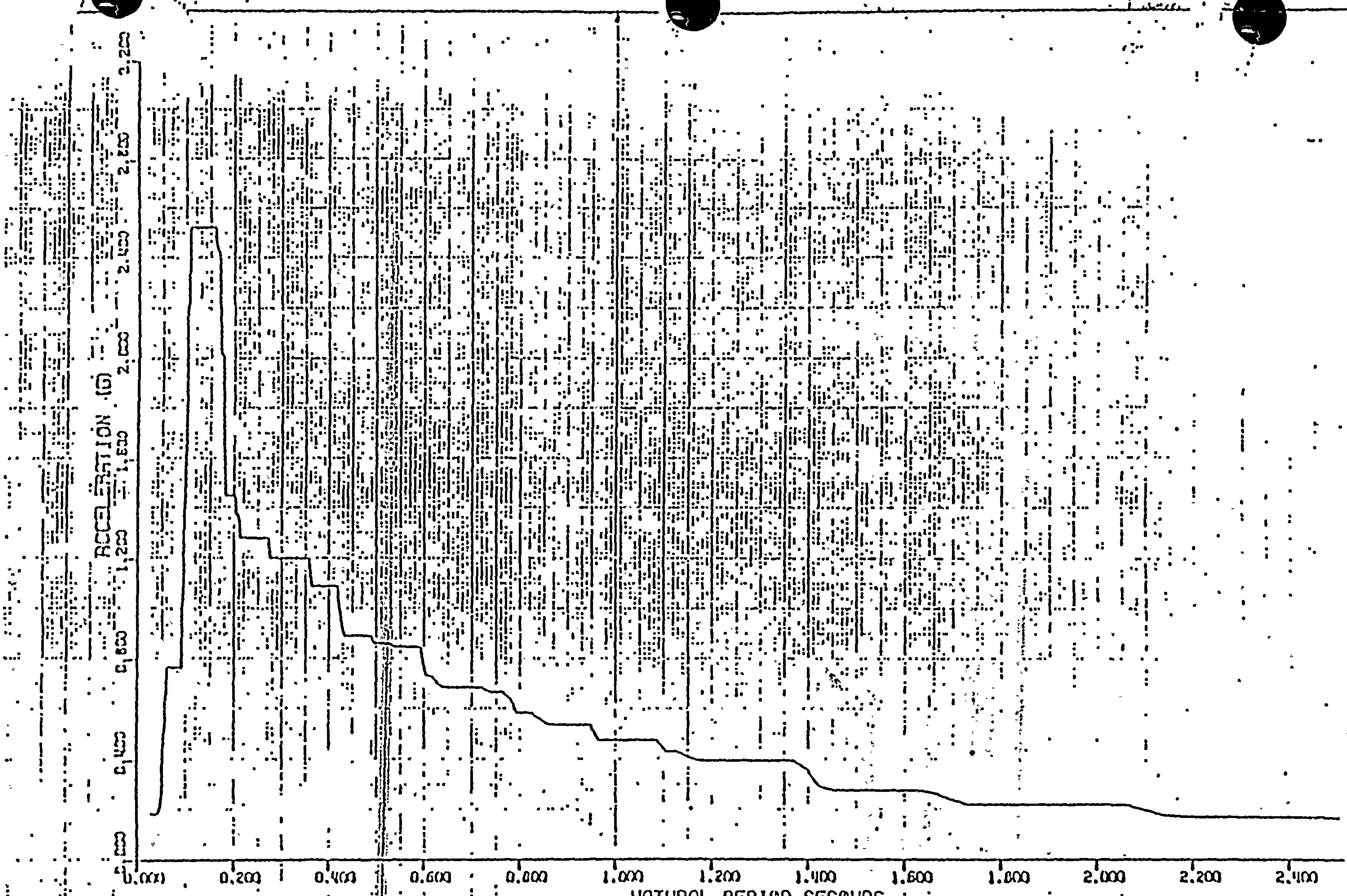
IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS	STRESS ALLOWABLE

See ref. 1.1 of the documentation secition of this File

B.

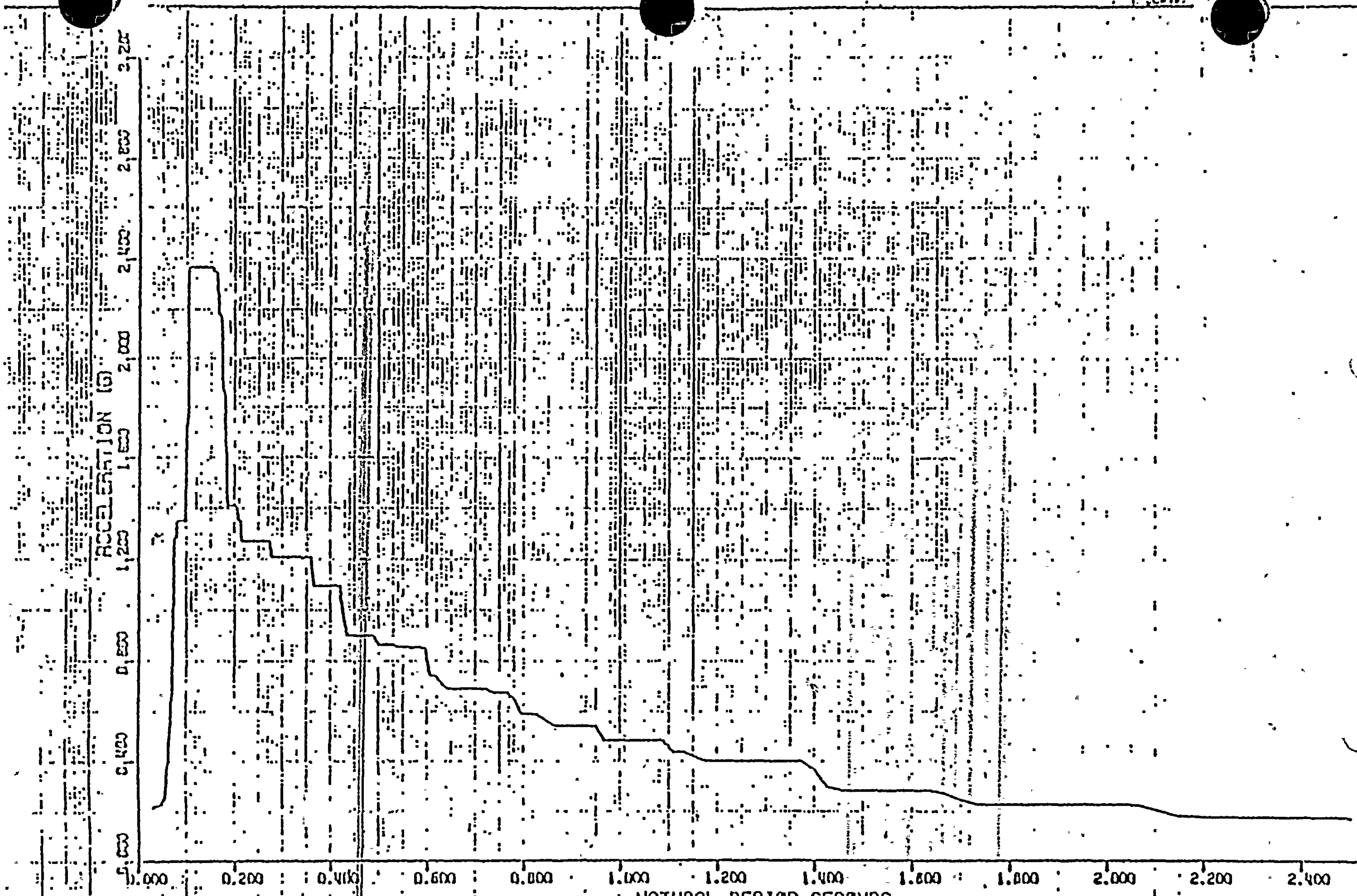
MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY
—	—	—

REV	BY	DATE	CHECKED	DATE		
1	RLP	10/12/82	JRW	10-26-82	eds nuclear	JOB NO 0740-014-361 CALC NO 233002-S



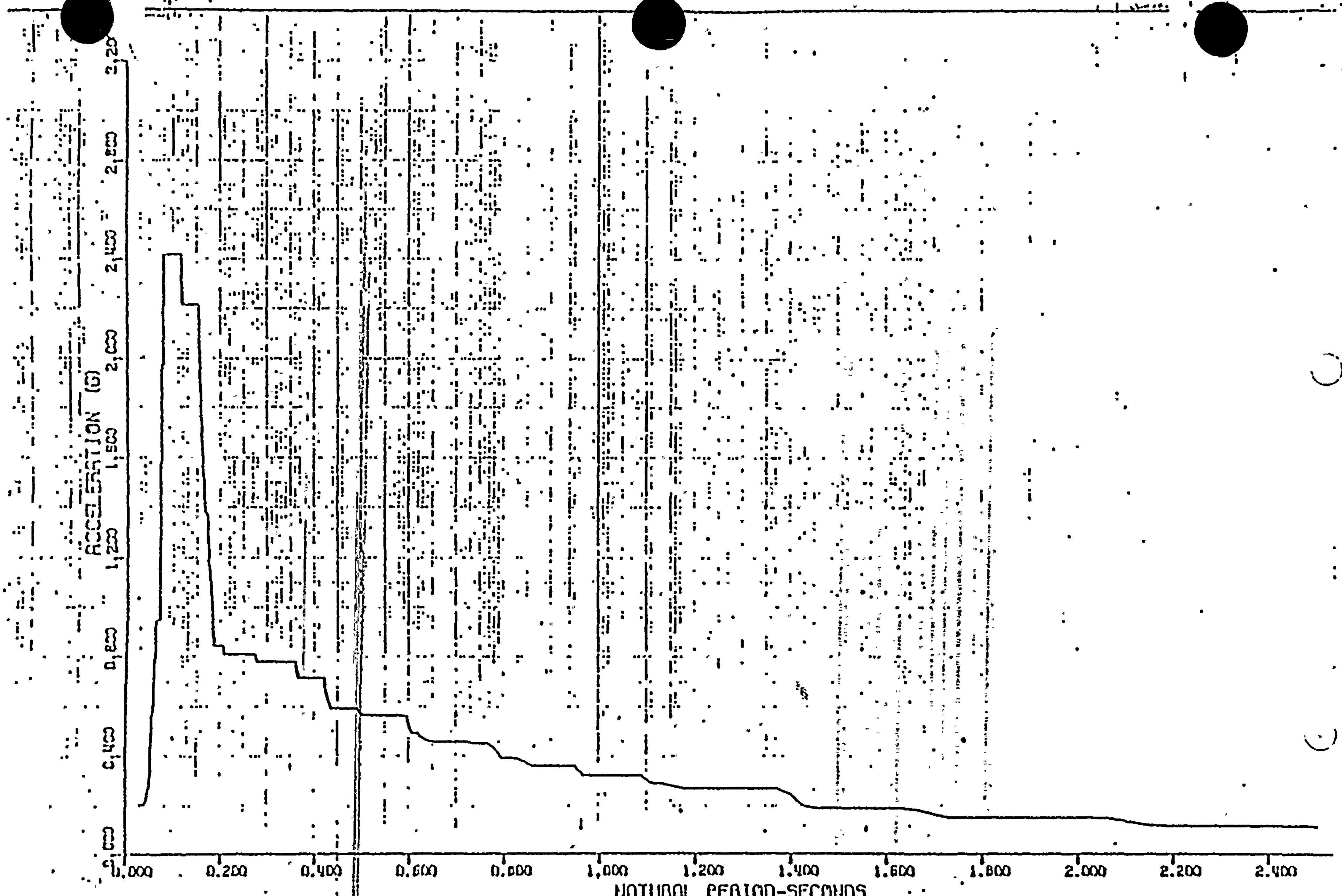
WPPSS, HANFORD NO. 2, DIESEL-GENERATOR BLDG., REV.1
SSE/2 (OBE) FLOOR SPECTRUM (N-S) - HORIZONTAL
MASS 3, EL. 497' - 6", DAMPING=0.005

Pg. 15/54

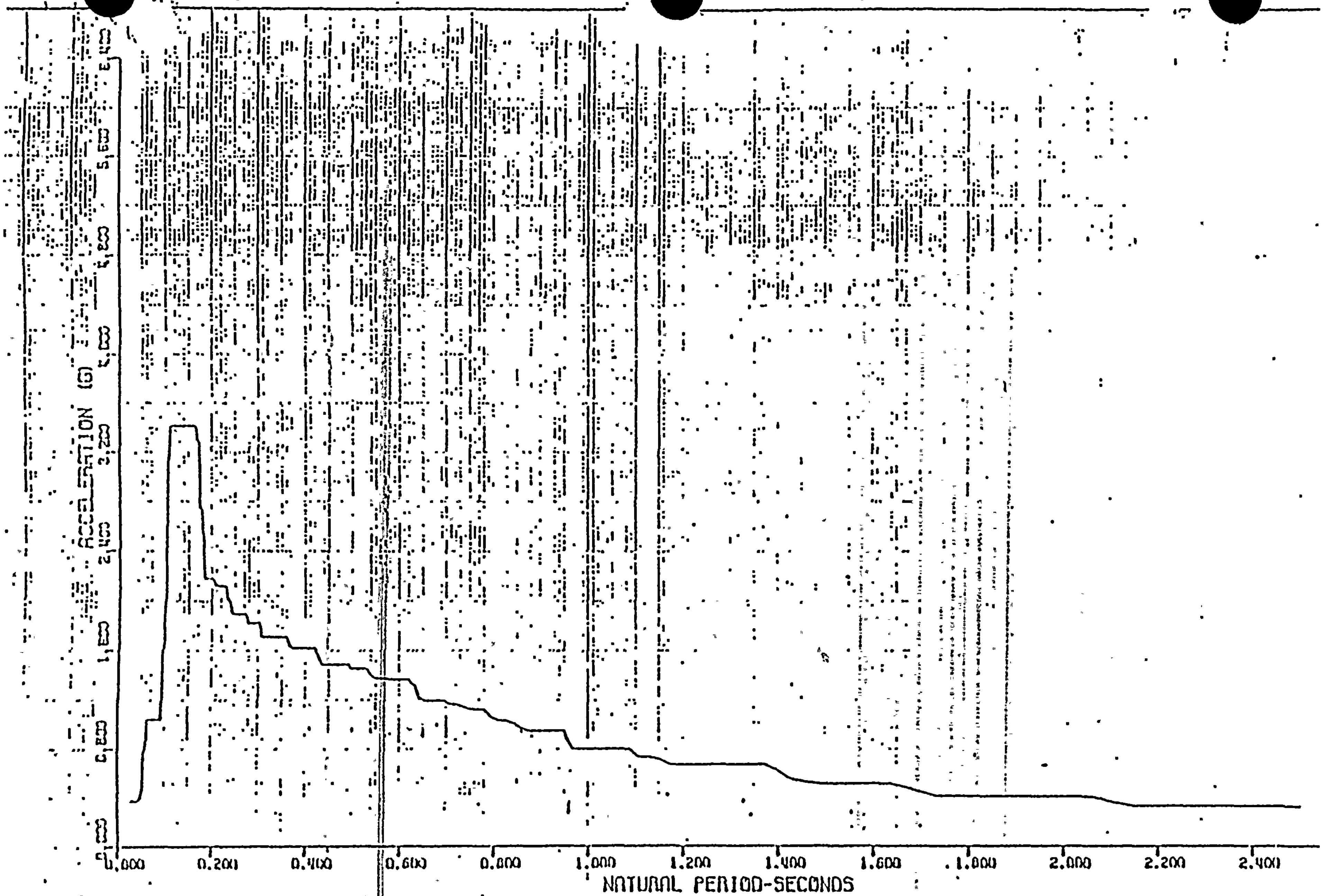


WPPSS, HANFORD NO. 2, DIESEL-GENERATOR BLDG., REV.1
SSE/2 (OBE) FLOOR SPECTRUM (E-W) - HORIZONTAL
MASS 9, EL. 437' - 6", DAMPING=0.005

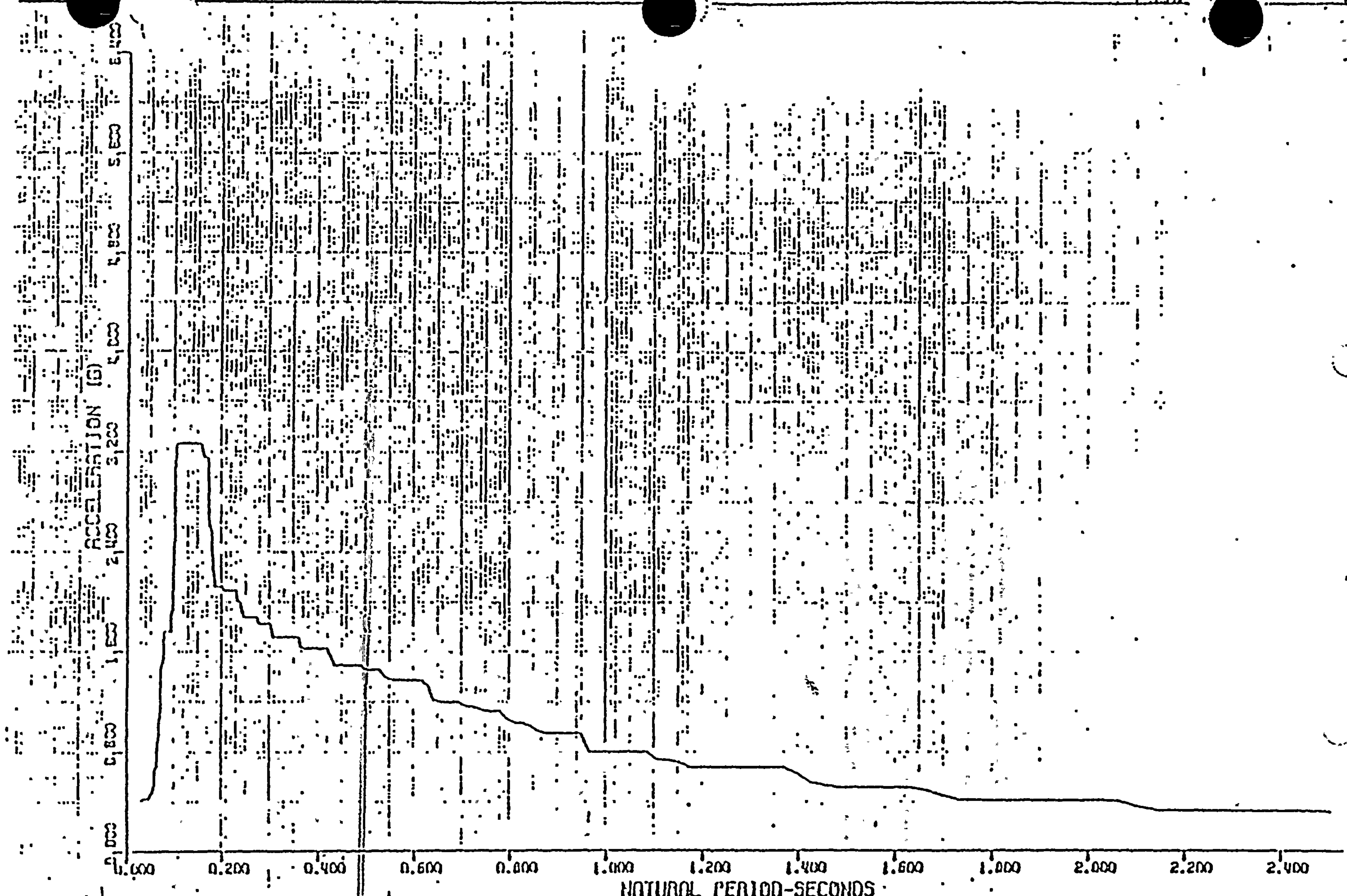
pg. 1659



WPPSS, HANFORD NO. 2, DIESEL-GENERATOR BLDG., REV.1
SSE/2 (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS 3, EL. 437' - 6", DAMPING=0.005

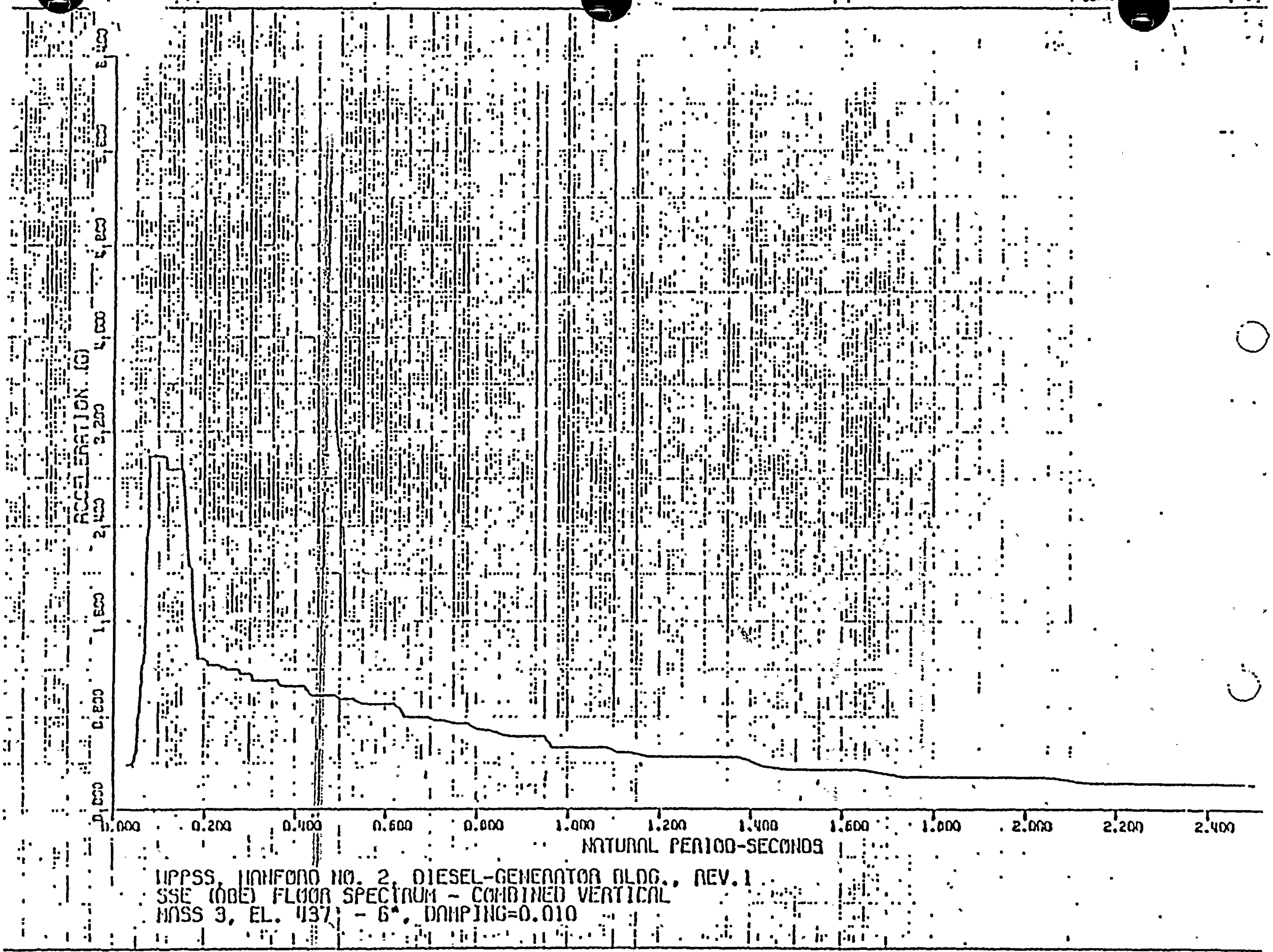


WPPSS, HANFORD NO. 2, DIESEL-GENERATOR BLDG., REV.1
SSE (DDE) FLOOR SPECTRUM (N-S) - HORIZONTAL
MASS 3, EL. 437' - 6", DAMPING=0.010



WPPSS, HANFORD NO. 2, DIESEL-GENERATOR BLDG., REV.1
SSE (DBE) FLOOR SPECTRUM (E-W) - HORIZONTAL
MASS 3, EL. 437' - 6", DAMPING=0.010

18/52


ACCELERATION (G)
0.000
0.800
1.600
2.400
3.200
4.000
4.800
5.600
6.400
0.000
0.200
0.400
0.600
0.800
1.000
1.200
1.400
1.600
1.800
2.000
2.200
2.400
NATURAL PERIOD-SECONDS
WPPSS, HANFORD NO. 2, DIESEL-GENERATOR BLDG., REV.1
SSE (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS 3, EL. 437' - 6", DAMPING=0.010
6.19/59

BOP-4 2-1

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

Qualification Summary of Equipment QID 361712

		Ref. No.
I. PLANT NAME: WNP-2	TYPE	
	PWR:	
1. NSSS: GE 2. A/E: Burns & Roe	BWR Mark II	4
II. COMPONENT NAME: 10" - 150# Gate Valve	COMPONENT NO. RCC-V-5 RCC-V-21 RCC-V-40 RCIC-V-68	4
1. SCOPE: ☐ NSSS ☒ BOP		
2. MODEL NUMBER: P2-3311-N-11	QUANTITY: 4	4
3. VENDOR: Velan Engineering Ltd.		4
4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED: N/A		
5. PHYSICAL DESCRIPTION: a. APPEARANCE: N/A		
b. DIMENSIONS: 54.06 in.		7
c. WEIGHT: 1460 lb.		
6. LOCATION: BUILDING: Reactor / Primary Containment		4
ELEVATION: 514 ft. & 474 ft. / 514 ft.		
7. FIELD MOUNTING CONDITIONS: ☐ BOLT (NO. ____ SIZE ____) ☐ WELD (LENGTH ____) ☒ Butt Weld 10"		7
8. a. SYSTEM IN WHICH LOCATED: Reactor Core Isolation Cooling System / Closed Cooling Water System		4
b. FUNCTIONAL DESCRIPTION: Primary Containment Isolation (RCIC-V-68: Emergency Core Heat Removal)		
c. IS THE EQUIPMENT REQUIRED FOR: ☒ HOT STANDBY (RCIC-V-68 only) ☐ COLD SHUTDOWN ☐ BOTH ☒ NEITHER		4
9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-41A		4
III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES ☐ NO		

Qualification Summary of Equipment (Continued) QID 361712

	Ref. No.
IV. EQUIPMENT QUALIFICATION METHOD:	
☐ TEST ☒ ANALYSIS ☐ COMBINATION OF TEST & ANALYSIS	
QUALIFICATION REPORT: (NO., TITLE & DATE): Seismic and Hydrodynaimc Requalification Analysis for 10"-150# Gate Valves for RCC and RCIC Systems. Valve Tag No's. RCC-V-5, RCC-V-21, RCC-V-40, RCIC-V-68.	8
COMPANY THAT PREPARED REPORT: Cygna Energy Services	
COMPANY THAT REVIEWED REPORT:	
V. VIBRATION INPUT:	
1. LOADS CONSIDERED: a. ☐ SEISMIC ONLY	
b. ☐ HYDRODYNAMIC ONLY	
c. ☒ COMBINATON OF (a) AND (b)	4
2. METHOD OF COMBINING RRS: ☐ ABSOLUTE SUM ☒ SRSS ☐ OTHER (SPECIFY)	5
3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): Reactor Bldg., Elev. 521'	3
4. DAMPING CORRESPONDING TO RSS: ☒ OBE ½% ☒ SSE 1%	14
5. REQUIRED ACCELERATION IN EACH DIRECTION: ☐ ZPA ☒ OTHER (SPECIFY) System Freq. Cut off	
OBE S/S = *5.0 F/B = *5.0 V = 5.85**	3, 13
SSE S/S = *5.0 F/B = *5.0 V = 5.85**	
*Seismic, includes 1.5 factor to account for higher modes	
6. WERE FATIGUE EFFECTS OR OTHER VIBRATION LOADS CONSIDERED?	
☒ YES ☐ NO	5
IF YES, DESCRIBE LOADS CONSIDERED AND HOW THEY WERE TREATED IN OVERALL QUALIFICATION PROGRAM:	
Nuclear Class 2 Valve - fatigue analysis performed on yoke legs only in accordance with AISC Appendix B.	
**Hydrodynamic accelerations combined with seismic vertical to produce a worst case.	
*NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT	

Qualification Summary of Equipment (Continued) QID 361712

Ref. No.

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*: N/A

1. ☐ SINGLE FREQUENCY ☐ MULTI-FREQUENCY ☐ RANDOM

2. ☐ SINGLE AXIS ☐ MULTI-AXIS ☐ SINE BEAT ☐ ________

3. NO. OF QUALIFICATION TESTS: OBE ________ SSE ________ OTHER (SPECIFY) ________

4. FREQUENCY RANGE: ________

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

   S/S = ________ F/B = ________ V = ________

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:

   ☐ BOLT (NO. ________, SIZE ________) ☐ WELD (LENGTH ________) ☐ ________

10. FUNCTIONAL OPERABILITY VERIFIED: ☐ YES ☐ NO ☐ NOT APPLICABLE

11. TEST REULTS INCLUDING MODIFICATIONS MADE:

____

____

____

12. OTHER TEST PERFORMED (SUCH AS AGING OR FRAGILITY TEST, INCLUDING RESULTS):

____

____

____

____

*NOTE: IF QUALIFICATION BY A COMBINTATION OF TEST AND ANALYSIS, ALSO COMPLETE ITEM VII.

Qualification Summary of Equipment (Continued) QID 361712

	Ref. No.
I. IF QUALIFICATION BY ANALYSIS, THEN COMPLETE:	
1. METHOD OF ANALYSIS:	
☐ STATIC ANALYSIS ☒ EQUIVALENT STATIC ANALYSIS	8
☐ DYNAMIC ANALYSIS ☐ TIME-HISTORY ☐ RESPONSE SPECTRUM	
2. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):	
Actuators S/S = 48.4 Hz F/B = 48.4 Hz V = 100 Hz	6
System 5.6 Hz 5.6 Hz 8 Hz	8
3. MODEL TYPE:	
☐ 3D ☐ 2D ☐ 1D ☐ FINITE ELEMENT ☐ BEAM ☐ CLOSED FORM SOLUTION	
4. ☐ COMPUTER CODES: None	
FREQUENCY RANGE AND NO. OF MODES CONSIDERED: N/A	
☒ HAND CALCULATIONS	
5. METHOD OF COMBINING DYNAMIC RESPONSES: ☐ ABSOULTE SUM ☒ SRSS ☐ OTHER (SPECIFY) ______	
6. DAMPING: OBE ½% SSE 1% BASIS FOR THE DAMPING USED: WNP-2 FSAR	14
7. SUPPORT CONSIDERATIONS IN THE MODEL: —	
8. CRITICAL STRUCTURAL ELEMENTS:	

A.

IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS	STRESS ALLOWABLE	Ref. No.
Principal Stress	Yoke Legs	Operating + SRSS of SSE + SRV + AP/CHUG		13,058 psi	26,250 psi	8

B.

MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY	Ref. No.
0.0144"	Top of Actuator	0.02"	8

Qualification Summary of Equipment (Continued)

QID No. 361712

VIII. REFERENCES

1. "ASME Boiler and Pressure Vessel Code", American Society of Mechanical Engineers, 1974 Edition with Winter 1974 Addenda. Section III, Division 1, Subsections NC and Appendices.

2. U.S. Atomic Energy Commission Regulatory Guide No. 1.61, October 1973.

3. Response Spectra Plots. From Design Input Document No. 82045 DID 001.

4. WNP-2 Safety Related Mechanical Equipment List, SRM02. Dated 9/9/82, Section 5.4.

5. "Project Manual for WPPSS Equipment Seismic and Hydrodynamic Requalification", Cygna Energy Services, Rev. 0, dated 6/8/82. Including Design Criteria DC-1.

6. Velan Engineering Ltd. Seismic Report for 10" Bolted Bonnet Gate Valve Class 150 lb. No. SR-6213.

7. Velan Engineering Ltd. Assembly Drawings for 10" Bolted Bonnet Valves. Drawing Nos. P2-3311-N-11, Rev. I.

8. Cygna Energy Services Calculation No. 82044/26.01.F.

9. Cygna Energy Services Equipment qualification Walkdown Verification Forms for EPN's RCC-V-5, RCC-V-21, RCC-V-40, and RCIC-V-68, dated 7/13/82, 7/15/82 and 7/24/82.

10. Qualification Report for QID 221001, Limitorque Report No. 80058.

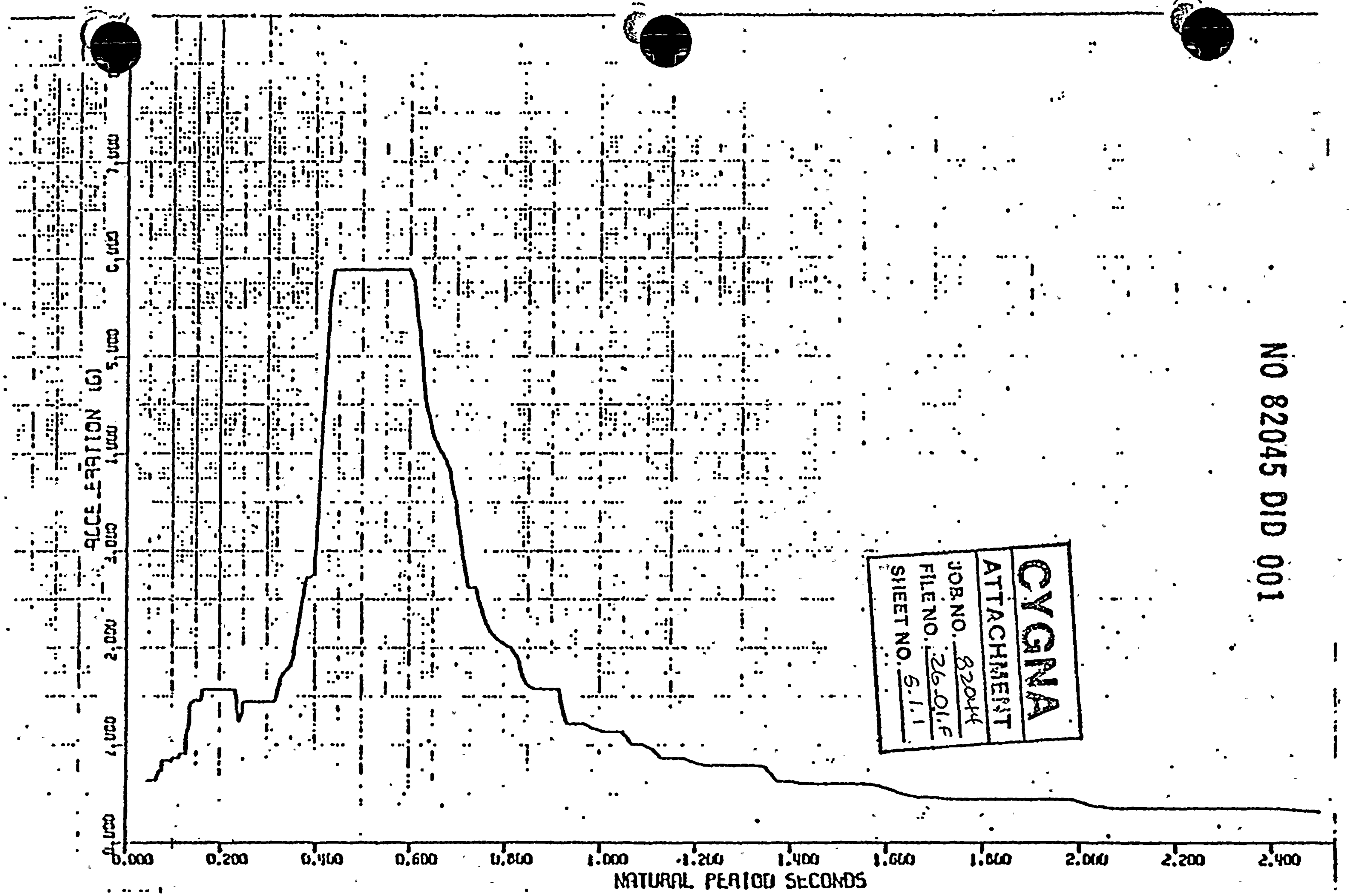
11. American Institute of Steel Construction, "Manual of Steel Construction", 8th Edition, AISC, New York, N.Y.

12. W.T. Thomson, "Mechanical Vibrations", 2nd Edition, Prentice-Hall, Inc., New Jersey.

13. Cygna Energy Services Project Memorandum, 82044/027SF, dated 9/9/82.

14. WPPSS WNP-2, FSAR Table 3-7.1

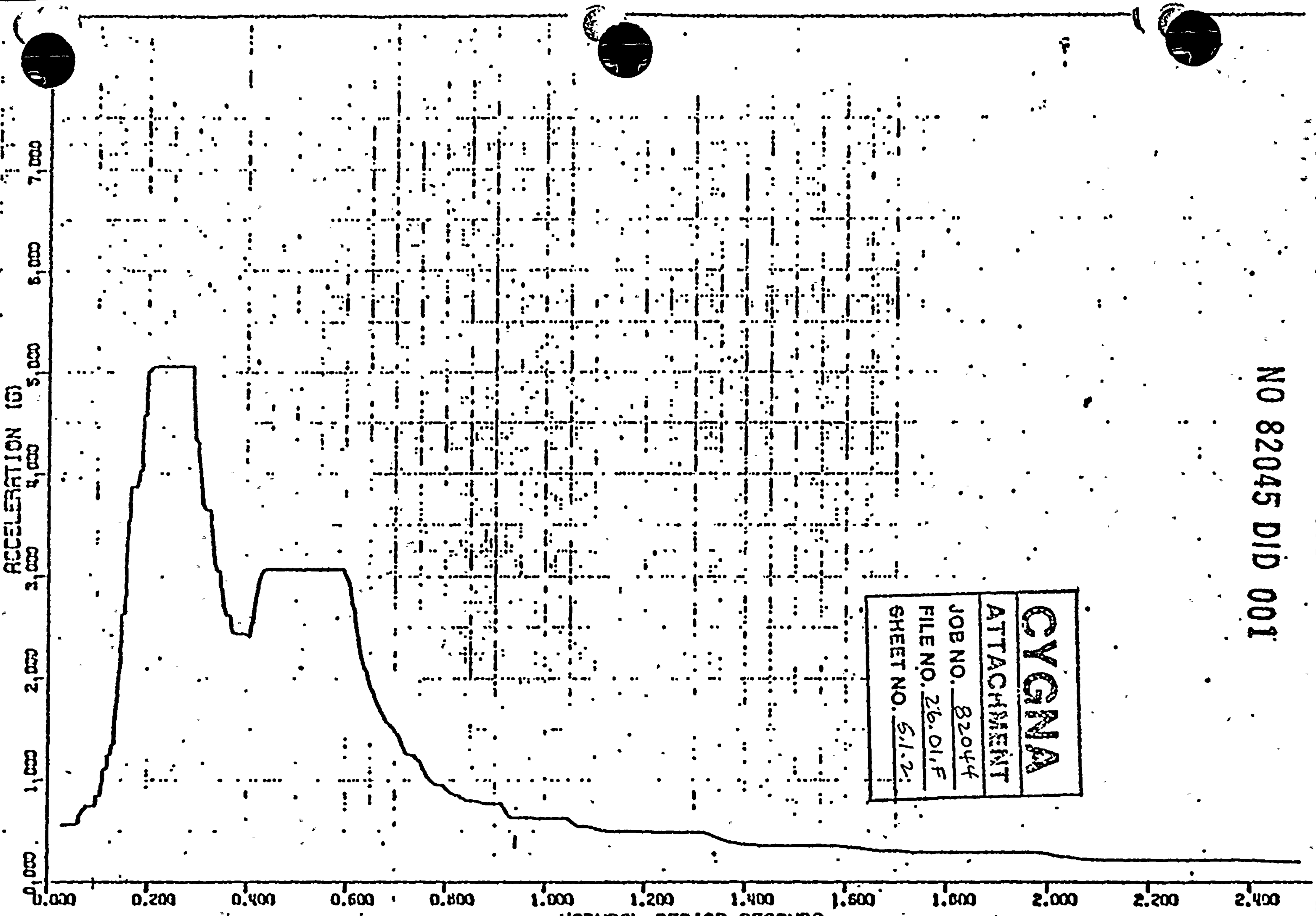
Completed By J M Foley	Date 10/13/82
Reviewed By S Capistrano	Date 10/13/82



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (DBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.5, EL. 521'-0", DAMPING=0.01

CYGNA
ATTACHMENT
JOB NO. 82044
FILE NO. 26.01.F
SHEET NO. 6.1.1

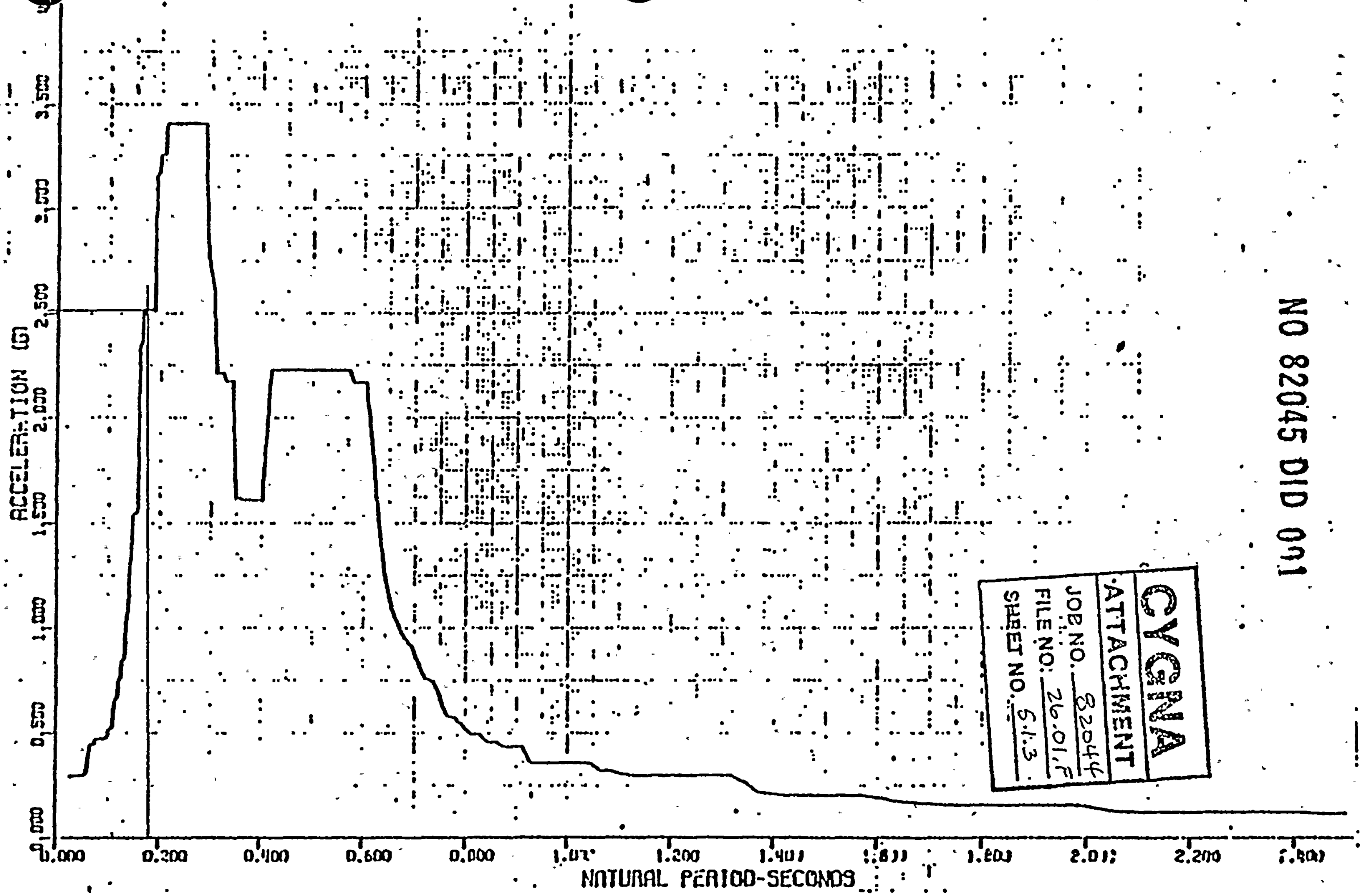
NO 82045 DID 001



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO.5, EL. 521'-0", DAMPING=0.01

CYGNA
ATTACHMENT
JOB NO. 82044
FILE NO. 26.01.F
SHEET NO. 51.2.

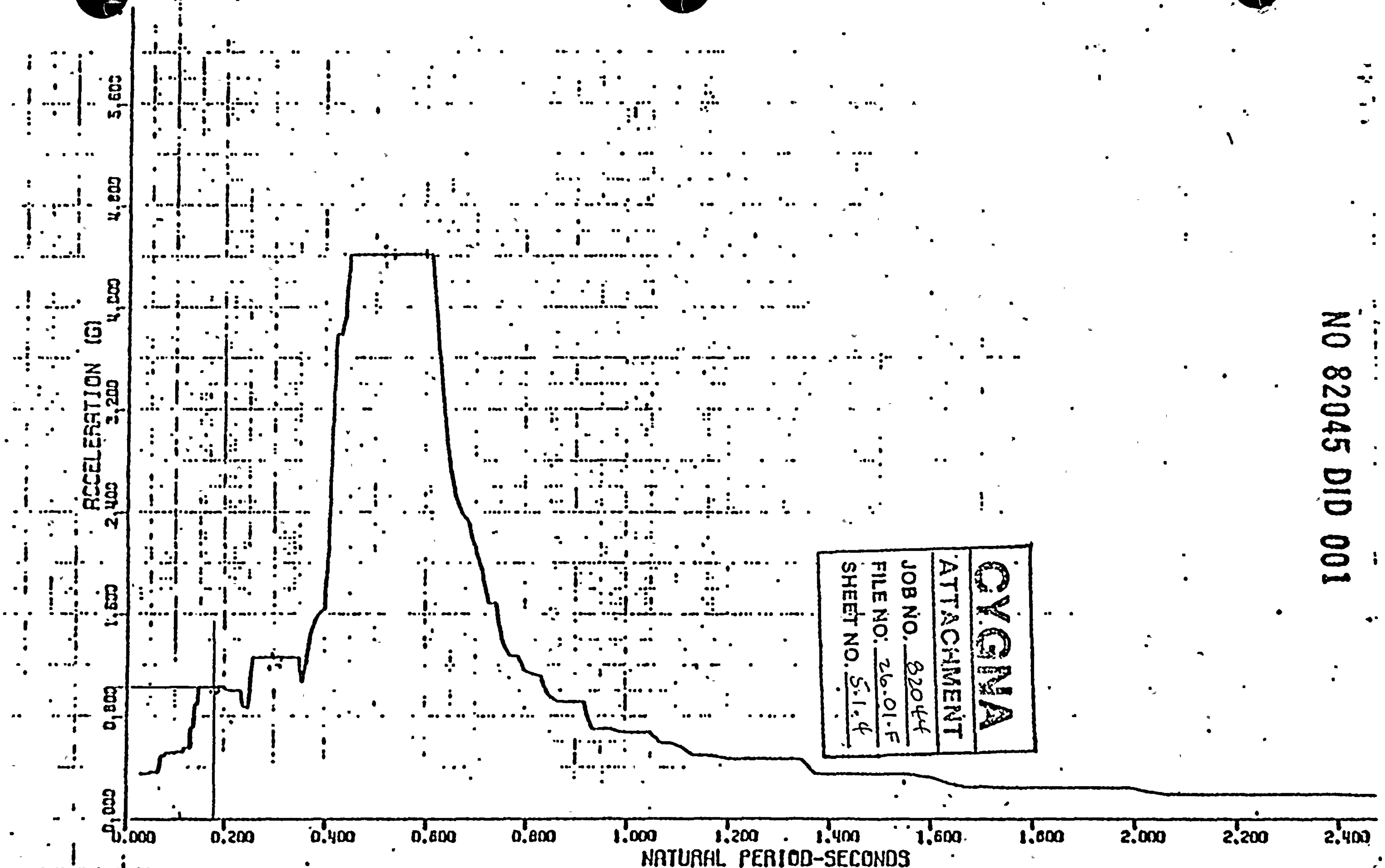
NO 82045 DID 001



HPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE/2 (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO.5, EL. 521'-0", DAMPING=0.005

CYGNA
ATTACHMENT
JOB NO. 82044
FILE NO. 26.01.F
SHEET NO. 6.1.3

NO 82045 DID 001



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE/2 (OBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.5, EL. 521'-0", DAMPING=0.005

CYGNA
ATTACHMENT
JOB NO. 82044
FILE NO. 26.01.F
SHEET NO. 5.1.4

NO 82045 DID 001

BOP-7

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 TYPE:

1. UTILITY: WPPSS PWR ______

2. NSSS: GE 3. A/E: B&R BWR ✓

II. COMPONENT NAME: 75 KVA TRANSFORMER (DRY TYPE) COMPONENT NO: E-TR-7A, -8A

1. SCOPE: ☐ NSSS ☑ BOP

2. MODEL NUMBER: 126386 QUANTITY: 2

3. VENDOR: SORGEL ELECTRIC (SUBSIDIARY OF SQUARE D)

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

N/A

5. PHYSICAL DESCRIPTION: a. APPEARANCE: SOLID BOX-TYPE

b. DIMENSIONS: 36"W x 24"D x 42"H (APPROX.)

c. WEIGHT: ≃ 900 LB

6. LOCATION: BUILDING: RADWASTE

ELEVATION: 467 FT.

7. FIELD MOUNTING CONDITIONS: ☑ BOLT (NO. 4, SIZE 1/2")

☐ WELD (LENGTH ______)

☐ ______

8. a. SYSTEM IN WHICH LOCATED: ELECTRICAL

b. FUNCTIONAL DESCRIPTION: SUPPLY POWER TO PANELS E-PP-7A AND -8A

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN

☑ BOTH ☐ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-218

IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☑ YES ☐ NO

REV	BY	DATE	CHECKED	DATE	eds nuclear	JOB NO 0740-012 / CALC NO 349008-S
Ø	DAG	10/20/82	DG	10/21/82		

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

[✓] TEST [ ] ANALYSIS [ ] COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: "SEISMIC SIMULATION TEST PROGRAM ON 8 TRANSFORMERS",

(NO., TITLE & DATE): WYLE LAB REPORT # 43205-1, DATED 4/21/76

COMPANY THAT PREPARED REPORT: WYLE LAB

COMPANY THAT REVIEWED REPORT: EDS

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): RADWASTE BLDG., EL. 466'-0" (SEE ATTACHMENT I)

4. DAMPING CORRESPONDING TO RRS: [ ] OBE ____ [X] SSE 2 %

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:

N/A

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

REV	BY	DATE	CHECKED	DATE		
					edis nuclear	JOB NO 0740-012
0	DKC	10/20/82	DG	10/21/82		CALC NO 3490 08-5

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. [ ] SINGLE FREQUENCY [X] MULTI-FREQUENCY [X] RANDOM

2. [ ] SINGLE AXIS [X] MULTI-AXIS [ ] SINE BEAT [X] ½·2g SINE SWEEP

3. NO. OF QUALIFICATION TESTS: OBE 5 SS/V AND 5 FB/V SSE 1 SS/V AND 1 FB/V OTHER (SPECIFY) ______

4. FREQUENCY RANGE: 1 - 31.5 Hz.

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = 9.7 Hz. (AVERAGE) F/B = 10.5 Hz V = 9.8, 12.2, 14.2, 23.4, 22.1, 33.5 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) (SEE ATTACHMENT II) [ ] NO

8. INPUT g-LEVEL TEST: OBE S/S = ______ F/B = ______ V = ______

SSE S/S = ______ F/B = ______ V = ______

9. LABORATORY MOUNTING:

1. [X] BOLT (NO. 4 , SIZE 1/2"-13) [ ] WELD (LENGTH ______) [ ] ______

10. FUNCTIONAL OPERABILITY VERIFIED: [✓] YES [ ] NO [ ] NOT APPLICABLE

11. TEST RESULTS INCLUDING MODIFICATIONS MADE:

TEST RESULTS INDICATE TRANSFORMER IS SEISMICALLY QUALIFIED.

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:

REV	BY	DATE	CHECKED	DATE		
1A	DAC	10/20/82	DG	10/21/82	eds nuclear	JOB NO 076-012 CALC NO 3490 08-5

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IF QUALIFICATION BY ANALYSIS, THEM 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. CRITCAL STRUCTURAL ELEMENTS:

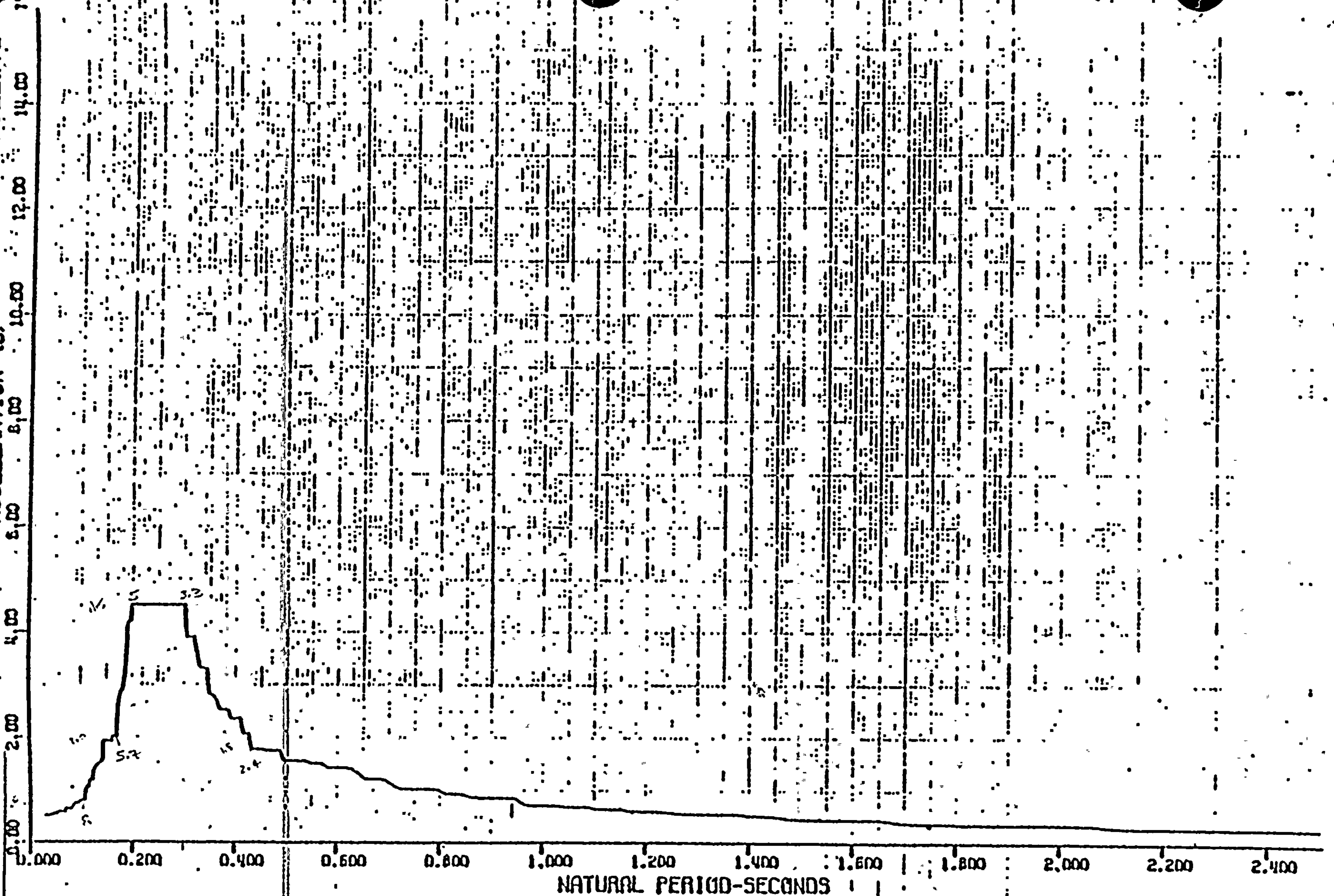
A. IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS	STRESS ALLOWABLE

B. MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY

REV	BY	DATE	CHECKED	DATE		
0	DAC	10/20/82	DG	10/21/82	eds nuclear	JOB NO 0240-012 CALC NO 3490 08-5

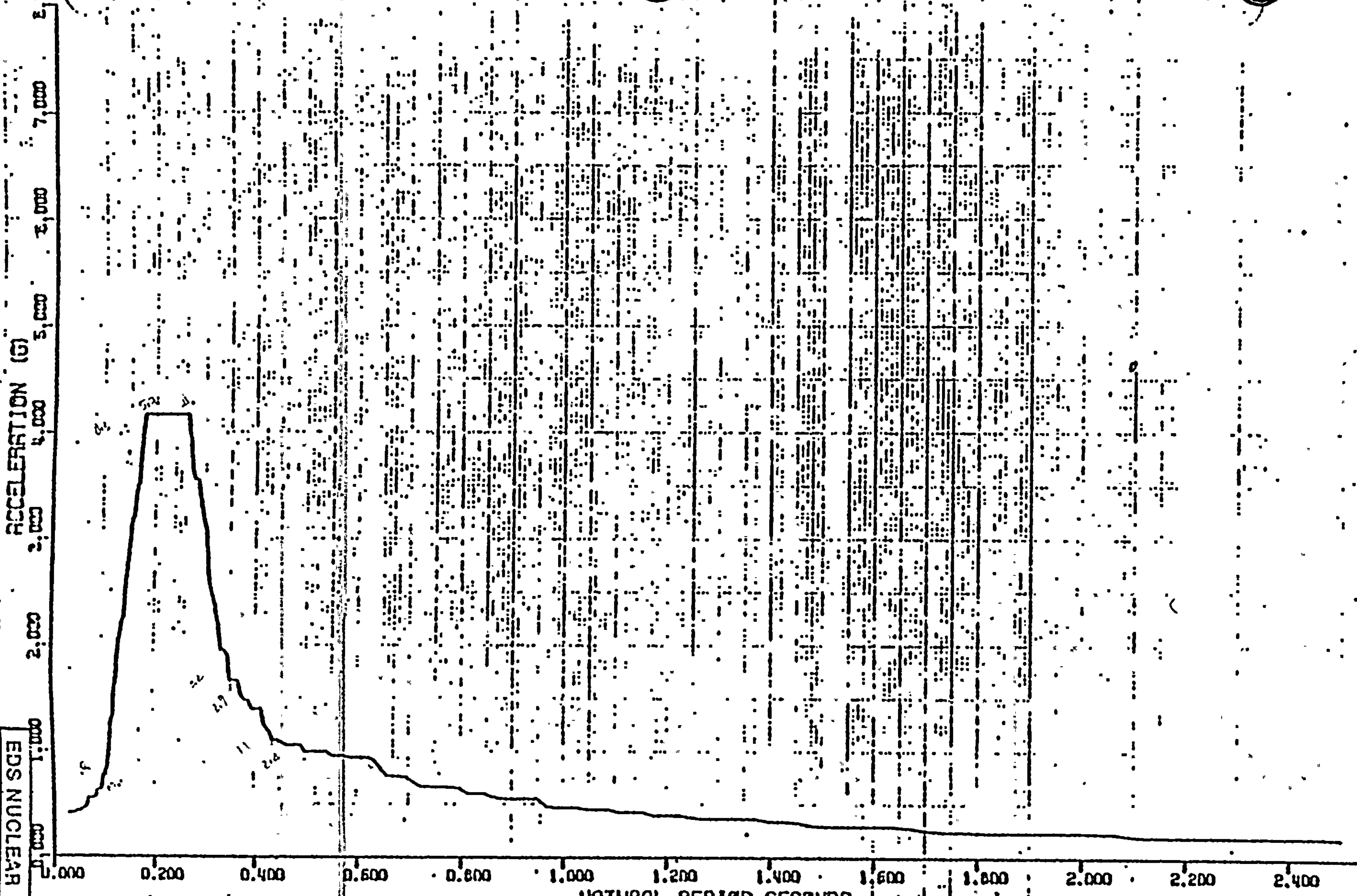
3490 08

ATTACHMENT I
REQUIRED RESPONSE SPECTRA



WPPSS, HANFORD NO.2, RADWASTE BUILDING, REV. 1
SSE (OBE) FLOOR SPECTRUM - HORIZONTAL
MASS 7, EL. 466' - 0", DAMPING=0.020

EDS NUCLEAR	
JOB No. 0740-017	
CALC. No. 3490 08-S	
BY PAK	DATE 10/20/82
CHK DG	DATE 10/21/82



WPPSS, HANFORD NO.2, RADWASTE BUILDING, REV. 1
SSE (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS 7, EL. 466' - 0", DAMPING=0.020

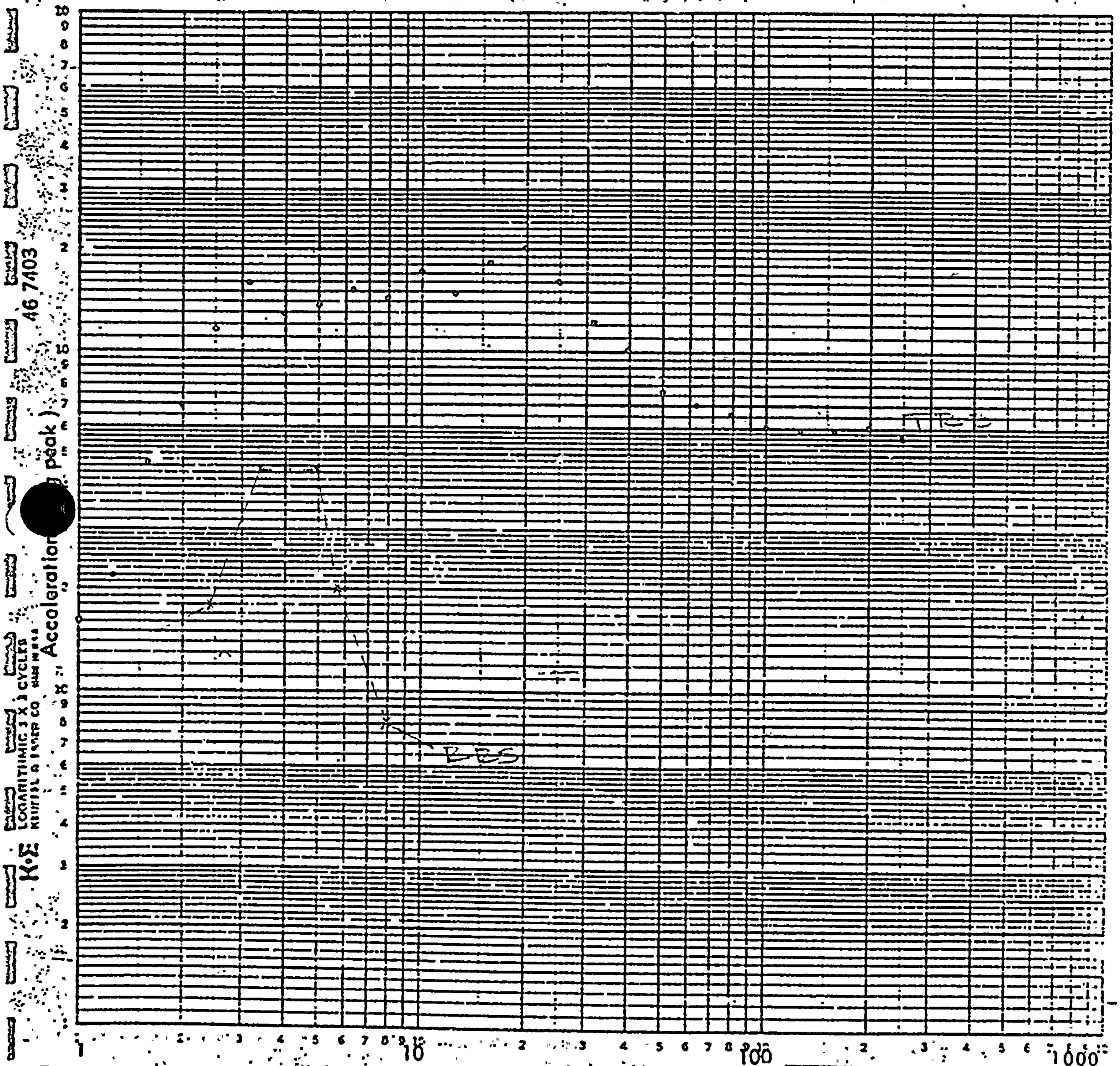
EDS NUCLEAR	
JOB No. 036-012	
CALC. No. 3490 08-S	
BY PAG	DATE 10/20/82
CHK DG	DATE 10/21/82

7-11/12

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐

DAMPING 2%



HMENT =: TRS vs. RRS

--- RRS, SSE (HORIZONTAL)
RADWASTE BLDG.
EL. 466'-0"

SPECIMEN # 8

AXIS F-B & V (S-S) (PAG)

LOCATION NO. 32 E-8

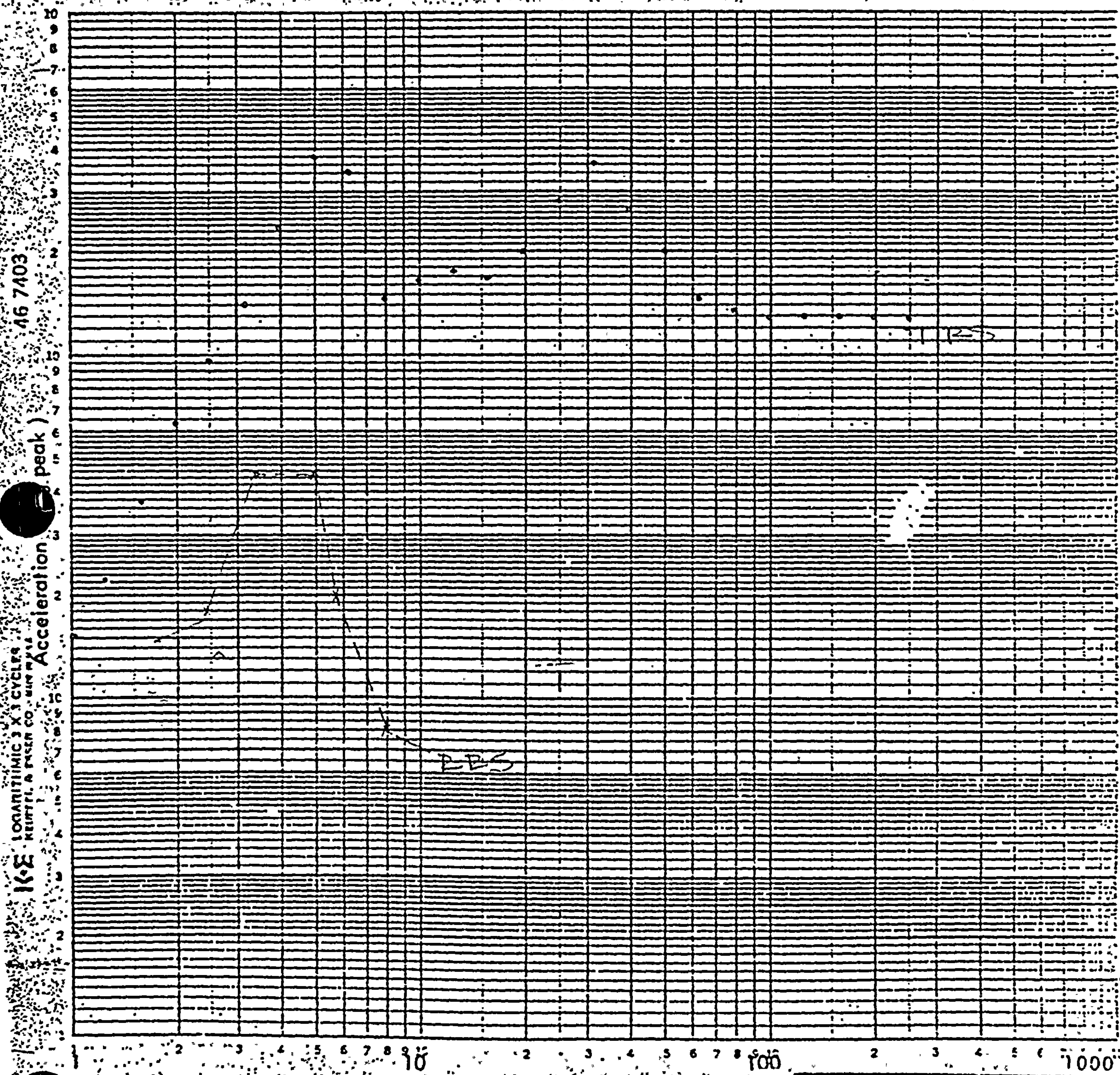
TEST RUN NO. 18

EDS NUCLEAR	
JOB No. 0740-012	
CALC. No. 3490 08-5	
BY PAG	DATE 10/20/82
CHK DG	DATE 10/21/82

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐

DAMPING $\boxed{2\%}$



RRS, SSE HORIZONTAL
RADWASTE BLDG.
EL. 466'-0"

AXIS SS&V

LOCATION NO. 30FB

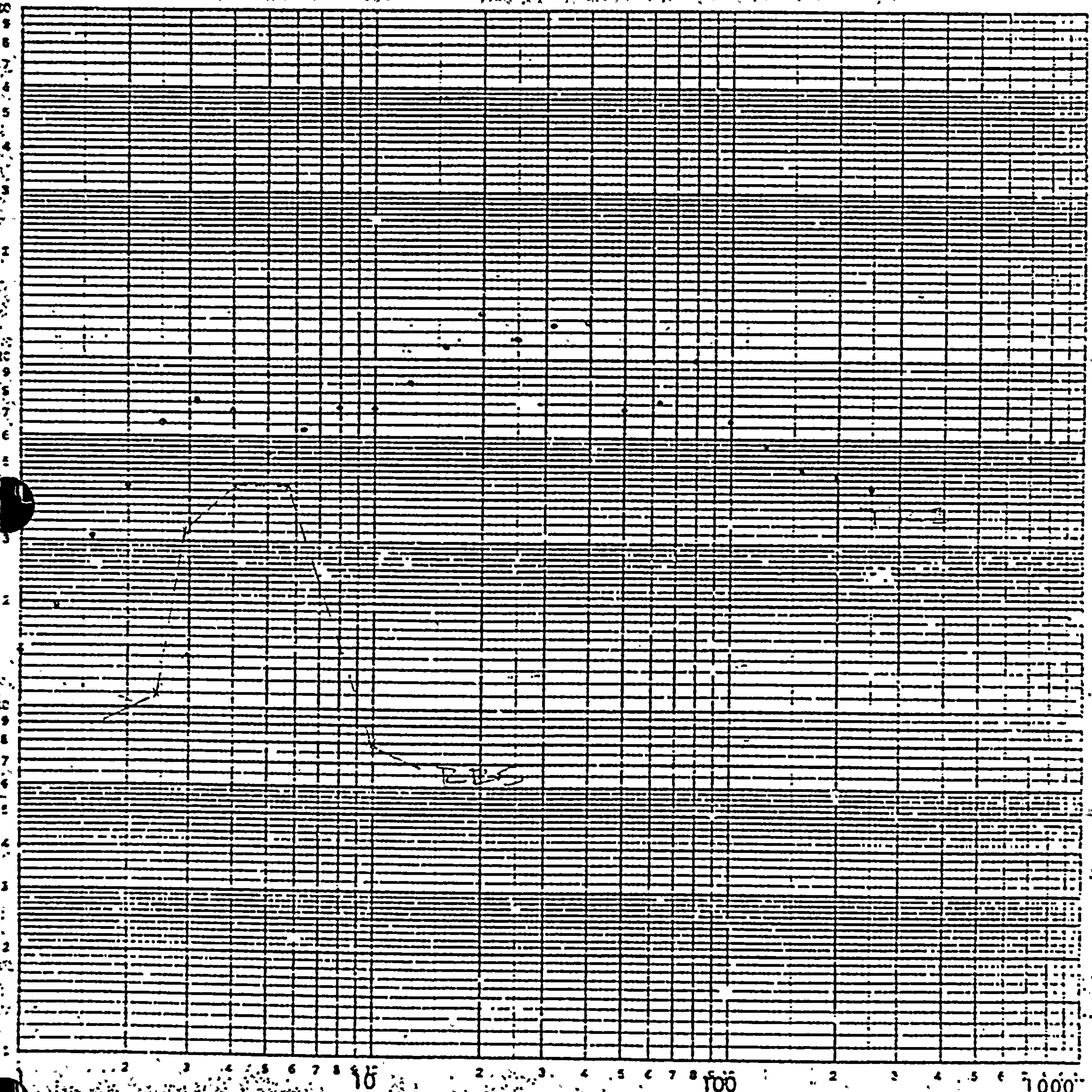
TEST RUN NO. 25

EDS NUCLEAR	
JOB No. 0740-012	
CALC. No. 34901 11-5	
BY DAG	DATE 10/20/82
CHK DG	DATE 10/21/82

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐

DAMPING 2%



--- RRS, SSE
COMBINED VERTICAL
RADWASTE BLDG.
EL. 466'-0"

AXIS E-B&V

LOCATION NO. 31V

TEST RUN NO. 18

EDS NUCLEAR	
JOB No. 0740-012	
CALC. No. 349008-S	
BY PHG	DATE 10/20/82
CHK DG	DATE 10/21/82

p. 14/14

8312-8

OID 233017
Rev. 1 8/3/82

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2

TYPE:

1. UTILITY: WPPSS

PWR

2. NSSS: GE

3. A/E: Burns & Roe

BWR 5, Mark II

II. COMPONENT NAME: Standby Service Water Pump

COMPONENT NO: SW-P-1A & 1B

1. SCOPE: ☐ NSSS ☒ BOP

2. MODEL NUMBER: 28 KXH/28 IN KXH - 3 Stage

QUANTITY: 2

3. VENDOR: Byron Jackson Pumps, Inc.

4. IF THE COMPONENT IS A CABINET OR PANEL NAME AND MODEL NO. OF THE DEVICES INCLUDED:

N/A

5. PHYSICAL DESCRIPTION: a. APPEARANCE: Pump

b. DIMENSIONS: 28" Ø x 45' .6" (Approx.) DWG 2C-5173

c. WEIGHT: 34,100 lbs. (Wet)

6. LOCATION: BUILDING: Standby Service Water Pump House 1A & 1B

ELEVATION: 441' .0" DWG 2C-5173

7. FIELD MOUNTING CONDITIONS: ☒ BOLT (NO. 12, SIZE 1½")

☐ WELD (LENGTH ______)

☐ ______

8. a. SYSTEM IN WHICH LOCATED: Standby Service Water System

b. FUNCTIONAL DESCRIPTION: Supply Coolant Water to Plant Auxiliaries/C,D,E,F,J as per WPPSS SRM Listing, 6/22/82.

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN

☒ BOTH ☐ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: WPPSS 2808-23, Standby Service Water Pumps for Hanford No. 2, Sept. 8, 1972.

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES ☐ NO

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

☐ TEST ☒ ANALYSIS ☐ COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: Design Report of Standby Service Water Pump, Hanford 2

(NO., TITLE & DATE): (1) TCF-1002-DES, Rev. A, Aug. 8, 1975 (2) Requalification Report 82044 No. OL.01/F, July 28, 1982

COMPANY THAT PREPARED REPORT: (1) Byron Jackson Pump Division/Borg Warner Corp.

COMPANY THAT REVIEWED REPORT: (2) Cygna Energy Services

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): See Attachments

4. DAMPING CORRESPONDING TO RRS: ☒ OBE 2% ☒ SSE 2%

5. REQUIRED ACCELERATION IN EACH DIRECTION: ☐ ZPA ☒ OTHER (SPECIFY) fh = 14.32 Hz fv = 49.15 Hz

	S/S =	F/B =	V =	
OBE	0.40	0.30	0.32	See Response Spectra attachments.
SSE	0.80	0.60	0.64	
	E-W	N-S		

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:

For Class 3 components the allowable stress limits in the ASME Code Section III, are frequency independent. There are no hydrodynamic loads and the total fatigue cycles for seismic loading are far less than 20,000 cycles which will not have effect on the allowable stress limits used for AISC components per Appendix B of AISC manual.

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*: NA

1. ☐ SINGLE FREQUENCY ☐ MULTI-FREQUENCY ☐ RANDOM

2. ☐ SINGLE AXIS ☐ MULTI-AXIS ☐ SINE BEAT ☐ ________

3. NO. OF QUALIFICATION TESTS: OBE ________ SSE ________ OTHER (SPECIFY) ________

4. FREQUENCY RANGE: ________

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = ________ F/B = ________ V = ________

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.

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VII. IF QUALIFICATION BY ANALYSIS, THEM COMPLETE:

1. METHOD OF ANALYSIS:

[ ] STATIC ANALYSIS [ ] EQUIVALENT STATIC ANALYSIS

[X] DYNAMIC ANALYSIS [ ] TIME-HISTORY [X] RESPONSE SPECTRUM

2. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = 14.32 Hz F/B = 14.32 Hz V = 49.15 Hz

3. MODEL TYPE:

[X] 3D [ ] 2D [ ] 1D [ ] FINITE ELEMENT [X] BEAM [ ] CLOSED FORM SOLUTION

4. [X] COMPUTER CODES: SAP IV

FREQUENCY RANGE AND NO. OF MODES CONSIDERED: First ten modes

[ ] HAND CALCULATIONS

5. METHOD OF COMBINING DYNAMIC RESPONSES: [ ] ABSOLUTE SUM [X] SRSS [ ] OTHER (SPECIFY) ______

6. DAMPING: OBE ______ SSE 2% BASIS FOR THE DAMPING USED: Reg. Guide 1.61

7. SUPPORT CONSIDERATIONS IN THE MODEL: Bolted to floor - 12 1-1/2" Ø bolts

8. CRITCAL STRUCTURAL ELEMENTS:

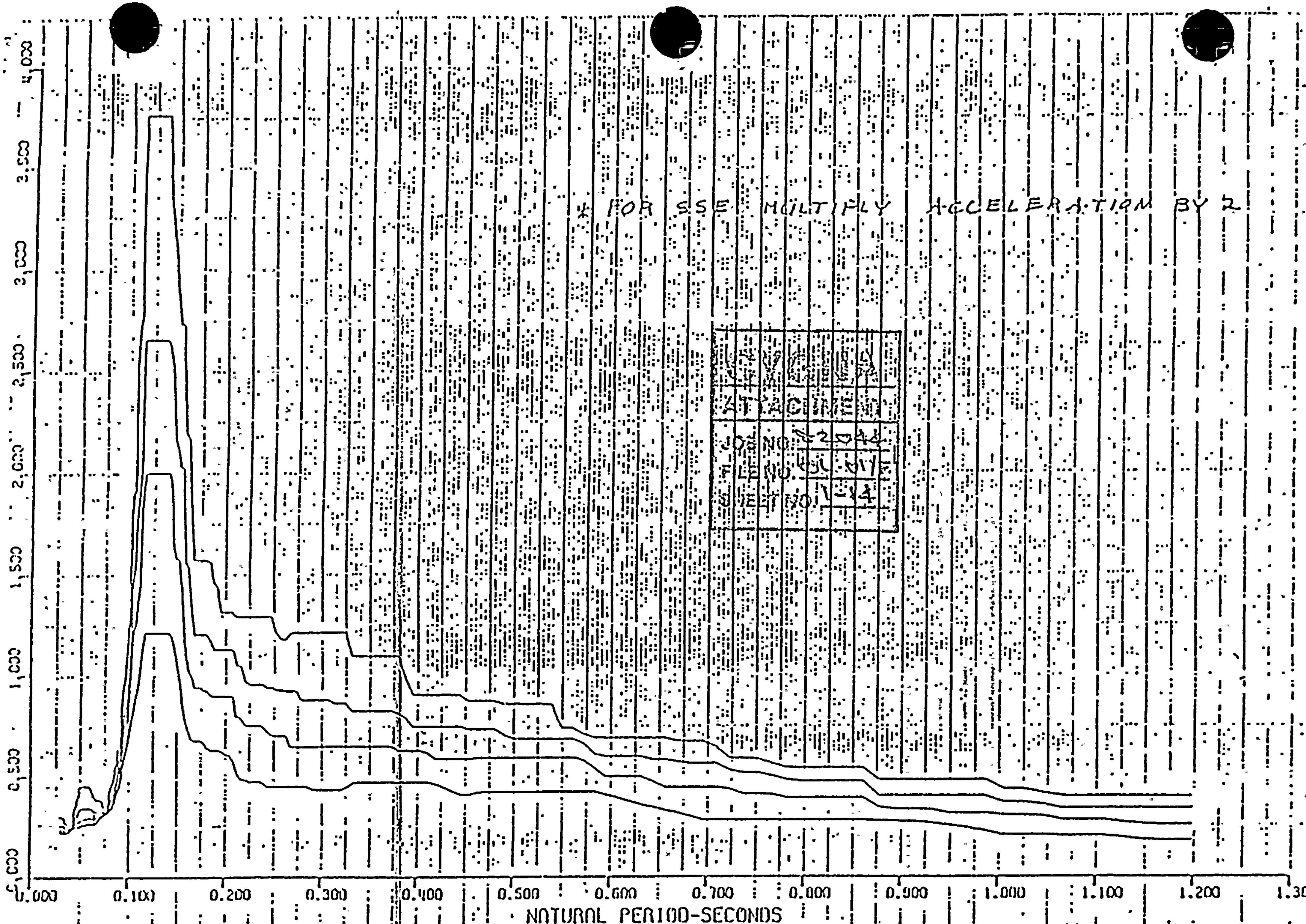
A.

IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS	STRESS ALLOWABLE
	Pump Shaft	SSE + Operating Loads		21,142	21,600

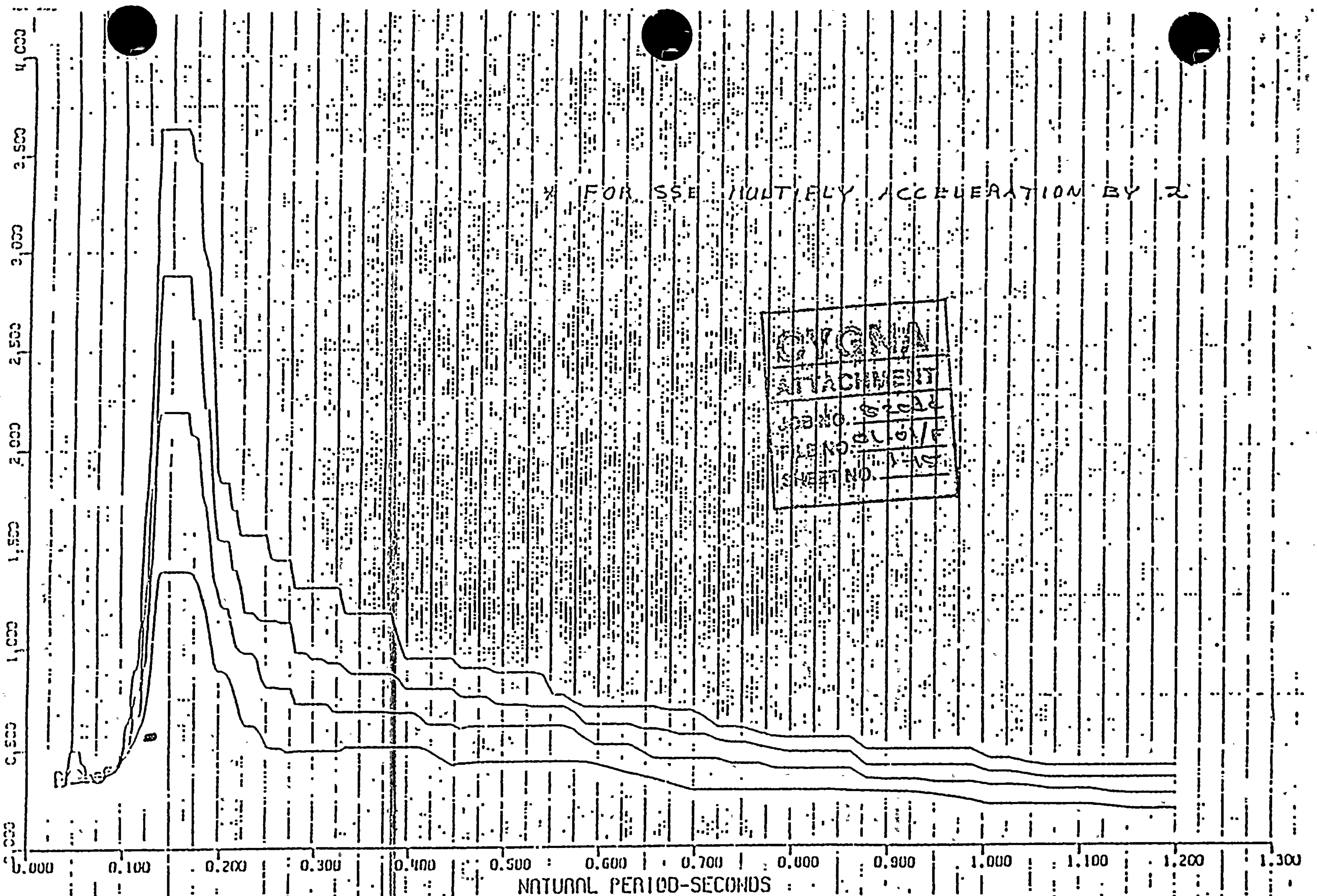
B.

MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY
0.0084"	Impeller Shaft	0.020"

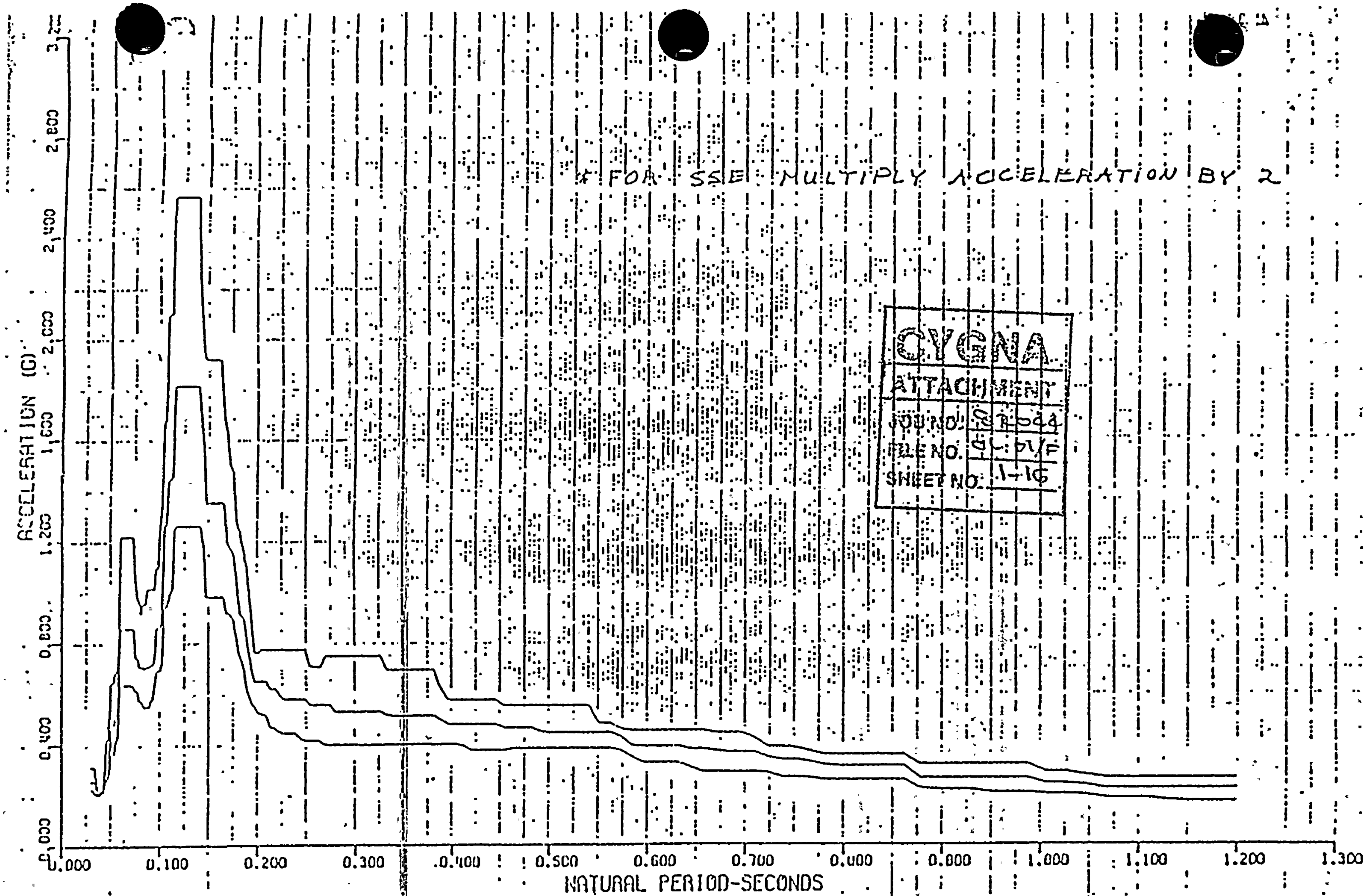
COMPLETED BY	[signature]	DATE 7/16/82
REVIEWED BY	Hal Reese	DATE 7-28-82



HPPSS PUMPHOUSE MODEL NO.2 REV.1 N-S, MASS NO.2 EL. 440'-8"
* SSE/2 (OBE) FLOOR SPECTRUM HORIZONTAL DAMPING = 0.005,0.01,0.02,0.05
HIGHER RESPONSE CORRESPONDS TO LOWER DAMPING



WPPSS PUMPHOUSE MODEL NO.2 REV.1 E-W, MASS NO.2 EL. 440'-8"
* SSE/2 (OBE) FLOOR SPECTRUM HORIZONTAL DAMPING = 0.005,0.01,0.02,0.05
HIGHER RESPONSE CORRESPONDS TO LOWER DAMPING



WPPSS PUMPHOUSE MODEL NO.2 REV.1 MASS NO.2 EL. 440'-8"

*(SSE/2) OBE FLOOR SPECTRUM COMBINED VERTICAL DAMPING = 0.005,0.01,0.02

HIGHER RESPONSE CORRESPONDS TO LOWER DAMPING

BOP-9

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 — TYPE:

1. UTILITY: WPPSS — PWR

2. NSSS: G.E — 3. A/E: B&R. — BWR X

II. COMPONENT NAME: RELAYS — COMPONENT NO: See pp 7 & 8.

1. SCOPE: ☐ NSSS ☒ BOP

2. MODEL NUMBER: RK-223 (SEE REF. 5) — QUANTITY: 41

3. VENDOR: ASEA ELECTRIC INC.

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

N/A

5. PHYSICAL DESCRIPTION: a. APPEARANCE: RECTANGULAR BOX

b. DIMENSIONS: 3" x 3 1/2" x 1" (APPROX.)

c. WEIGHT: 1 1/2 LBS.

6. LOCATION: BUILDING: REACTOR AND RADWASTE

ELEVATION: 522 TO 528 (REACTOR BLDG.) & 501 TO 505 (RADWASTE)

7. FIELD MOUNTING CONDITIONS: ☒ BOLT (NO. 4, SIZE #8)

☐ WELD (LENGTH ______)

☒ STANDARD (FM. WALKDOWN SHTS)

8. a. SYSTEM IN WHICH LOCATED: MAIN STEAM LEAKAGE CONTROL (MSLC), ELECTRICAL (E)

b. FUNCTIONAL DESCRIPTION: CONTROL- SWITCHING

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN ☐ BOTH ☒ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-58 (FOR MSLC RELAYS), 2808-218 (FOR "E" RELAYS)

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES ☐ NO

REV	BY	DATE	CHECKED	DATE		
0	DG	10/15/82	KRB	10/25/82	eds nuclear	JOB NO 0740-012; CALC NO 293015-S

LISTING OF EPN'S WITH MODEL # RK-223XXX-XX
VARIES

RELAY EPN S.	ELEV. (FT.)	RACK	BLDG
MSLC-RLY-CR/1	526	E-IR-74	REACTOR
-CR/3	526		
-CR/4	522		
-CR/10	527	E-IR-73	
-CR/11	527		
-CR/12	527		
-CR/13	527		
-CR/1A	528		
-CR/1B	528		
-CR/1C	527		
-CR/1D	527		
-CR/5A1	528		
-CR/5C1	527		
-CR/5D1	527		
-CR/6A1	528		
-CR/6B1	528		
-CR/6C1	527		
-CR/6D1	527		
-CR/8	528		
-CR/9	528		
E-RLY-CR10AX	505	E-CP-RC/2	RADWASTE
-CR11AX	504	-RC/1	
-CR 1AX	505	-RC/1	
-CR1BX	501	-RC/2	
-CR2AX	505	-RC/1	
-CR 2BX	501	-RC/2	
-CR 3AX	505	-RC/1	
-CR 4AX	505	-RC/1	
-CR 4BX	501	-RC/2	
-CR 5AX	505	-RC/1	
-CR 5BX	501	-RC/2	
-CR 7AX	504	-RC/1	
-CR 7BX	504	-RC/2	
~~CR 8AX~~			
-CR 8BX	504	-RC/2	
-CR 9AX	504	-RC/1	
-CR 9BX	504	-RC/2	

TRANSFERRED TO QTO FILE # 283011 BECAUSE THIS IS TYPE RK-225 NOT RK-223 AS VERIFIED BY WALKDOWN

					WPPSS/WNP-2
					SEISMIC QUALIFICATION
					eds nuclear — An Impell Corporation Company; JOB NO 6740-012; CALC NO 283015-S; PAGE 7 OF 22
0	DG	10/15/82	KRB	10/25/82	
REV	BY	DATE	CHECKED	DATE	

CONTINUED: (FOR EPN's WITH MODEL # RK-223 XXX_XX)

RELAY EPN's	ELEV. (FT.)	RACK	BLDG
E-RLY-CR3BX	504	E-CP-RC/2	RADWASTE
-CR11BX	501	-RC/2	"
-CR12AX	504	-RC/1	"
-CR12BX	504	-RC/2	"
MSLC-RLY-CR/5BL	527	E-IR-73	REACTOR

THIS WAS TRANSFERRED FROM QID # 283011 TO QID # 283015 BECAUSE THE INSTALLED MODEL # IS RK-223, AND NOT RK-225 AS VERIFIED BY WALKDOWN

TOTAL RELAYS = 41

					WPPSS / WNP-2
					SEISMIC QUALIFICATION
					JOB NO 0740-012
0	DG	10/15/82	KRB	10/25/82	eds nuclear — An Impell Corporation Company — CALC NO 283015-S — PAGE 9 OF 22
REV	BY	DATE	CHECKED	DATE	

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

EQUIPMENT QUALIFICATION METHOD:

[X] TEST   [ ] ANALYSIS   [ ] COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: SEISMIC TESTING OF 9 RELAYS, 10 SWITCHES, & 1 TIMER FOR FISCHBACH/LORD ELEC. CO.

(NO., TITLE & DATE): REPORT. NO. 58238 (10/26/77).

COMPANY THAT PREPARED REPORT: WYLE LABS.

COMPANY THAT REVIEWED REPORT: EDS NUCLEAR

V. VIBRATION INPUT:

1. LOADS CONSIDERED: a. [X] SEISMIC ONLY
   b. [ ] HYDRODYNAMIC ONLY
   c. [ ] COMBINATION OF (a) and (b)

N/A 2. METHOD OF COMBINING RRS: [ ] ABSOLUTE SUM [ ] SRSS [ ] OTHER (SPECIFY)

3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): SEE ATTACHED SHEETS

4. DAMPING CORRESPONDING TO RRS: [X] OBE 1% [X] SSE 2%

5. REQUIRED ACCELERATION IN EACH DIRECTION: [X] ZPA [ ] OTHER (SPECIFY)

	S/S =	F/B =	V =
OBE	0.30 * / 0.45 **	0.30 * / 0.45 **	0.20 * / 0.30 **
SSE	0.75 g * / 0.75 g **	0.75 g * / 0.75 g *	0.45 g * / 0.40 g **

NOTES:
* - EL. 506 FT - RADWASTE BLDG.
** - EL. 547 FT - REACTOR BLDG.
(SEE RRS ATTACHMENT, P. 12-15)

6. WERE FATIGUE EFFECTS OR OTHER VIBRATION LOADS CONSIDERED?

[ ] YES [X] NO

IF YES, DESCRIBE LOADS CONSIDERED AND HOW THEY WERE TREATED IN OVERALL QUALIFICATION PROGRAM:

N/A

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

REV	BY	DATE	CHECKED	DATE		
0	DG	1/15/82	KRB	10/25/82	eds nuclear	JOB NO 0740-012; CALC NO 283015-5

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. ☐ SINGLE FREQUENCY ☒ MULTI-FREQUENCY ☒ RANDOM
2. ☐ SINGLE AXIS ☒ MULTI-AXIS ☐ SINE BEAT ☐ ________

3. NO. OF QUALIFICATION TESTS: OBE 5-FB/V, 5-SS/V SSE 2-FB/V, 2-SS/V OTHER (SPECIFY) ________
4. FREQUENCY RANGE: 1.1 TO 100 HZ
5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

N/A S/S = ________ F/B = ________ V = ________

6. METHOD OF DETERMINING NATURAL FREQUENCIES:

N/A ☐ 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 = ≥2.9g ZPA F/B = ≥2.9g ZPA V = ≥1.1g ZPA
SSE S/S = ≥ 3.4g ZPA F/B = ≥3.4g ZPA V = ≥ 1.6g ZPA

9. LABORATORY MOUNTING:

1. ☐ BOLT (NO. ______, SIZE ______) ☐ WELD (LENGTH ______) ☒ STANDARD

10. FUNCTIONAL OPERABILITY VERIFIED: ☒ YES ☐ NO ☐ NOT APPLICABLE

11. TEST RESULTS INCLUDING MODIFICATIONS MADE:

THERE WAS NO CONTACT CHATTER OBSERVED IN ASEA - RELAYS TYPE "RY-MH2" (MODEL NO RK-223 XXX-XX) UNDER THE 5 OBE AND 2 DBE TESTS DONE IN THE FB/V AND SS/V DIRECTIONS. THERE WERE NO STRUCTURAL DAMAGE OR CHANGE IN PERFORMANCE OF THE TEST SPECIMENS DURING THE TESTING.

12. OTHER TEST PERFORMED (SUCH AS AGING OR FRAGILITY TEST, INCLUDING RESULTS):

THERE WERE EIGHT FRAGILITY TESTS DONE ON THE ASEA RELAYS — FOUR ON THE Z-Y AXIS, AND FOUR ON THE X-Y AXIS. OUT OF THE EIGHT TESTS IN TWO SAMPLE RELAYS — ONE "NORMALLY CLOSED (N.C.)" AND THE OTHER "NORMALLY OPEN (N.O.)" THERE WAS CONTACT CHATTER DETECTED IN THE 2nd AND 3RD TESTS ON THE X-Y AXIS FOR THE "N.C." AND IN THE 3RD TEST ON THE X-Y AXIS FOR THE "N.O." RELAY.

* NOTE: IF QUALIFICATION BY A COMBINATION OF TEST AND ANALYSIS, ALSO COMPLETE ITEM VII:

					eds nuclear	JOB NO 0740-012
0	DG	10/15/82	KRB	10/25/82		CALC NO 283015-S.
REV	BY	DATE	CHECKED	DATE		

I. IF QUALIFICATION BY ANALYSIS, THEM 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: ________

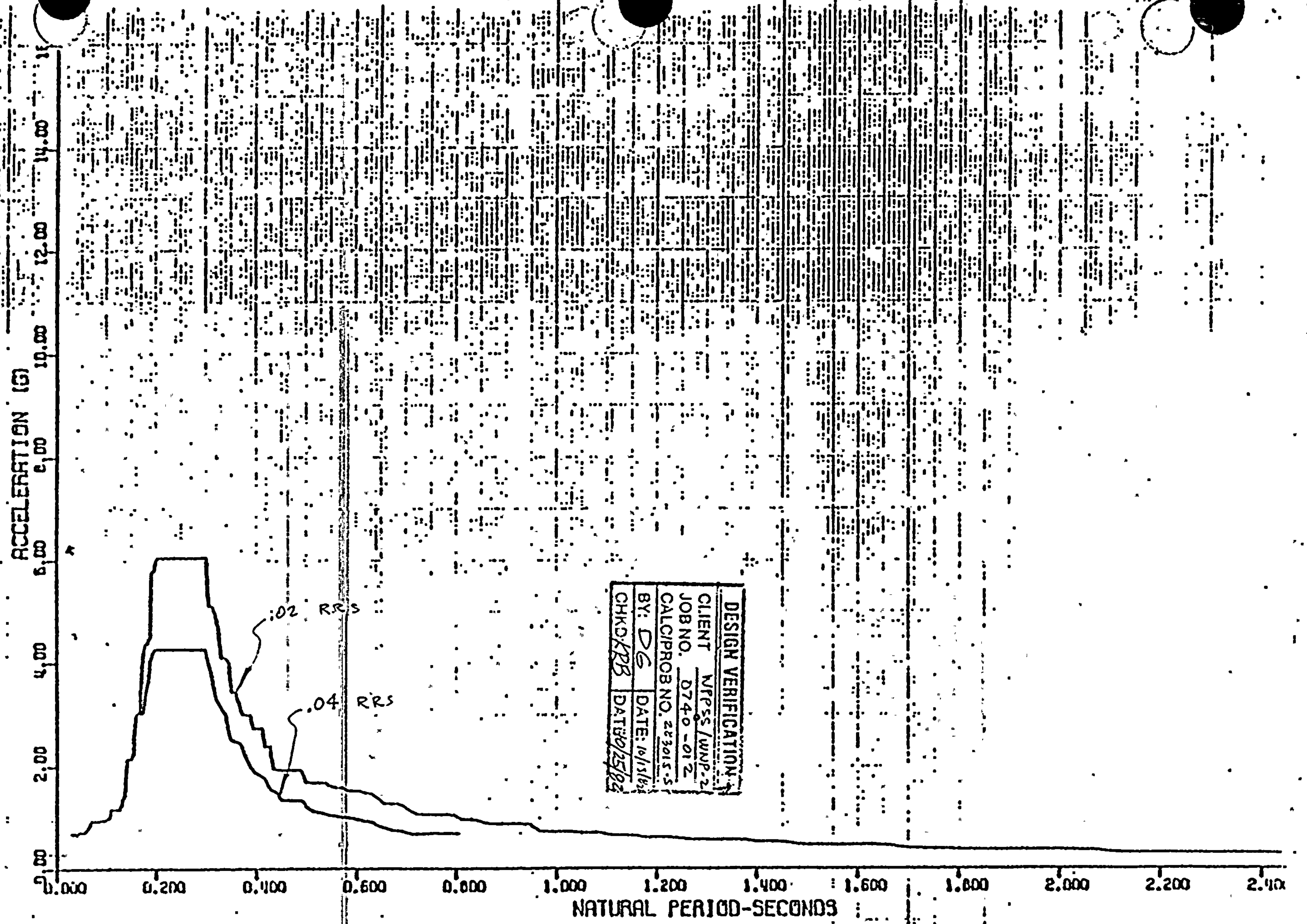
7. SUPPORT CONSIDERATIONS IN THE MODEL: ________

8. CRITCAL STRUCTURAL ELEMENTS:

A. IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS	STRESS ALLOWABLE

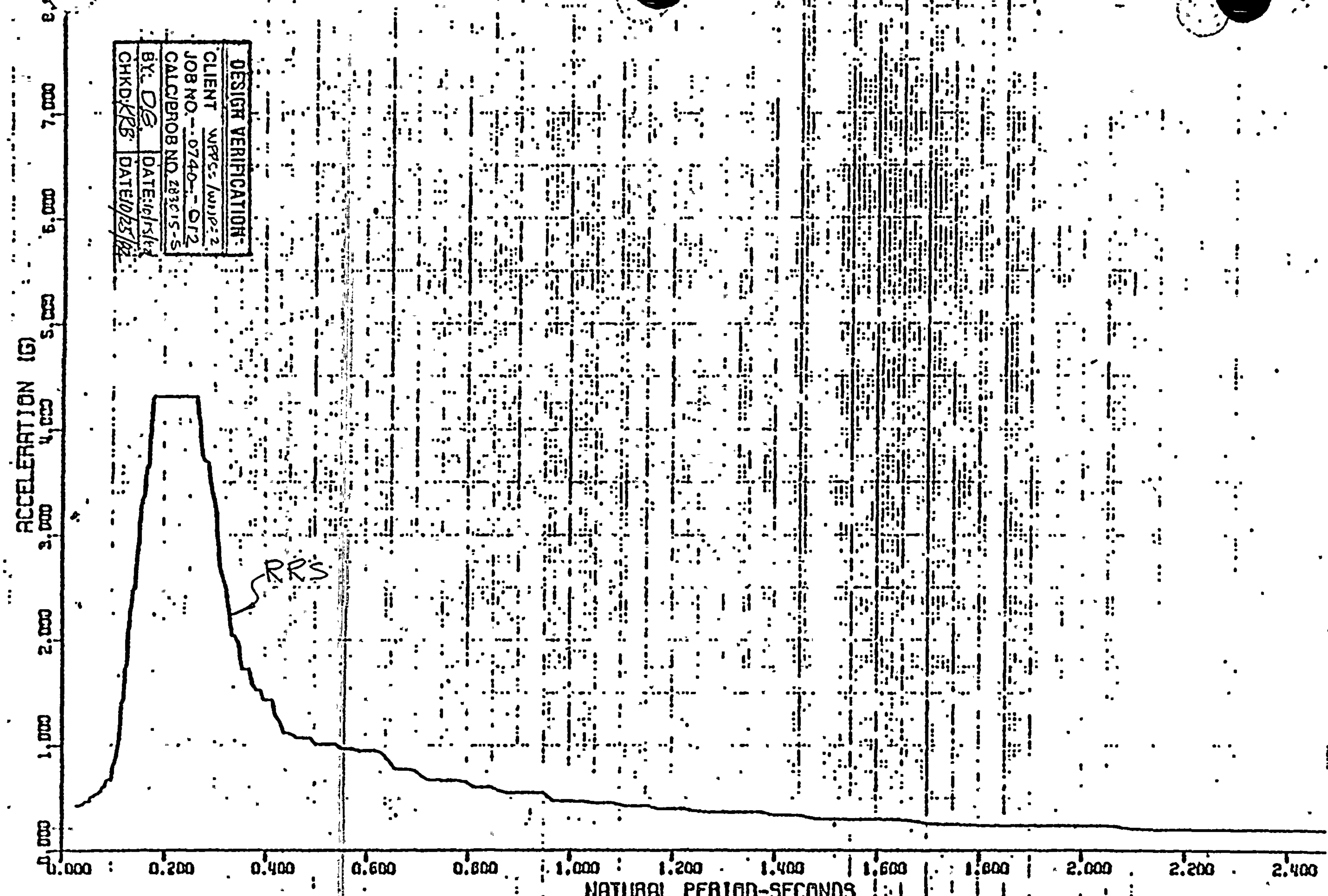
B. MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY

REV	BY	DATE	CHECKED	DATE		
0	DG	10/15/82	KRB	10/25/82	eds nuclear	JOB NO 6740-012 CALC NO 283015-S



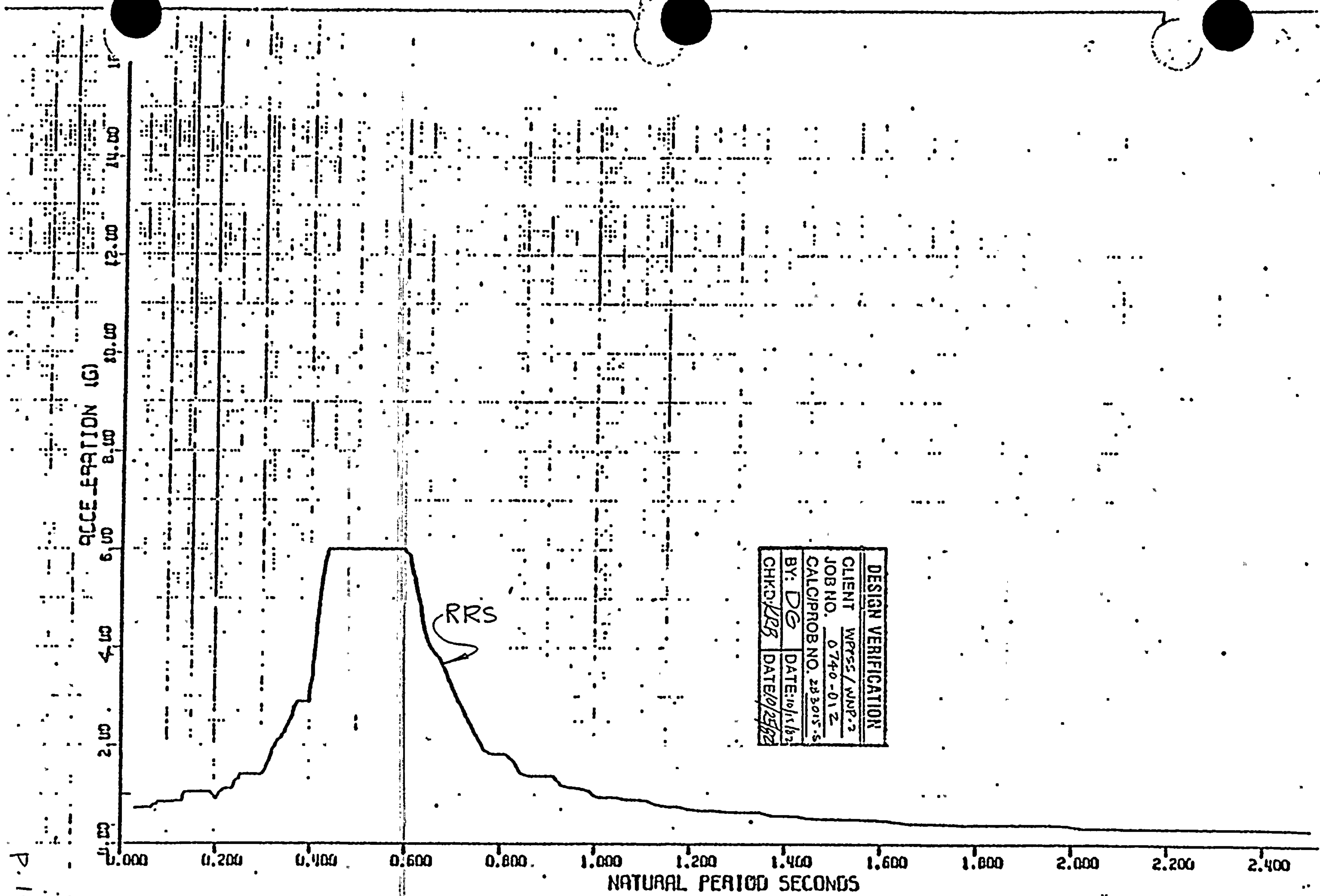
WPPSS, HANFORD NO.2, RADWASTE BUILDING, REV. 1
SSE (OBE) FLOOR SPECTRUM - HORIZONTAL
MASS 4, EL. 506' - 0", DAMPING=0.020/.040

P. 12/22



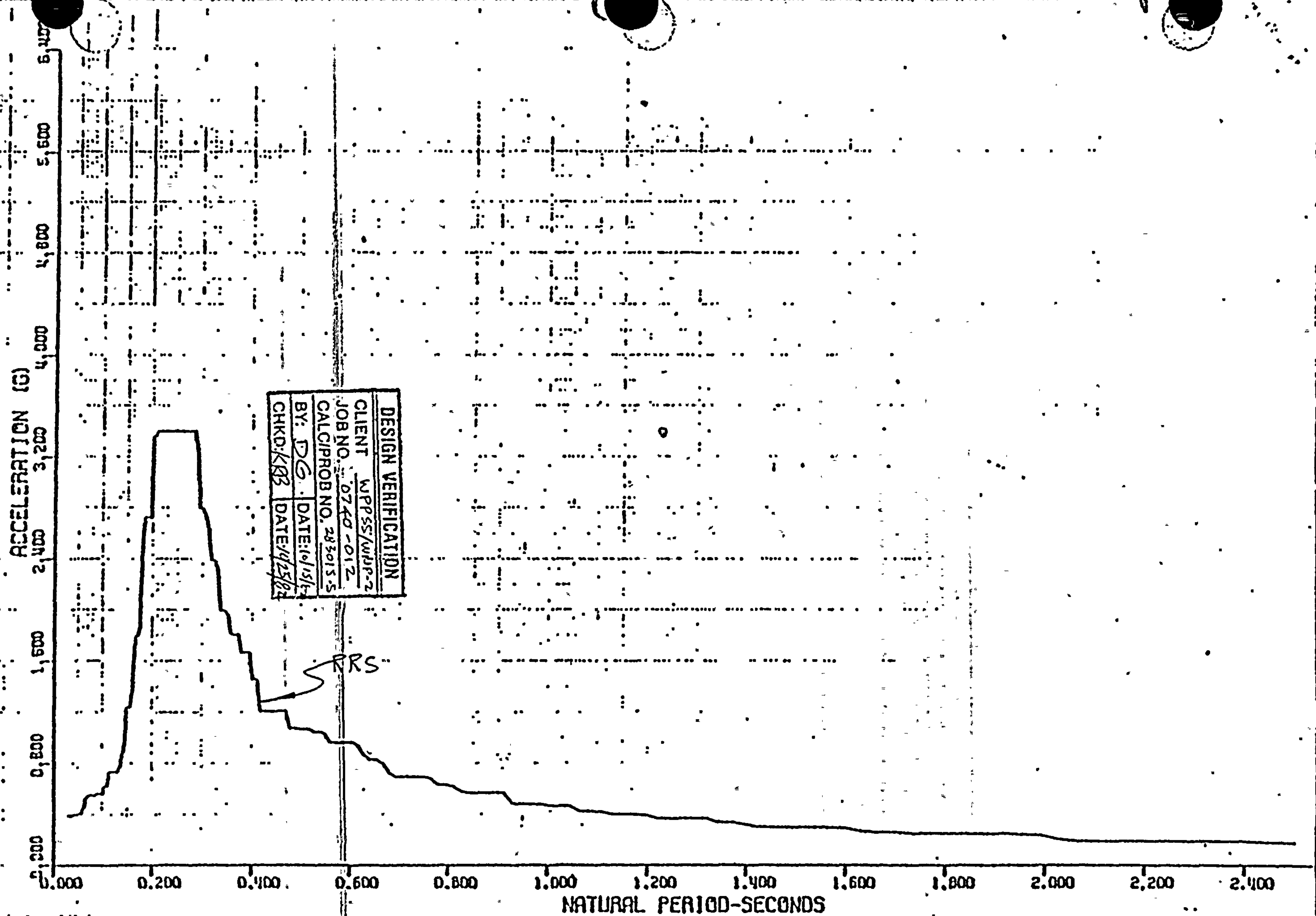
WPPSS, HANFORD NO.2, RADWASTE BUILDING, REV. 1
SSE (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS 4, EL. 506' - 0", DAMPING=0.020

P. 13/22



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (DBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.4, EL. 547'-0", DAMPING=0.02

P. 14/22



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (OBE) FLOOR SPECTRUM - VERTICAL
MASS NO.4, EL. 547'-0", DAMPING=0.02

P. 15/22

2-83015

WYLE LABORATORIES

Report No. 58238

CUSTOMER Fischback/Lord Job No. 58238 Page No. 30

Full Scale 100 g Accel. No. 1 Control (x) Response ( )

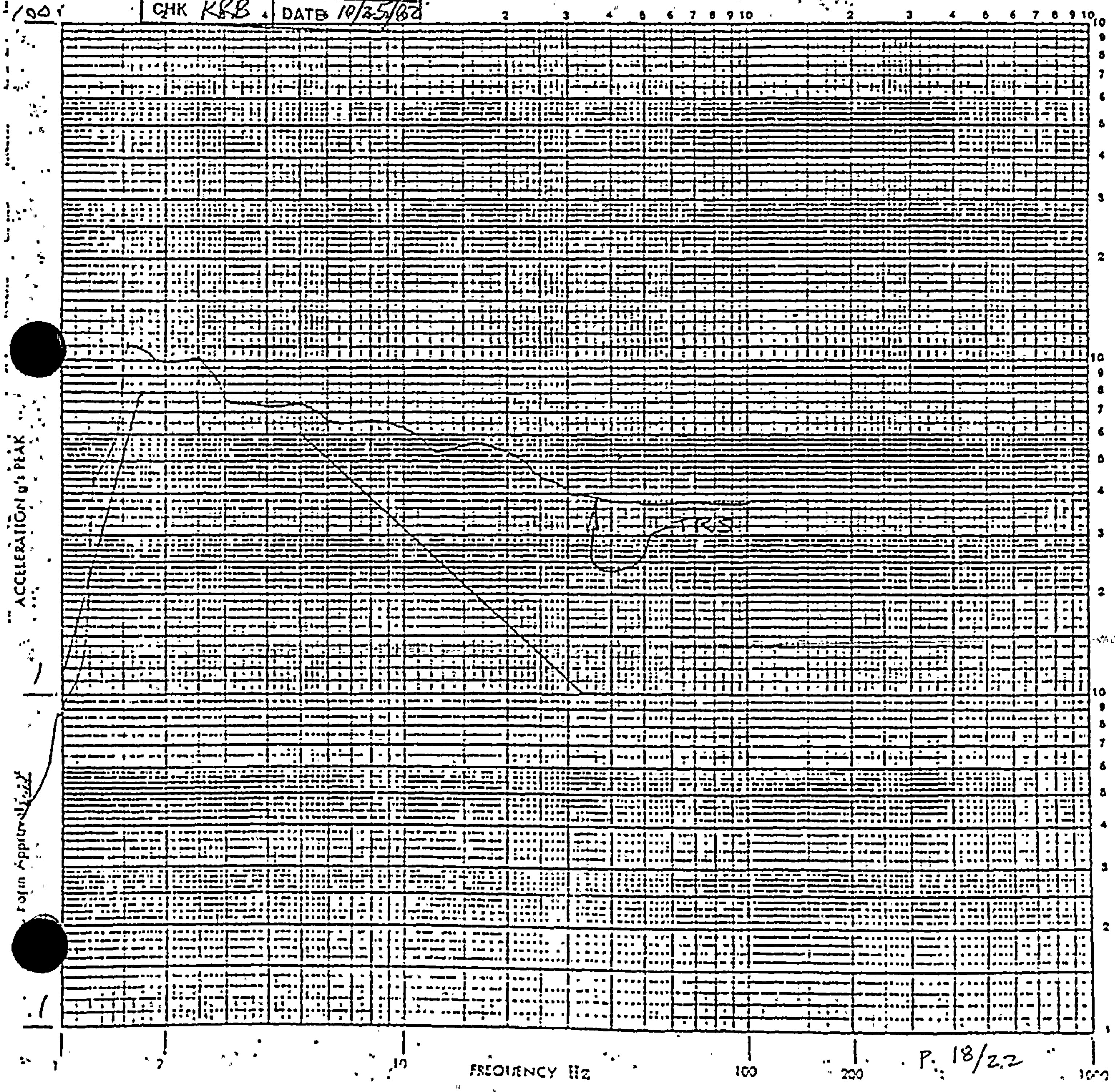
Operator MEEHAN Specimen SEE RECEIVING INSPECTION

Date. Damping 2 % Axis of Test X-Y HORIZ

EDS NUCLEAR	
JOB No. 0740-012	
CALC. No. 0740-283015-S	
BY DG	DATE 10/15/82
CHK KBB	DATE 10/25/82

DBE #2
ENERGIZED

RESPONSE SPECTRA



Form Approved

P. 18/22

WYLE LABORATORIES

Report No. 58238

CUSTOMER FISHBACK/LORD Job No. 58238 Page No. 31

Full Scale 100 g. Accel. No. 2 Control (x) Response ( )

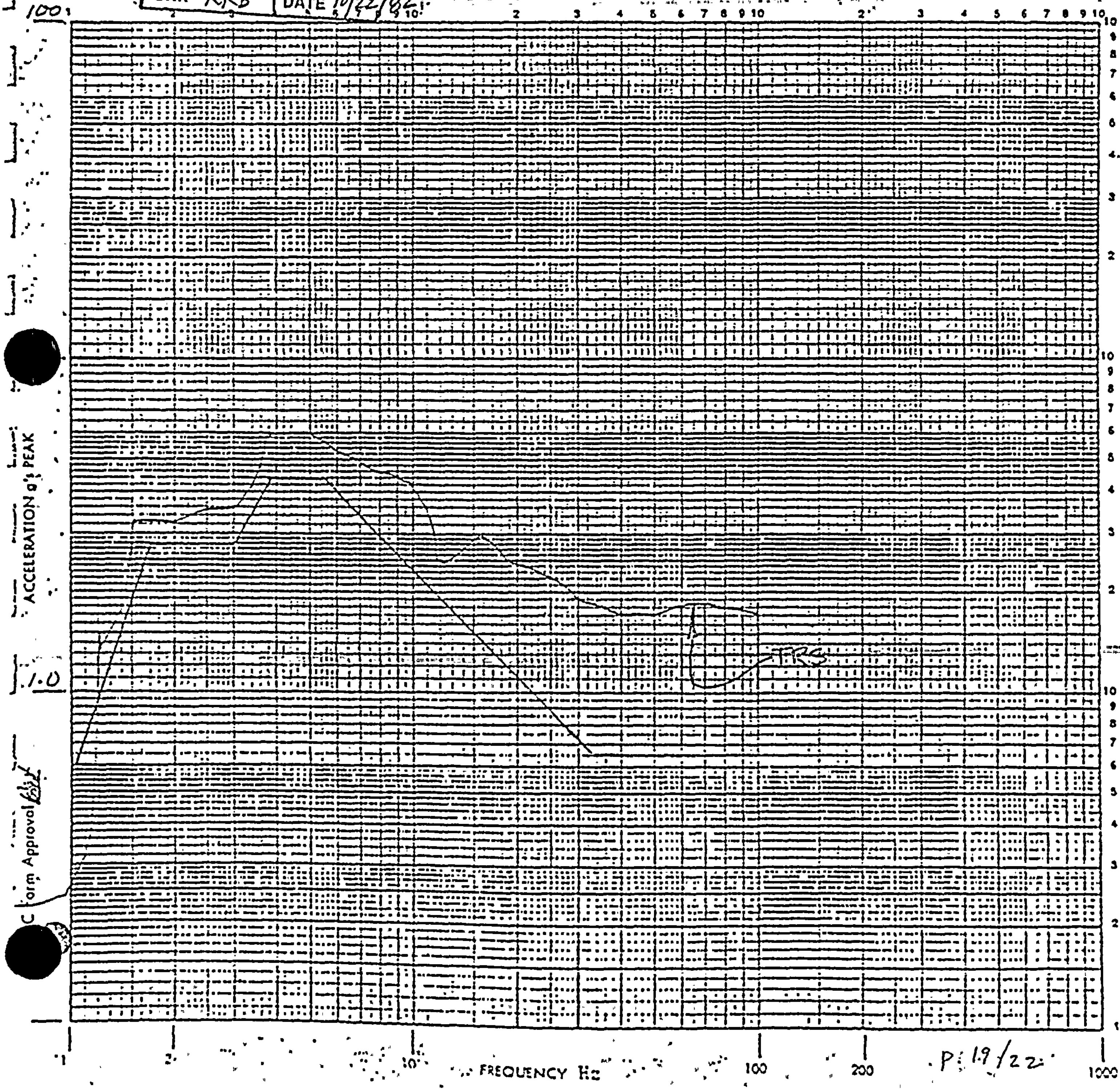
Operator JAGEMAN Specimen SEE RECEIVING INSPECTION

Date Damping 2 % Axis of Test X-Y VERT

EDS NUCLEAR
JOB No. 27 0740-012
CALC. No. QID-283015-S
BY DG DATE 10/15/82
CHK KRB DATE 10/22/82

DBE#2

RESPONSE SPECTRA ENERGIZED



Form Approval

P: 19/22

WYLE LABORATORIES

Report No. 58238

CUSTOMER FISCHBACK/LORD Job No. 58238 Page No. 44

Full Scale 100 g Accel. No. 1 Control (X) Response ( )

Operator [illegible] Specimen SEE RECEIVING INSPECTION

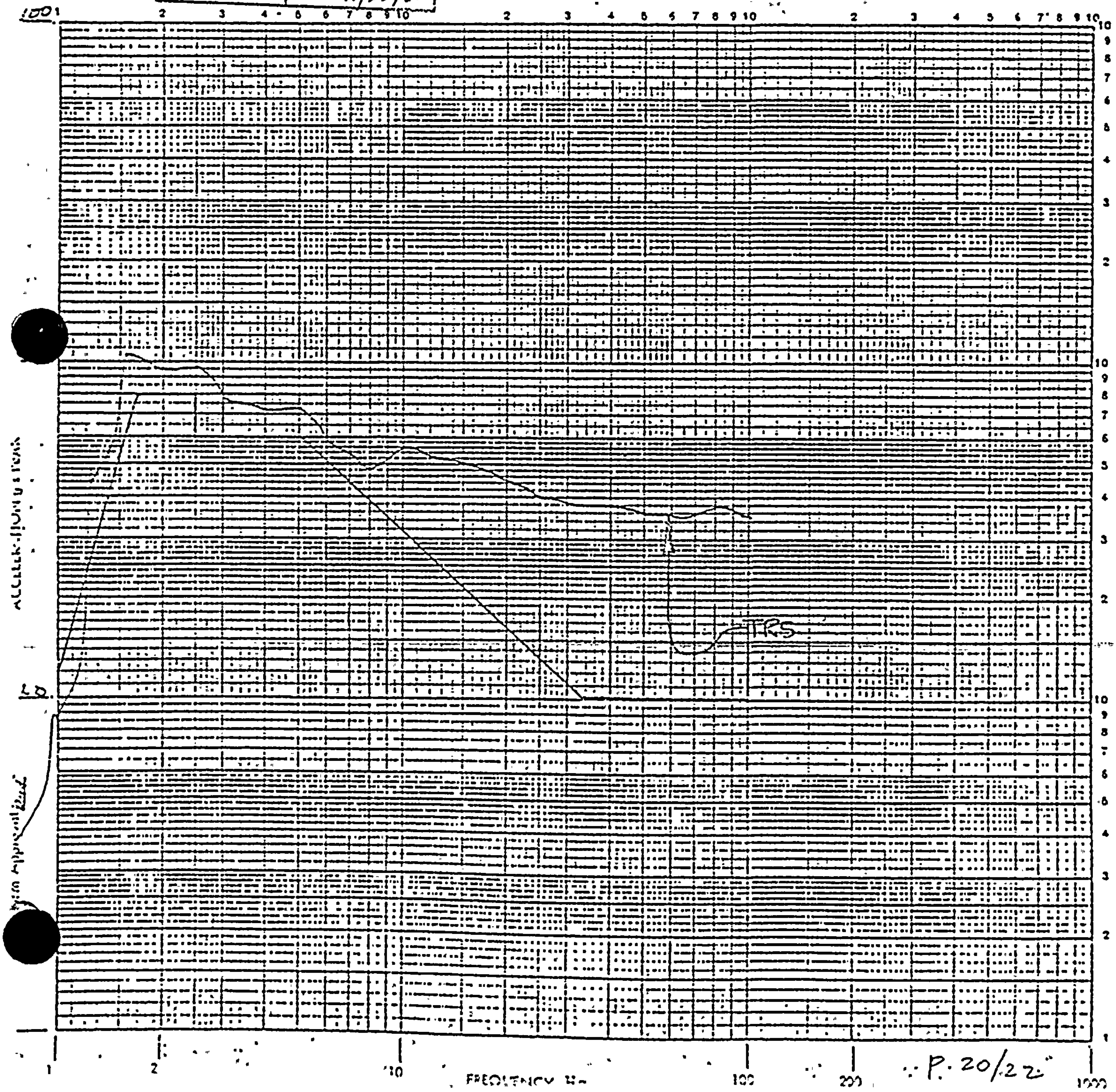
Date [illegible] Damping 2 % Axis of Test Z-Y HORIZ

DBE # 2

ENERGIZED

EBS NUCLEAR
JOB No. 0790-012
CALC. No. 020-283015-S
BY DG DATE 10/15/82
CHK KRB DATE 10/22/82

RESPONSE SPECTRA



P. 20/22

WYLE LABORATORIES

Report No. 58238

CUSTOMER FISCHBACK/LORD Job No. 58238 Page No. 45

Full Scale 100 g Accel. No. 2 Control (x) Response ( )

Operator MEEHAN Specimen 8Cm SLE R...

Date 10/10/82 0740-012 Damping 2 % Axis of Test Z-Y VERT

OBE #2

ENERGIZED

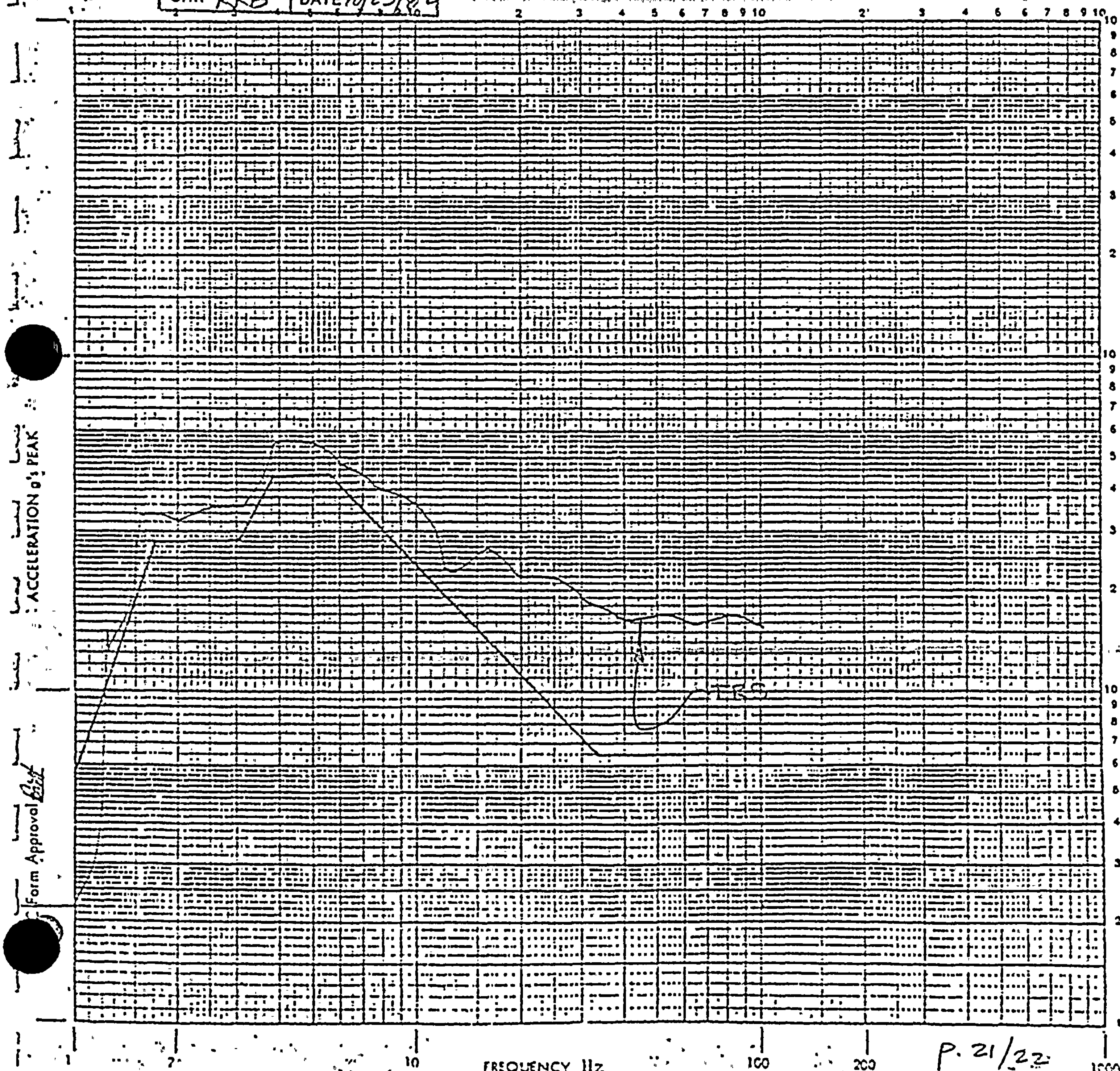
EDS NUCLEAR

CALC. No. 030-283015-S

BY OG DATE 10/15/82

CHK KRB DATE 10/25/82

RESPONSE SPECTRA



Form Approval

P. 21/22

BOP-10 ✓= have walkdown sheet level 2

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT 315004

I. PLANT NAME: WNP-2 TYPE:

1. UTILITY: WPPSS PWR

2. NSSS: GE 3. A/E: B&R BWR ✓

II. COMPONENT NAME: Solenoid Pilot Valve COMPONENT NO: RCIC-SPV-25, -4, -54, -26, -5

1. SCOPE: ☐ NSSS ☒ BOP

2. MODEL NUMBER: WJHT831654 QUANTITY: 5

3. VENDOR: Automatic Switch Co

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

5. PHYSICAL DESCRIPTION: a. APPEARANCE: Forged brass body with elec. box

b. DIMENSIONS: 5" x 4 3/4" x 2 3/4"

c. WEIGHT: < 4 lbs

6. LOCATION: BUILDING: R

ELEVATION: 471 & 501

7. FIELD MOUNTING CONDITIONS: ☒ BOLT (NO. 4, SIZE #10)

In rigid racks IR-624-63

☐ WELD (LENGTH ______)

☐ ______

8. a. SYSTEM IN WHICH LOCATED: Reactor Core Isolation Cooling

b. FUNCTIONAL DESCRIPTION: Operate RCIC valves on signal

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN ☒ BOTH ☐ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION:

2808-58

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES ☐ NO

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

[X] TEST [ ] ANALYSIS [ ] COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: Seismic Qualification ... Six Solenoid...

(NO., TITLE & DATE): Valves, #58167, 28March 1977

COMPANY THAT PREPARED REPORT: Wyle Labs

COMPANY THAT REVIEWED REPORT: WPPSS

V. VIBRATION INPUT:

1. LOADS CONSIDERED: a. [X] 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): Yes for level 547 (worst case)

4. DAMPING CORRESPONDING TO RRS: [ ] OBE 2% [ ] SSE 2%

5. REQUIRED ACCELERATION IN EACH DIRECTION: [ ] ZPA [X] OTHER (SPECIFY) RRS

OBE S/S = ______ F/B = ______ V = ______

SSE S/S = ______ F/B = ______ V = ______

6. WERE FATIGUE EFFECTS OR OTHER VIBRATION LOADS CONSIDERED?

[ ] YES [X] NO

IF YES, DESCRIBE LOADS CONSIDERED AND HOW THEY WERE TREATED IN OVERALL QUALIFICATION PROGRAM:

N/A

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. ☐ SINGLE FREQUENCY ☒ MULTI-FREQUENCY ☒ RANDOM

2. ☐ SINGLE AXIS ☒ MULTI-AXIS ☐ SINE BEAT ☐ ____________

3. NO. OF QUALIFICATION TESTS: OBE 5 SSE 1 OTHER (SPECIFY) ________

4. FREQUENCY RANGE: 1.1 to 100 Hz

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = ____________ F/B = ____________ V = ____________

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

See p 2A & 3A

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 ______) ☒ Simulated normal in-service Mounting

10. FUNCTIONAL OPERABILITY VERIFIED: ☒ YES ☐ NO ☐ NOT APPLICABLE

11. TEST RESULTS INCLUDING MODIFICATIONS MADE:

Satisfactory

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:

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

II. IF QUALIFICATION BY ANALYSIS, THEM COMPLETE:

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. CRITCAL 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 OPERABILITY

COMPLETED BY F S Sullivan	DATE 6-22-81
REVIEWED BY [signature]	DATE 10-29-82

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

[X] TEST   [ ] ANALYSIS   [ ] COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: Justification of Seismic Qualification below 8Hz of com'l. 8316 valves for WPPSS

(NO., TITLE & DATE): Engr. Job 67,489 May 4, 1981

COMPANY THAT PREPARED REPORT: Automatic Switch Co

COMPANY THAT REVIEWED REPORT: WPPSS

V. VIBRATION INPUT:

1. LOADS CONSIDERED: a. [X] 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 [X] OTHER (SPECIFY) ______

   OBE S/S = ______ F/B = ______ V = ______

   SSE S/S = ______ F/B = ______ V = ______
6. WERE FATIGUE EFFECTS OR OTHER VIBRATION LOADS CONSIDERED?

   [ ] YES [X] NO

   IF YES, DESCRIBE LOADS CONSIDERED AND HOW THEY WERE TREATED IN OVERALL QUALIFICATION PROGRAM:

   N/A

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. [X] SINGLE FREQUENCY [ ] MULTI-FREQUENCY [ ] RANDOM

2. [X] SINGLE AXIS [ ] MULTI-AXIS [X] SINE BEAT [X] RESONANT SEARCH AND EXPLORITORY FRAGILITY TEST

3. NO. OF QUALIFICATION TESTS: OBE N/A SSE N/A OTHER (SPECIFY) ______

4. FREQUENCY RANGE: 1 to 35 Hz & 3 to 100 Hz

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = >40 Hz F/B = >40 Hz V = >40 Hz

6. METHOD OF DETERMINING NATURAL FREQUENCIES:

[X] LAB TEST [ ] IN-SITU TEST [ ] ANALYSIS

7. TRS ENVELOPING RRS USING MULTI-FREQUENCY TEST: [ ] YES (ATTACH TRS & RRS GRAPHS) [ ] NO N/A

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:

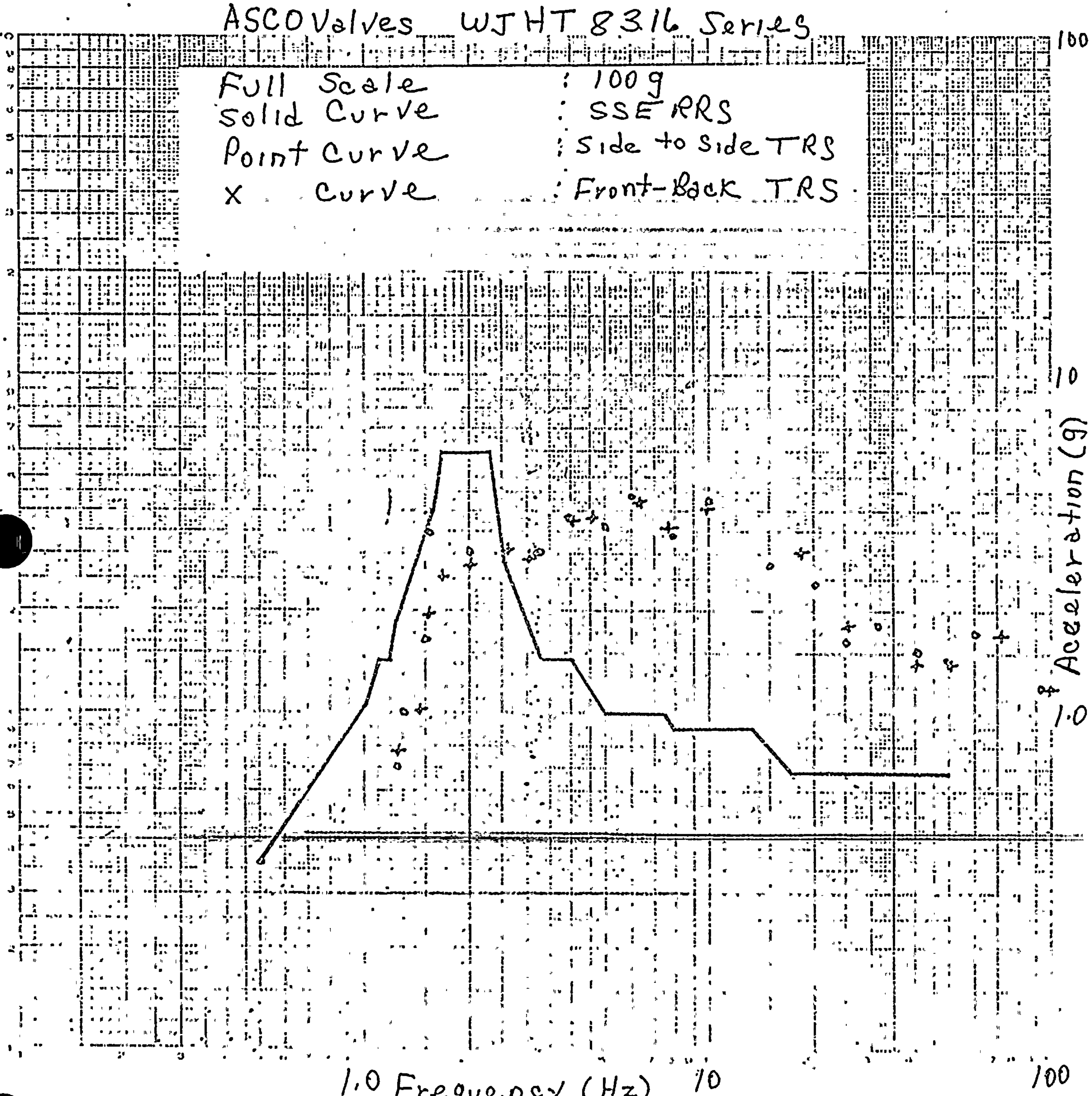
No resonant frequencies below 40 Hz therefore the non enveloping below 5 Hz by test reported in Wyle #58167 is acceptable

12. OTHER TEST PERFORMED (SUCH AS AGING OR FRAGILITY TEST, INCLUDING RESULTS): FRAGILITY TEST SINE BEAT EACH AXIS

1 Hz	.5g	2.5 Hz	1.7g	6 Hz	4.0g
1.25 Hz	.83g	3.2 Hz	2.1g	7 Hz	4.5g
1.6 Hz	1.2g	4 Hz	2.5g	8 Hz	5.2g
2 Hz	1.35g	5 Hz	3.0g	9 Hz	5.8g

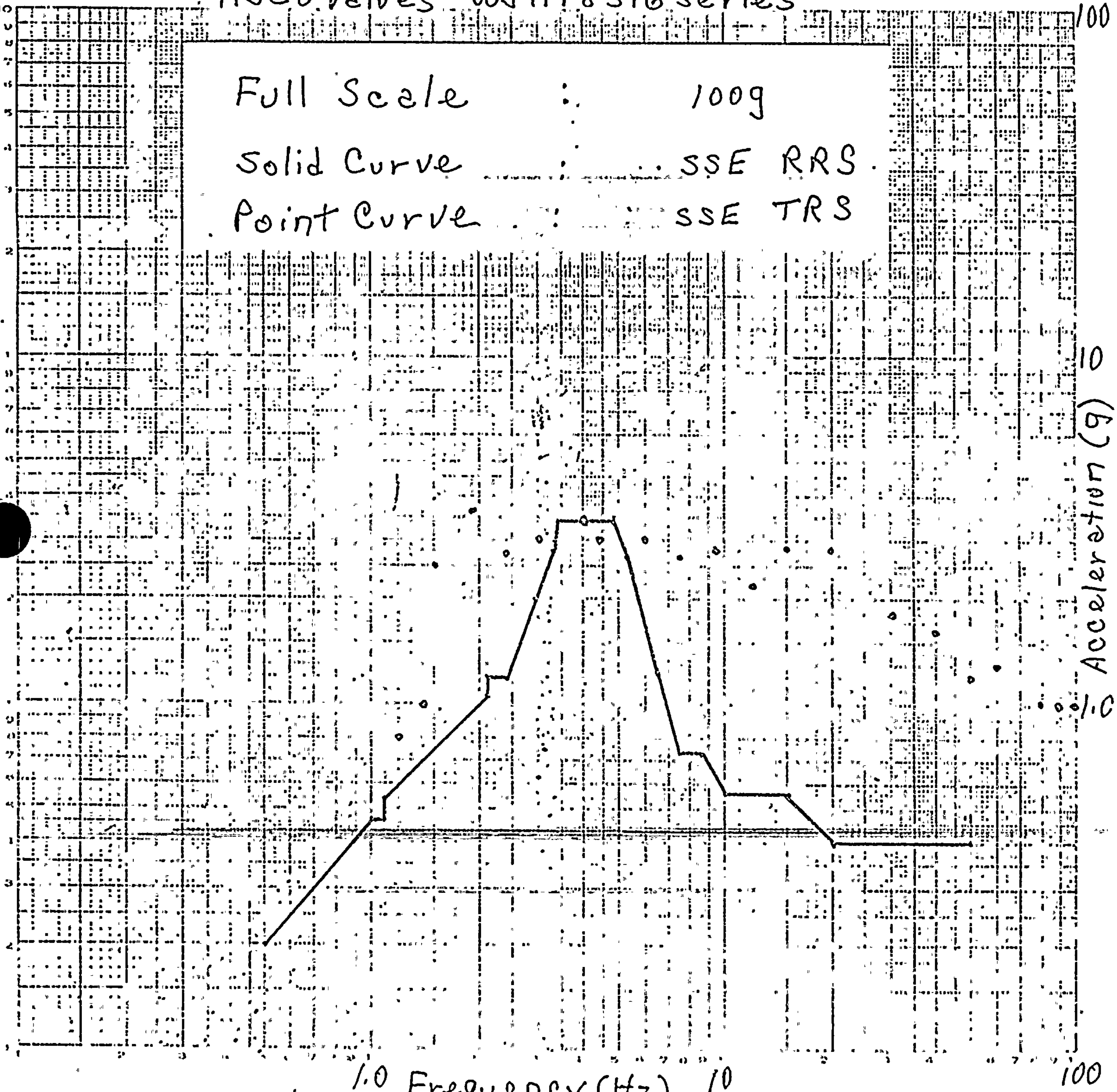
* NOTE: IF QUALIFICATION BY A COMBINATION OF TEST AND ANALYSIS, ALSO COMPLETE ITEM VII:

968-12562



Reactor Bldg.
547' level Horiz.
2% damping

ASCO Valves WJHT8316 series



Reactor Bldg.
547' level Vert.
2% damping

BOP-11

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 TYPE:

1. UTILITY: WPPSS PWR

2. NSSS: GE 3. A/E: B+R BWR ✓

II. COMPONENT NAME: Motor Starter COMPONENT NO: E-42-RRA/FN20

1. SCOPE: ☐ NSSS ☑ BOP

2. MODEL NUMBER: Type A QUANTITY: 1

3. VENDOR: ITE

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

This component is part of MCC E-MC-8BA and was tested as a part of E-MC-8BA. The qualification of E-MC-8BA is on following pages

5. PHYSICAL DESCRIPTION: a. APPEARANCE: 3 fused disconnect switches, 3 magnetic starters, transformers + fuse mounted

b. DIMENSIONS:

c. WEIGHT: in a section of the MCC

6. LOCATION: BUILDING: R

ELEVATION: 529

7. FIELD MOUNTING CONDITIONS: ☐ BOLT (NO. _____, SIZE _____) ☐ WELD (LENGTH _____) ☐ _____ } standard as in factory + seismic test

8. a. SYSTEM IN WHICH LOCATED: Reactor Bldg Recirculating Air

b. FUNCTIONAL DESCRIPTION: Provide overload protection for motor

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN ☒ BOTH ☐ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-49

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES ☐ NO

JSL

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

☐ TEST ☐ ANALYSIS ☐ COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: ______

(NO., TITLE & DATE): ______

COMPANY THAT PREPARED REPORT: ______

COMPANY THAT REVIEWED REPORT: ______

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 THROUGH VII FOR EACH REPORT.

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 TYPE:

1. UTILITY: WPPSS PWR ______

2. NSSS: GE 3. A/E: B & R BWR ✓

II. COMPONENT NAME: MOTOR CONTROL CENTER COMPONENT NO: E-MC-7A, -7AA, -7B, -7BA, -7BB, -7F, -8A, -8AA, -8B, -8BA, -8BB, -8F, -S1/1D, -S1/2D, -S2/1A

1. SCOPE: ☐ NSSS ☑ BOP

2. MODEL NUMBER: 5600 SERIES QUANTITY: 15

3. VENDOR: ITE IMPERIAL

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

COMPONENTS INCLUDE MOTOR STARTERS, RELAYS, FUSES AND CIRCUIT BREAKERS

5. PHYSICAL DESCRIPTION: a. APPEARANCE: SHEET METAL PANEL

b. DIMENSIONS: 9½' H x 20" D x 10' - 20' L (VARIABLE DEPENDING ON NUMBER OF SECTIONS IN MCC)

c. WEIGHT: VARIABLE

6. LOCATION: BUILDING: DIESEL GENERATOR, REACTOR AND RADWASTE

ELEVATION: 441' 471', 522' AND 572' 467' AND 525'

7. FIELD MOUNTING CONDITIONS: ☒ BOLT (NO. 32-84, SIZE ½") (DEPENDING ON # OF SECTIONS IN MCC)

☒ WELD (LENGTH LENGTH OF MCC)

☐ ______

NOTE: MCC IS WELDED TO I BEAMS & I BEAM IS BOLTED TO FLOOR

8. a. SYSTEM IN WHICH LOCATED: ELECTRICAL

b. FUNCTIONAL DESCRIPTION: PROVIDE EMERGENCY POWER

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN ☑ BOTH ☐ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-49

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☑ YES ☐ NO

REV	BY	DATE	CHECKED	DATE		
0	JAG	10/21/82	DG	10/21/82	eds nuclear	JOB NO 0740-012 CALC NO 216001-S

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

EQUIPMENT QUALIFICATION METHOD:

[✓] TEST [ ] ANALYSIS [ ] COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: "SEISMIC SIMULATION TEST PROGRAM ON A

(NO., TITLE & DATE): MOTOR CONTROL CENTER". WYLE REPORT # 42921-1, DATED 4/21/75
BURNS & ROE TRANSMITTAL # 14-14C, CONTRACT # 2503-49.

COMPANY THAT PREPARED REPORT: WYLE LABS / ITE IMPERIAL.

COMPANY THAT REVIEWED REPORT: EDS

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): DIESEL GEN., EL. 454'-6"; REACTOR BLG., EL. 605'-10.5"; RADWASTE, EL. 522'-0"

4. DAMPING CORRESPONDING TO RRS: [ ] OBE ______ [X] SSE 2% (SEE ATTACHMENT I)

5. REQUIRED ACCELERATION IN EACH DIRECTION: [✓] ZPA [ ] OTHER (SPECIFY) ______

OBE S/S = ______ F/B = ______ V = ______ (SEE ATTACHMENT II)

SSE S/S = 0.4g F/B = 0.4g V = 0.4g

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:

N/A

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

REV	BY	DATE	CHECKED	DATE		
					eds nuclear	JOB NO 0340-012
0	[illegible]	10/21/82	DG	10/21/82		CALC NO 216001-5

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. [x] SINGLE FREQUENCY [ ] MULTI-FREQUENCY [ ] RANDOM

2. [ ] SINGLE AXIS [x] MULTI-AXIS [x] SINE BEAT [x] ≈ .2g SINE SWEEP

3. NO. OF QUALIFICATION TESTS: OBE ≥5 SS/V AND ≥5 FB/V SSE ≥1 SS/V AND ≥1 FB/V OTHER (SPECIFY) ______

4. FREQUENCY RANGE: 1-35 HZ.

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = 10 HZ. F/B = 6.75 HZ. V = NONE

6. METHOD OF DETERMINING NATURAL FREQUENCIES:

[x] 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: (MINIMUM)

	S/S	F/B	V
OBE	.75	.74	.78
SSE	1.4	1.2	1.36

9. LABORATORY MOUNTING:

1. [ ] BOLT (NO. ______, SIZE ______) [x] WELD (LENGTH LENGTH OF MCC) (SEE ATTACHMENT II) [ ] ______

10. FUNCTIONAL OPERABILITY VERIFIED: [x] YES [ ] NO [ ] NOT APPLICABLE

11. TEST RESULTS INCLUDING MODIFICATIONS MADE:

CONTACT CHATTER WAS EXPERIENCED IN FB TESTS DUE TO DEFECTIVE AUXILIARY INTERLOCK. AFTER REPLACEMENT, CHATTER WAS ELIMINATED. OTHER IDENTICAL INTERLOCKS WORKED PERFECTLY (SEE REF (A7)). MCC IS SEISMICALLY QUALIFIED.

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:

REV	BY	DATE	CHECKED	DATE		
0	RLG	10/21/82	DG	10/21/82	eds nuclear	JOB NO 02-10-012; CALC NO 216001-S

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VII. IF QUALIFICATION BY ANALYSIS, THEM 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: ______

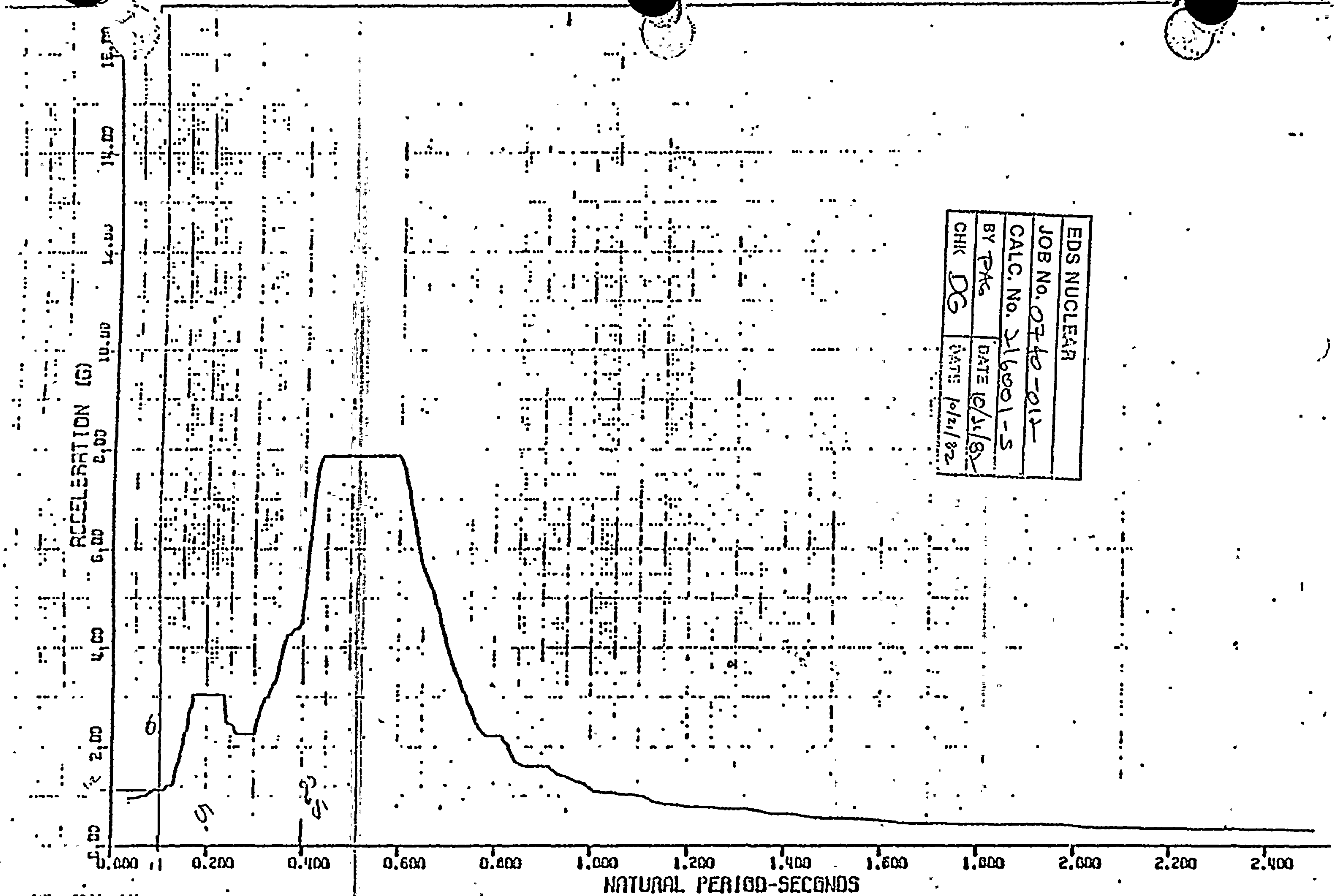
7. SUPPORT CONSIDERATIONS IN THE MODEL: ______

8. CRITCAL 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 OPERABILITY

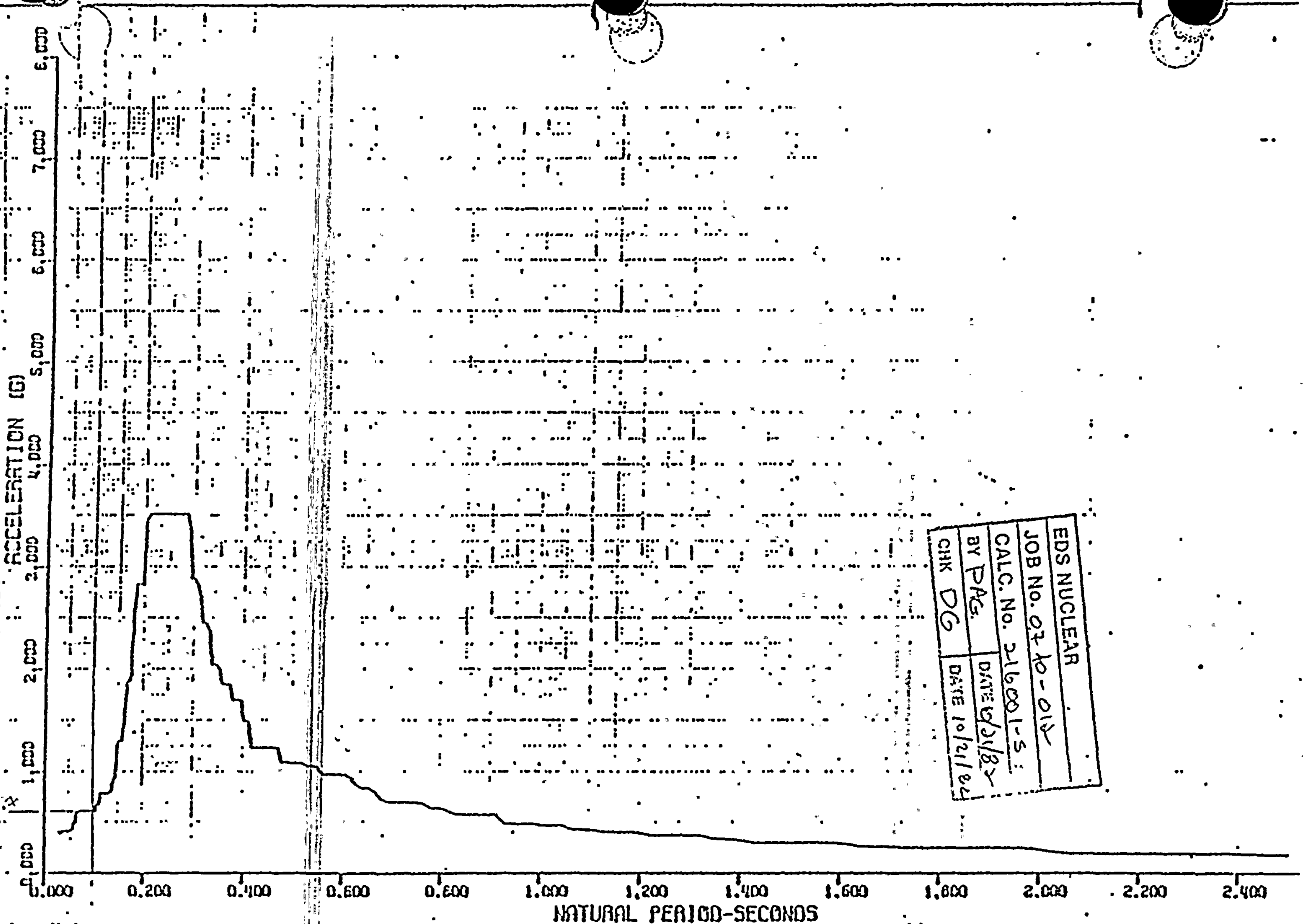
REV	BY	DATE	CHECKED	DATE	eds nuclear	JOB NO 0720-012 CALC NO 216001-S
0	DKL	10/21/82	DG	10/21/82		



EDS NUCLEAR
JOB No. 0740-012
CALC. No. 21601-5
BY PAG DATE 10/21/82
CHK DG DATE 10/21/82

WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (OBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.02

P. 15/19



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (DBE) FLOOR SPECTRUM - VERTICAL
MASS NO.2, EL. 605'-10.5", DAMPING=0.02

P.16/19

BOP-12

SGT-TS-EH1A10
-EH1A11
-EH1A111
-EH1A112
-EH1A113
-EH1A114
-EH1A115
-EH1A116
-EH1A117
-EH1A118
-EH1A12
-EH1A13
-EH1A14
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-EH1A26
-EH1A27
-EH1A28
-EH1A29
-EH1B10
-EH1B11
-EH1B111
-EH1B112

SGT-TS-EH1B113
-EH1B114
-EH1B115
-EH1B116
-EH1B117
-EH1B118
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-EH1B13
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-EH1B28
-EH1B29

-EH1B216

SGT-TS-1A11
-1A21
-1A31
-1A41
-2A11
-2A21
-2A31
-2A41
-1B11
-1B21
-1B31
-1B41
-2B11
-2B21
-2B31
-2B41

DESIGN VERIFICATION
CLIENT WPPSS
JOB NO. 07400.12
CALC/PROB NO. 355007-S
BY: [illegible] DATE: 10/14/92
CHKD: KRS DATE: 10/15/92

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 — TYPE:

1. UTILITY: WPPSS — PWR: ______

2. NSSS: GE — 3. A/E: BURNS & ROE, INC — BWR: ✓

II. COMPONENT NAME: TEMPERATURE SWITCH — COMPONENT NO: (SEE PRECEEDING PAGE)

1. SCOPE: ☐ NSSS ☒ BOP

2. MODEL NUMBER: 18000-0 — QUANTITY: 88

3. VENDOR: FENWAL

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

N/A

5. PHYSICAL DESCRIPTION: a. APPEARANCE: CYLINDRICAL ROD

b. DIMENSIONS: 4½" LONG, 5/8" DIAMETER

c. WEIGHT: ______

6. LOCATION: BUILDING: REACTOR

ELEVATION: 572' & 582'

7. FIELD MOUNTING CONDITIONS:

☐ BOLT (NO. ______, SIZE ______)

☐ WELD (LENGTH ______)

☒ STANDARD MOUNTING

Std means threaded into pipe sleeve that is welded to plenum shell.

8. a. SYSTEM IN WHICH LOCATED: STANDBY GAS TREATMENT

b. FUNCTIONAL DESCRIPTION: TEMPERATURE CONTROL ON SGTS

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN ☐ BOTH ☒ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: CONTRACT No: 2808-18

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☐ YES ☒ NO

REV	BY	DATE	CHECKED	DATE		
0	[illegible]	10/11/82	KRBrulik	10/15/82	eds nuclear	JOB NO 0740-012 CALC NO 355003-S

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

☐ TEST ☐ ANALYSIS ☒ COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: (SEE PAGE 12)

(NO., TITLE & DATE): — " —

COMPANY THAT PREPARED REPORT: — " —

COMPANY THAT REVIEWED REPORT: — " —

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) N/A

3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): SEE PAGES 13 - 16.

4. DAMPING CORRESPONDING TO RRS: ☐ OBE 2% ☐ SSE 2%

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:

   N/A

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

REV	BY	DATE	CHECKED	DATE		
0	[illegible signature]	10/11/82	KRBaxlib	10/15/82	eds nuclear	JOB NO 0740-012 CALC NO 355003-S

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

. IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. [ ] SINGLE FREQUENCY [X] MULTI-FREQUENCY [ ] RANDOM

2. [ ] SINGLE AXIS [X] MULTI-AXIS [ ] SINE BEAT [ ] ______

3. NO. OF QUALIFICATION TESTS: OBE 5 SSE 1 OTHER (SPECIFY) ______

4. FREQUENCY RANGE: 1.25 to 33 Hz

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = RIGID F/B = RIGID V = RIGID

6. METHOD OF DETERMINING NATURAL FREQUENCIES:

[ ] LAB TEST [ ] IN-SITU TEST [X] ANALYSIS (SEE ATTACHED CALCULATION)

7. TRS ENVELOPING RRS USING MULTI-FREQUENCY TEST: [ ] YES (ATTACH TRS & RRS GRAPHS) [X] NO

AN EXCEPTION OCCURS IN THE 1.25 TO 5 Hz FREQUENCY RANGE FOR ALL SPECTRA. SEE THE ATTACHED CALCULATION FOR RESOLUTION. TRS IS ATTACHED — SEE PAGES 17-40

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 ______) [X] STANDARD

10. FUNCTIONAL OPERABILITY VERIFIED: [X] YES [ ] NO [ ] NOT APPLICABLE

11. TEST RESULTS INCLUDING MODIFICATIONS MADE:

THE DEVICE FUNCTIONED SATISFACTORILY

12. OTHER TEST PERFORMED (SUCH AS AGING OR FRAGILITY TEST, INCLUDING RESULTS):

THE DEVICE WAS SUBJECTED TO THERMAL AGING, RADIATION LOADING, AND MECHANICAL AGING (CYCLING) FOLLOWED BY A FUNCTIONAL TEST, IN WHICH IT OPERATED SATISFACTORILY

* NOTE: IF QUALIFICATION BY A COMBINATION OF TEST AND ANALYSIS, ALSO COMPLETE ITEM VII:

REV	BY	DATE	CHECKED	DATE		
C	[illegible]	10/11/82	KRBaillie	10/15/82	ealdis nuclear	JOB NO 0740-012 CALC NO 355003-S

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VII. IF QUALIFICATION BY ANALYSIS, THEM COMPLETE:

1. METHOD OF ANALYSIS:

☐ STATIC ANALYSIS ☐ EQUIVALENT STATIC ANALYSIS ☒ NATURAL FREQUENCY CALC.

☐ DYNAMIC ANALYSIS ☐ TIME-HISTORY ☐ RESPONSE SPECTRUM

2. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = 156.6 Hz F/B = 156.6 Hz V = NOT CRITICAL

3. MODEL TYPE:

☐ 3D ☐ 2D ☐ 1D ☐ FINITE ELEMENT ☒ BEAM ☐ CLOSED FORM SOLUTION

4. ☐ COMPUTER CODES: N/A

FREQUENCY RANGE AND NO. OF MODES CONSIDERED: 1-33 Hz, 1st mode

☒ HAND CALCULATIONS

5. METHOD OF COMBINING DYNAMIC RESPONSES: ☐ ABSOLUTE SUM ☐ SRSS ☐ OTHER (SPECIFY) N/A

6. DAMPING: OBE N/A SSE N/A BASIS FOR THE DAMPING USED: N/A

THE HAND CALCULATION CONSERVATIVELY ASSUMED ZERO DAMPING.

7. SUPPORT CONSIDERATIONS IN THE MODEL: FIXED END CANTILEVER

8. CRITCAL STRUCTURAL ELEMENTS:

A.

IDENTIFICATION	LOCATION	GOVERNING LOAD OR RESPONSE COMBINATION	SEISMIC STRESS	TOTAL STRESS	STRESS ALLOWABLE
N/A*					

B.

MAX. CRITICAL DEFLECTION	LOCATION	MAXIMUM ALLOWABLE DEFLECTION TO ASSURE FUNCTIONAL OPERABILITY
N/A*		

* A HAND CALCULATION WAS DONE TO VERIFY THAT THE DEVICE NATURAL FREQUENCY (1st mode) EXCEEDS THE 33 Hz CUTOFF FREQUENCY. THEREFORE, THE STRESS CALCULATIONS ARE NOT APPLICABLE.

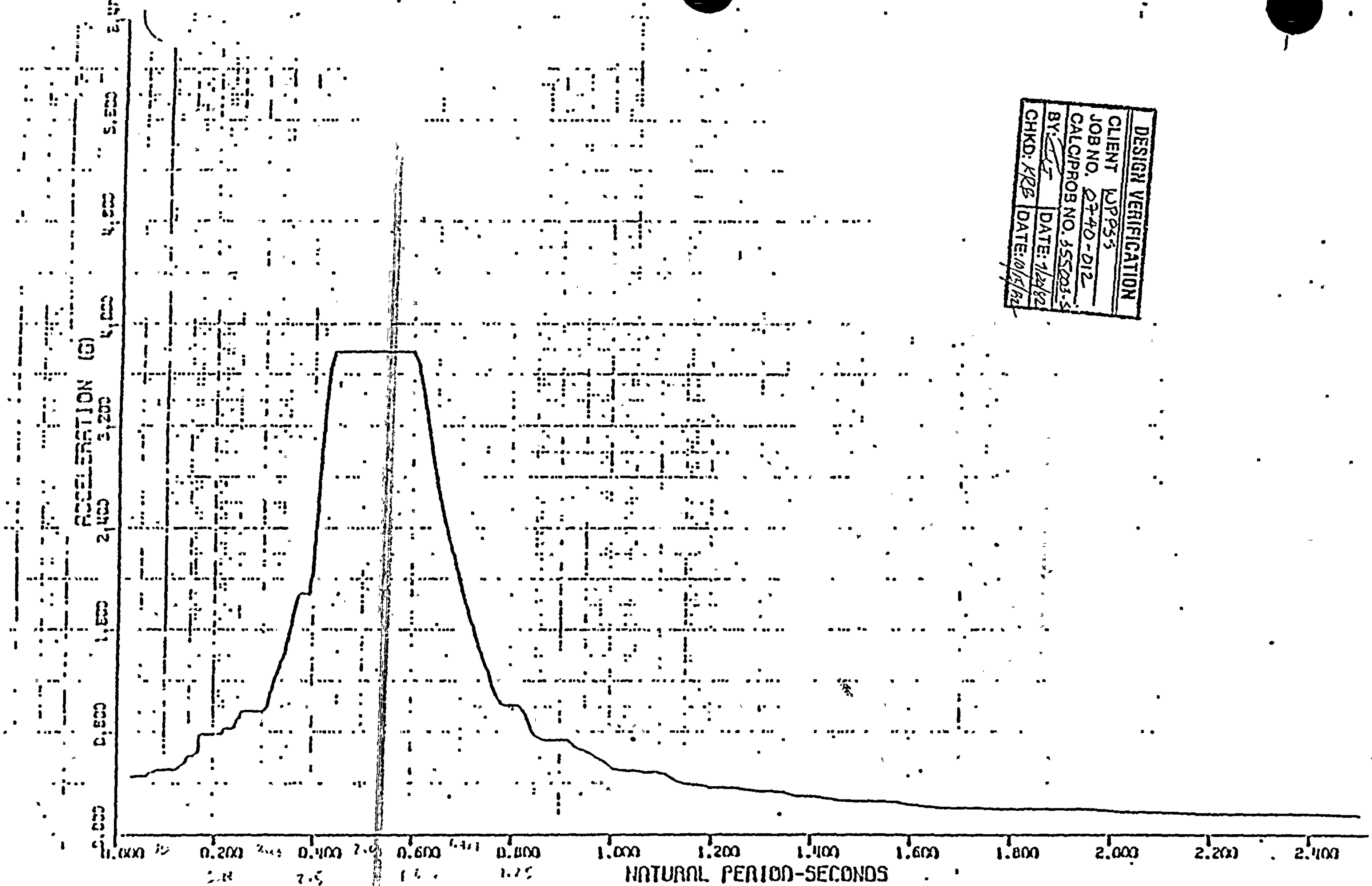
REV	BY	DATE	CHECKED	DATE		
^	P.T.	10/11/82	KR Bubb	10/15/82	eds nuclear	JOB NO 0740-012 CALC NO 355003-S

IV REPORTS

1. No. A-000021, "ENVIRONMENTAL QUALIFICATION OF THE SGTS ELECTRICAL EQUIPMENT", JUNE 1982
PREPARED BY: ANCO ENGINEERS, INC
REVIEWED BY: EDS NUCLEAR.

2. No. D-52890, "SGTS SEISMIC ANALYSIS", 5/16/74 (USED IN SECTION V "VIBRATION INPUT" TO ESTABLISH THE RIGIDITY OF THE SGTS)
PREPARED BY: FARR CO.
REVIEWED BY: EDS NUCLEAR

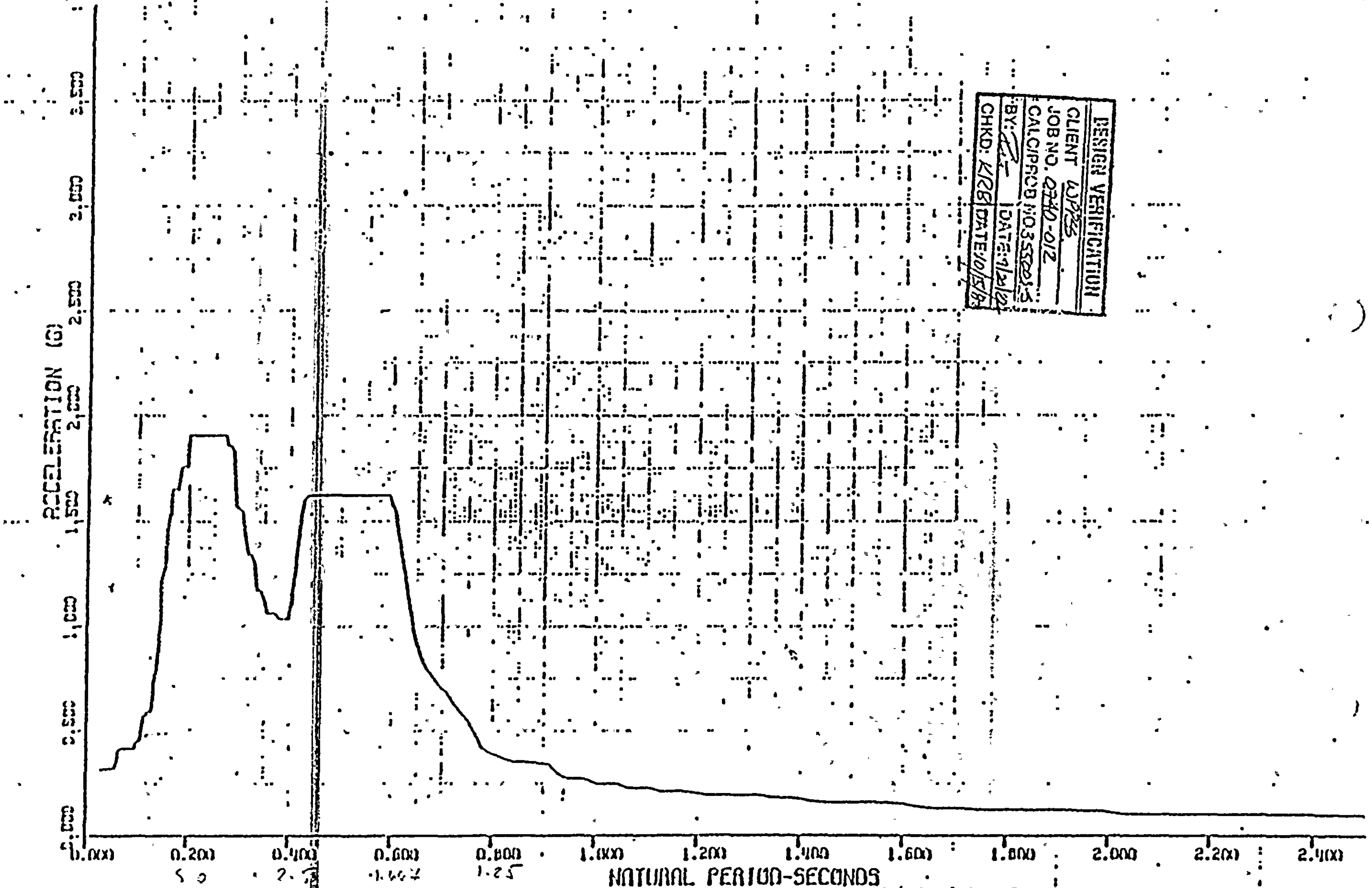
					WPPSS WNP-2
					Equip [illegible]
0	[illegible]	9/5/82	KRB	10/15/82	eds nuclear — JOB NO 0740-012-362 — CALC NO 355003-S — PAGE 12 OF 43
REV	BY	DATE	CHECKED	DATE	



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE/2 (OBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.3, EL. 567'-4.5", DAMPING=0.02

DESIGN VERIFICATION
CLIENT WPPSS
JOB NO. 07-40-012
CALC/PROB NO. 355003-5
BY: DATE: 1/22/82
CHKD: KRB DATE: 10/15/82

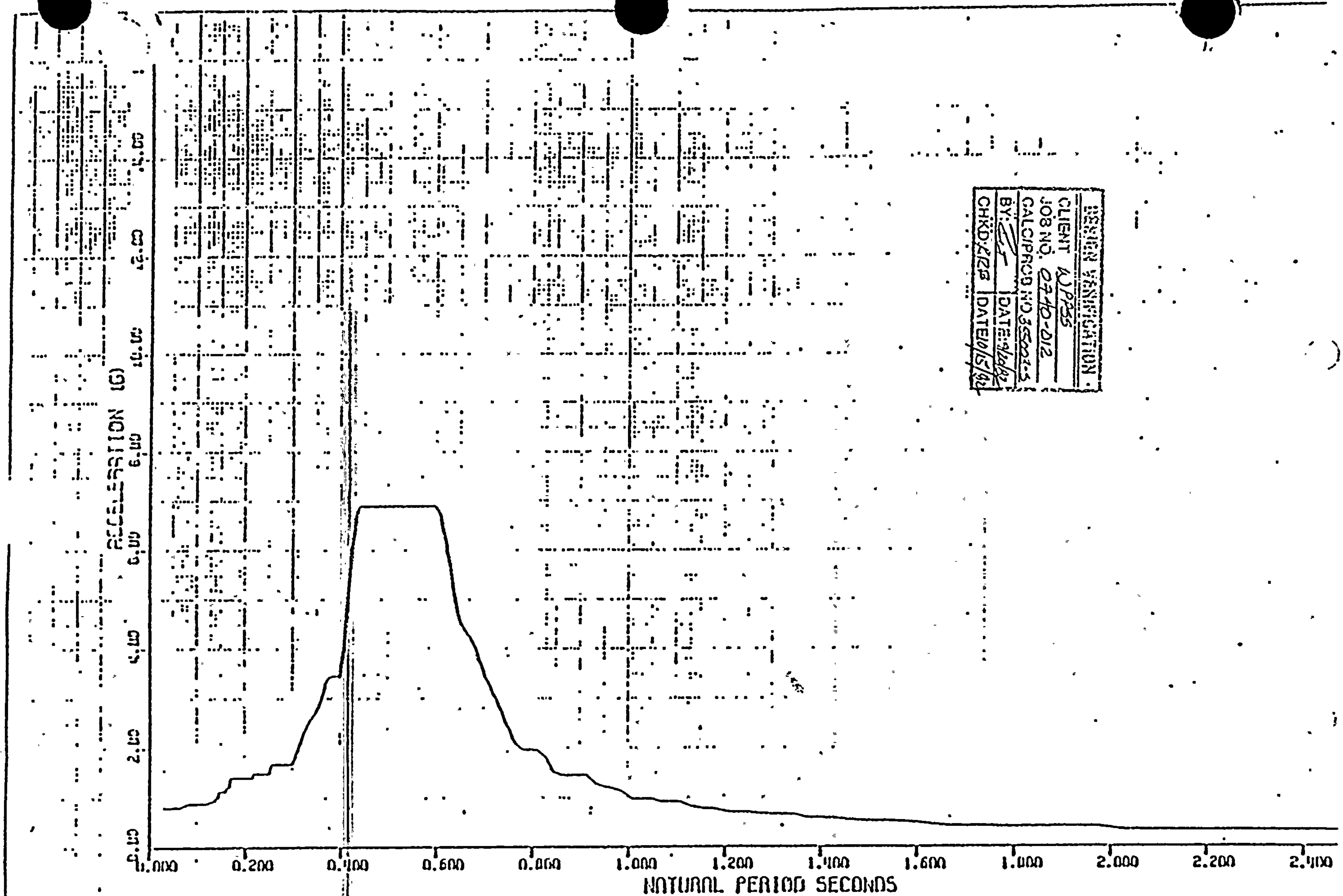
From V.3



WPPSS, HANFORD NO. 2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE/2 (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO. 3, EL. 567'-4.5", DAMPING=0.02

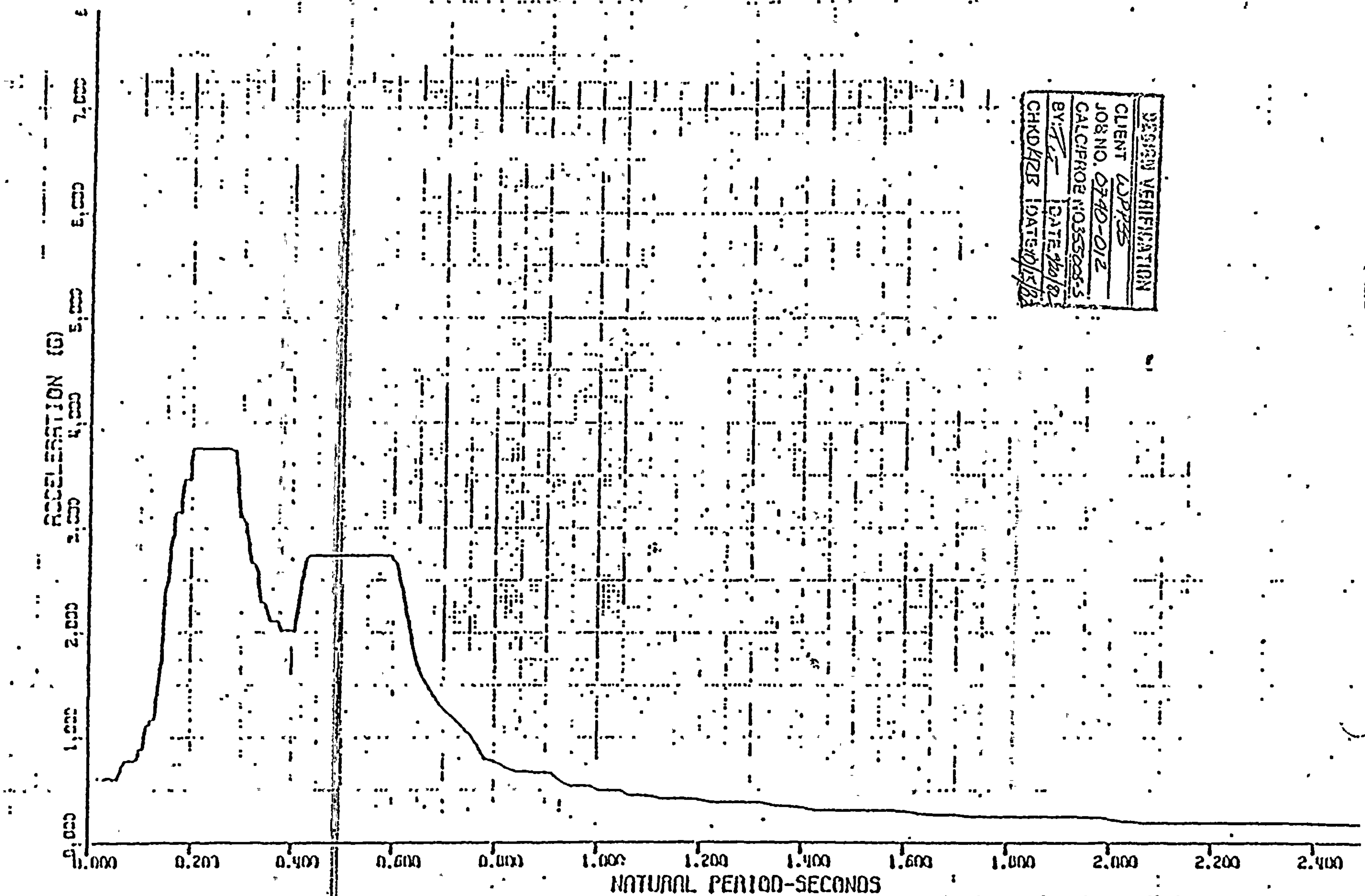
14/43

FROM V.3



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (DBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.3, EL. 567'-4.5", DAMPING=0.02

15/45



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (OBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO.3, EL. 567'-4.5", DAMPING=0.02

ANCO DOCUMENT# A-000021 PAGE# C-12

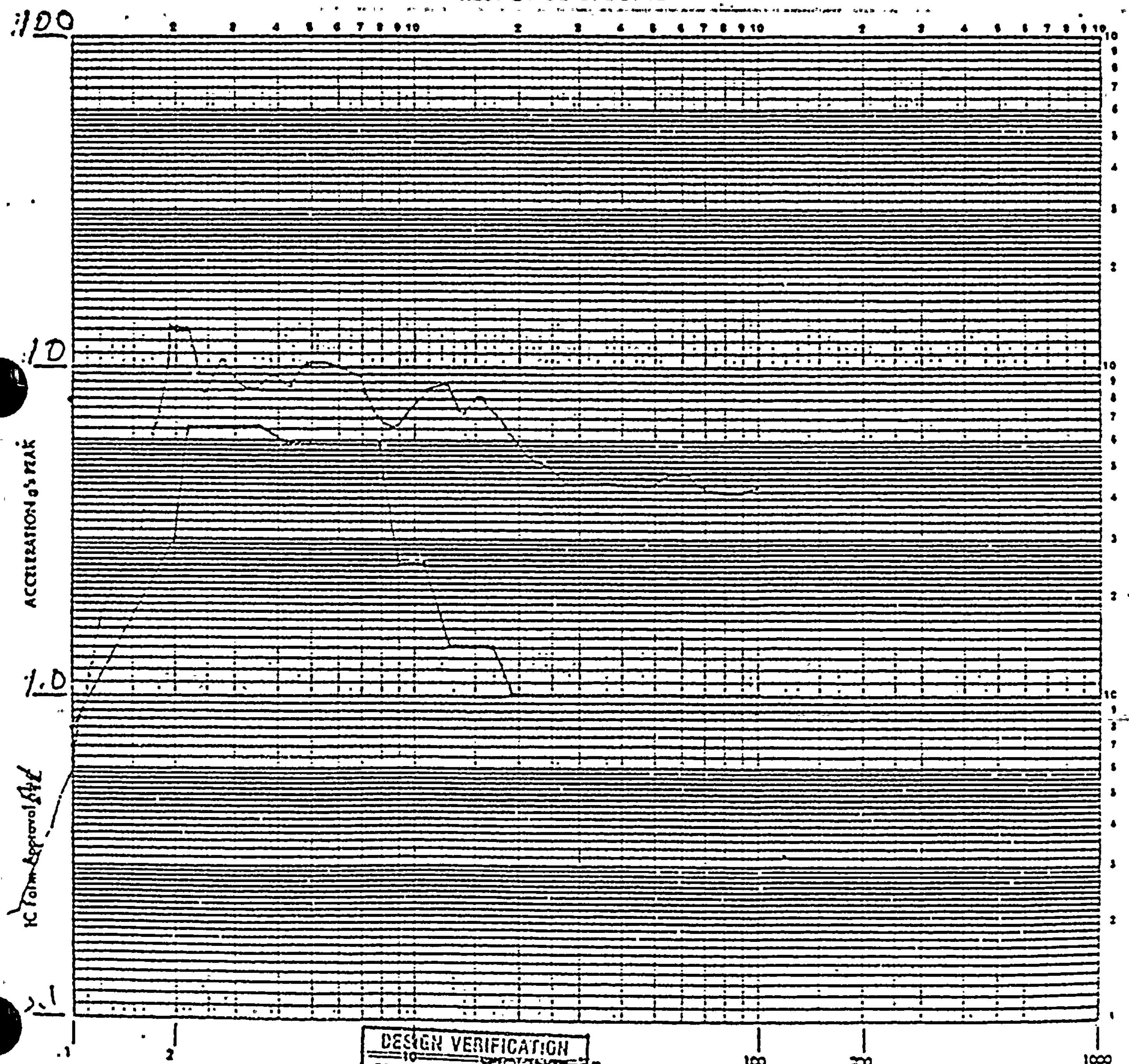
CUSTOMER ______ Job No. ______ Page No. 10 OF 31

Full Scale 100 g | Accel. No. 1 | Control (✓) | Response ( )

Operator WYLE LAB | Specimen 1 THRU 10

Date 8-28-79 | Damping 3 % | Axis of Test X-Z HORIZ. SSE #1

RESPONSE SPECTRUM



DESIGN VERIFICATION
CLIENT ANCO
JOB NO. 0740-012
CALC/PROB NO. 3556C1-S
BY: ZJ | DATE: 9/20/83
CHKD: KRB | DATE: 10/15/83

9-39

L-71167

135

27/43

From TT. 7

ANCO DOCUMENT# A-000021 PAGE# C-13

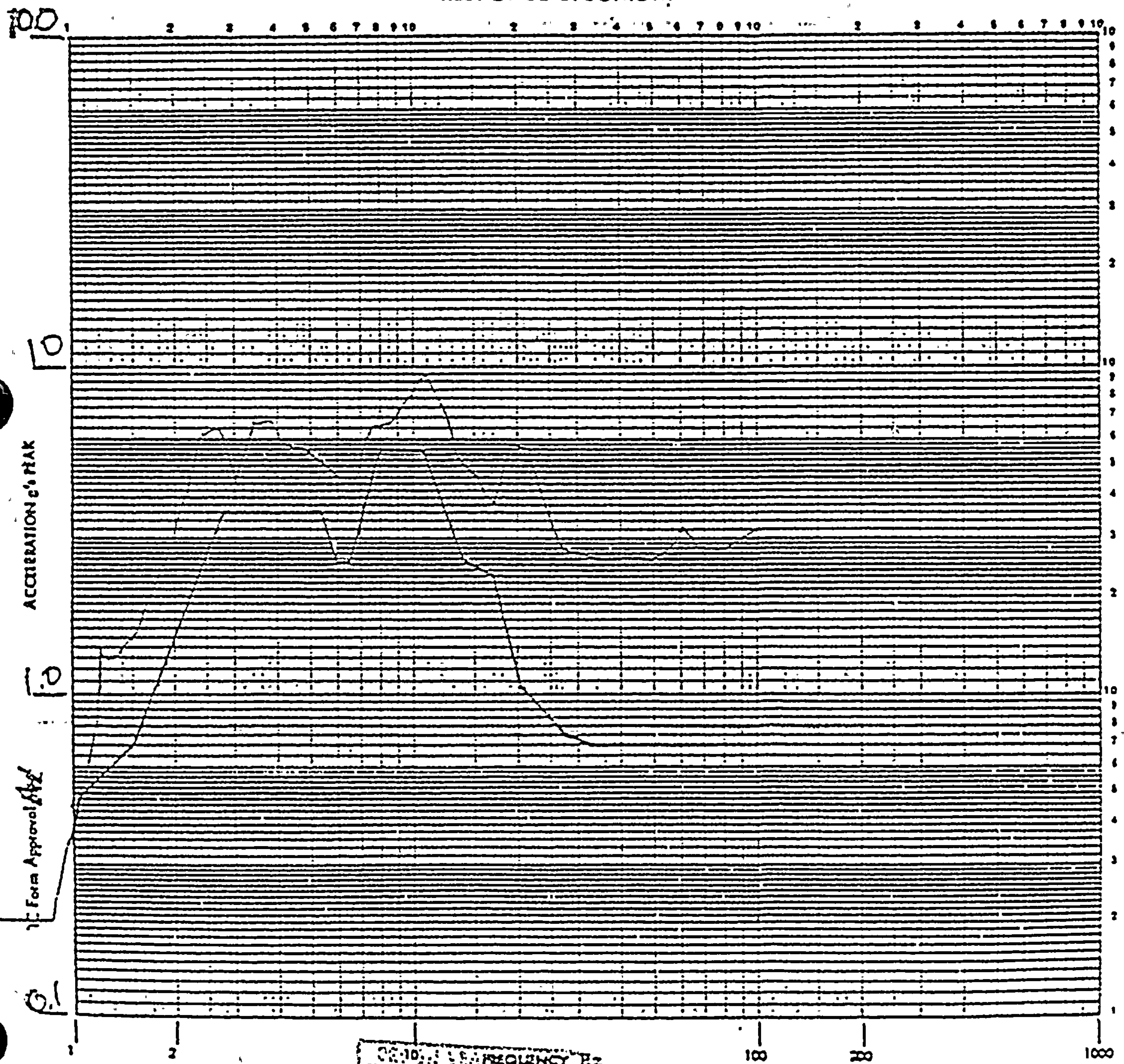
CUSTOMER ______________ Job No. ________ Page No. 11 OF 31

Full Scale 100 g Accel. No. 2 Control (✓) Response ( )

Operator WYLE LAB Specimen 1 THRU 10

Date 8-28-79 Damping 3 % Axis of Test X-Z VERT. SSE #1

RESPONSE SPECTRUM



Form Approval

9-40 L-71167 136

CLIENT WPPSS
JOB NO. 0740-012
CALC NO. 25503-3
BY [illegible] DATE 9/2/82
CHKD KRB DATE 9/15/82

FROM VT. 2

ANCO DOCUMENT # A-000021 PAGE # C-24

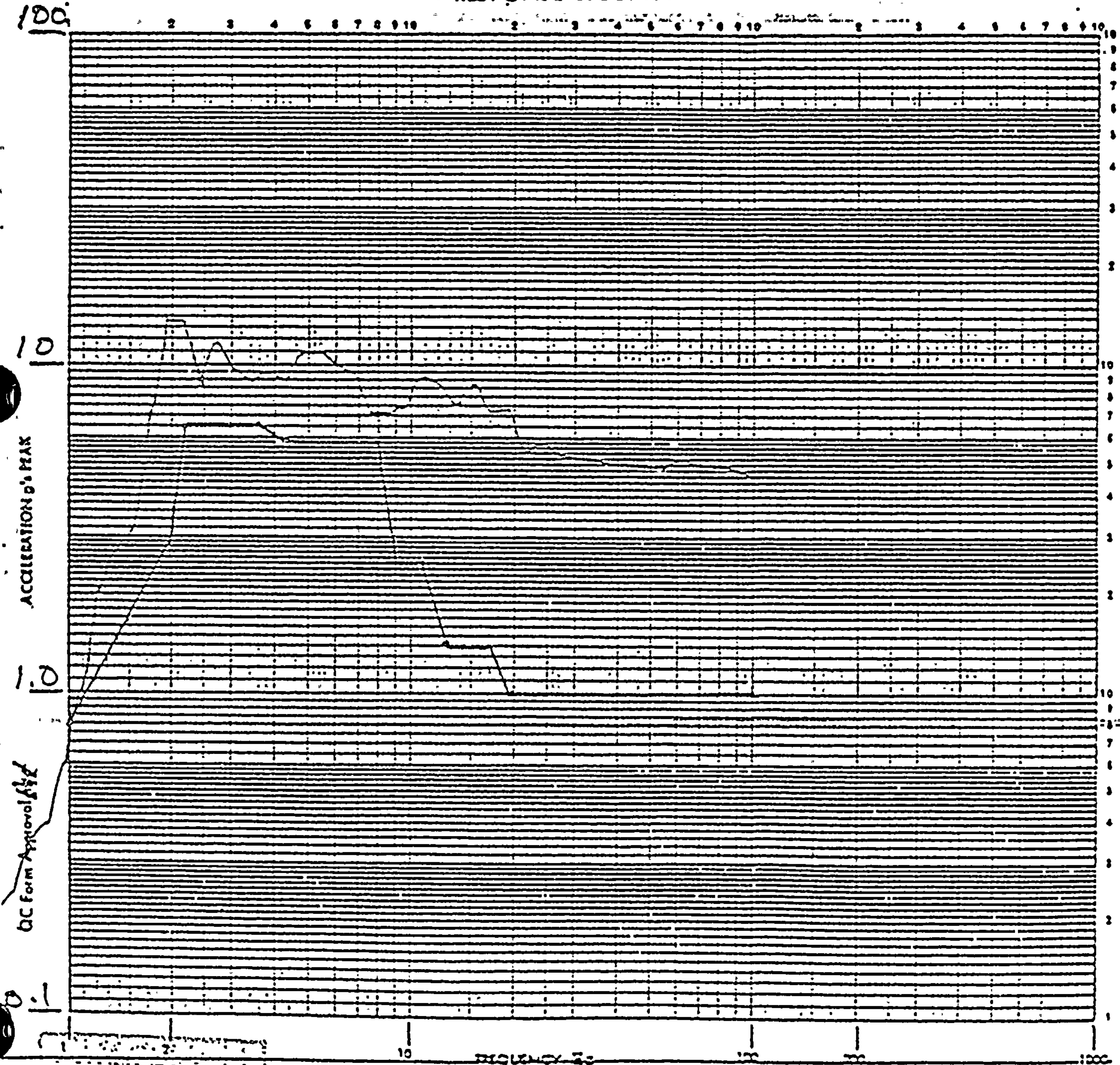
CUSTOMER ______ Job No. ______ Page No. 26 OF 31

Full Scale 100 g Accel. No. 1 Control (✓) Response ( )

Operator WYLE LAB Specimen 1 THRU 10

Date 8-29-79 Damping 3 % Axis of Test Y-Z HORIZ SSE #1

RESPONSE SPECTRUM



QC Form Approval

9-55 L-71167 . 151

CLIENT U-0755
0940-012
355003-3
BY
9/21/82
CHK KRB
10/15/82

FROM VT. 7

39/43

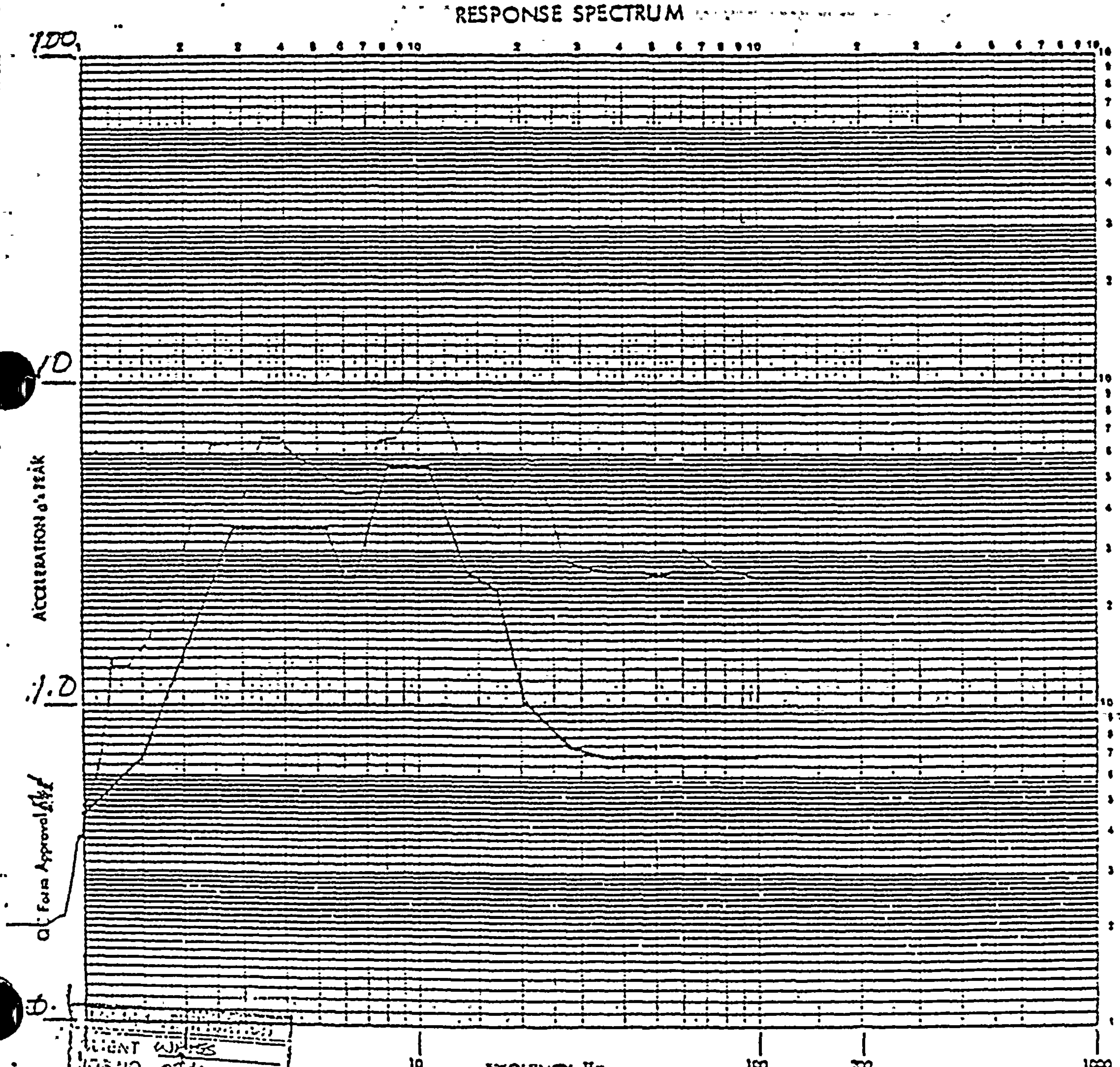
ANCO DOCUMENT# A-000021 PAGE# C-25

CUSTOMER ______________________ Job No. __________ Page No. 27 OF 31

Full Scale 100 g Accel. No. 2 Control (✓) Response ( )

Operator WYLE LAB Specimen 1 THRU 10

Date 8-29-79 Damping 3 % Axis of Test Y-Z VERT. SSE #1



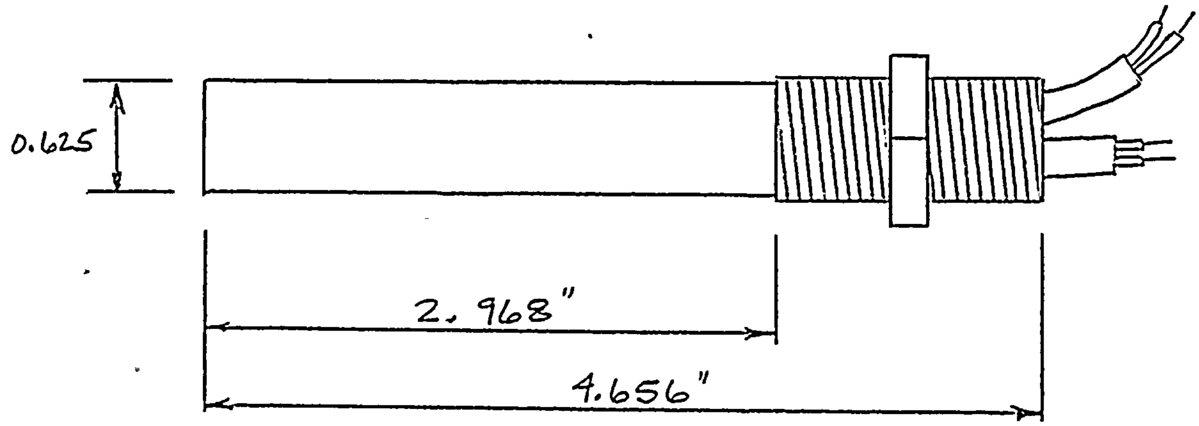
9-56

L-71167 152

CLIENT WPPSS
JOB NO. 2740-012
CALC. NO. ...
BY: ... DATE: 9/20/82
CHK'D KCS DATE 10/5/82
FROM VI.7

4.0 SUPPORTING CALCULATION

A CALCULATION WILL BE PERFORMED TO VERIFY THAT THE NATURAL FREQUENCY OF THE FENWAL TEMPERATURE SWITCH IS NOT IN THE RANGE 1.25 – 5.00 Hz, WHERE THE TRS DOES NOT BOUND THE RRS. THE SWITCH HAS THE FOLLOWING GEOMETRY (SEE FENWAL CATALOG – COPY IN QID 355003-E):



THE CROSS-SECTION IS CIRCULAR AND THE PIECE CAN BE MODELED AS A CANTILEVER WITH AN EVENLY DISTRIBUTED LOAD, W, IN lbf/ft. FROM ROARK & YOUNG "FORMULAS FOR STRESS + STRAIN", 5th Edition (McGraw Hill) pg 576, the

FOLLOWING FORMULA IS APPLICABLE:

$$f_n = \frac{K_n}{2\pi}\sqrt{\frac{EIg}{w(l)^4}} \qquad (1.)$$

WHERE

$K_n = 3.52$ for the first mode.

AS THE SHELL THICKNESS AND WEIGHT ARE NOT GIVEN, THE FOLLOWING CONSERVATIVE ASSUMPTIONS WILL BE MADE:

1. "I" WILL BE TAKEN AS 0.00586 in^4, * corresponding to 3/8 10s steel pipe
2. "E" WILL BE TAKEN AS 1.0×10^6 psi
3. "w" WILL BE TAKEN AS 0.74 lbf/ft, CORRESPONDING TO 3/8 80s steel pipe
4. "l" WILL BE TAKEN AS THE FULL LENGTH OF THE DEVICE

ALL OF THESE ASSUMPTIONS WILL TEND TO GIVE A LOWER VALUE OF f_n.

* SEE CRANE TECHNICAL PAPER # 410 "FLOW OF FLUIDS THROUGH VALVES, FITTINGS, AND PIPE" 1979, FOR PIPE SPECIFICATIONS

					WPPSS WNP-2 Equipment Qualification		
0	[illegible]	9/20/82	KRB	10/15/82	eldis nuclear	JOB NO 0740-012 CALC NO 355003-S	PAGE 42 OF 43
REV	BY	DATE	CHECKED	DATE			

MAKING THE SUBSTITUTIONS INTO EQN. 1 GIVES:

$$f_x = \frac{3.52}{2\pi}\sqrt{\frac{(1.0\times10^6\ psi)(0.00586\ in^4)(386.4\ in/s^2)}{\left(0.74\ \frac{lbf}{ft}\right)\left(\frac{ft}{12 in.}\right)\left(4.656\ in.\right)^4}}$$

$$= 156.6\ hz$$

THE FREQUENCY OF THE FIRST MODE FOR THIS DEVICE WILL BE "GREATER" THAN 157 HZ. THEREFORE, THE FACT THAT THE TRS DOES NOT BOUND THE RRS IS NOT A CONCERN.

NOTE: THE ABOVE CALCULATION APPLIES TO BOTH SIDE-TO-SIDE & FRONT-TO-BACK DIRECTIONS ON ACCOUNT OF SYMMETRY. THE NATURAL FREQUENCY IN THE AXIAL DIRECTION (FIRST MODE) WAS NOT DETERMINED SINCE THE STIFFNESS IN THIS DIRECTION IS OBVIOUSLY MUCH GREATER THAN SS OR FB.

BOP-A CAC-PS-68A (Part of E-CP-CAC/HR1B)

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

QUALIFICATION SUMMARY OF EQUIPMENT

I. PLANT NAME: WNP-2 TYPE:

1. UTILITY: WPPSS PWR ______

2. NSSS: GE 3. A/E: BURNS & ROE BWR 5, MARK II

II. COMPONENT NAME: HYDROGEN RECOMBINER CONTROL PANEL COMPONENT NO: E-CP-CAC/HR1A+ E-CP-CAC/HR1B+

1. SCOPE: ☐ NSSS ☒ BOP

2. MODEL NUMBER: S/N P2040 (1A+), S/N P2041 (1B+) QUANTITY: 2

3. VENDOR: AIR PRODUCTS & CHEMICALS, INC. (APCI)

4. IF THE COMPONENT IS A CABINET OR PANEL, NAME AND MODEL NO. OF THE DEVICES INCLUDED:

SEE ATTACHED SHEETS.

5. PHYSICAL DESCRIPTION: a. APPEARANCE: RECTANGULAR INSTRUMENT ENCLOSURE

b. DIMENSIONS: APPROX. 72"W x 30"D x 90"H

c. WEIGHT: APPROX. 3000 LB

6. LOCATION: BUILDING: REACTOR BLDG.

ELEVATION: 572'

7. FIELD MOUNTING CONDITIONS: ☒ BOLT (NO. 8, SIZE 5/8")

SEE SUPPORTING CALCULATION 4.2

☐ WELD (LENGTH ______)

☐ ______

8. a. SYSTEM IN WHICH LOCATED: ELECTRICAL

b. FUNCTIONAL DESCRIPTION: CONTROL PANEL FOR HYDROGEN RECOMBINERS 1A & 1B

c. IS THE EQUIPMENT REQUIRED FOR: ☐ HOT STANDBY ☐ COLD SHUTDOWN ☐ BOTH ☒ NEITHER

9. PERTINENT REFERENCE DESIGN SPECIFICATION: 2808-71

III. IS EQUIPMENT AVAILABLE FOR INSPECTION IN THE PLANT: ☒ YES ☐ NO

REV	BY	DATE	CHECKED	DATE		
0	KRBa.66	10/1/8?	MSR	10/15/8?	eds nuclear	JOB NO 0740012 CALC NO 050106-S

SUMMARY QUALIFICATION OF EQUIPMENT

II.4. DEVICES INCLUDED IN HYDROGEN RECOMBINER CONTROL PANELS:

MANUFACTURER	MODEL	NAME	EPN	QID
BAILEY INSTRUMENTS	9T66Y987	POWER SUPPLY	CAC-E/S-1A24 -1B24	105002
BARTON INSTRUMENTS	298	POWER SUPPLY	CAC-E/S-1A43 -1B43	105002
BAILEY METER CO.	50-730100DDDD1	FLOW INDICATOR	CAC-FI-5A1 -5B1	138001
BAILEY CONTROLS	50-701003AAAA1	FLOW INDICATING CONTROLLER	CAC-FIC-67A -67B	139001
BAILEY METER CO.	50-732132BBAA1	FLOW RECORDER	CAC-FR-67A1 -67B1	150002
MOORE INDUSTRIES	DCA/4-20MA/D-X2-X3	FLOW SWITCH	CAC-FS-6A -6B	154002
BABCOCK & WILCOX	745120AAAA1	LEVEL INDICATOR	CAC-LI-1A -1B	196003
MOORE INDUSTRIES	DCA/4-20MA/D-X1-X4	LEVEL SWITCH	CAC-LS-1A -1B	207009
ASEA ELECTRIC	RK-225-052-CF	RELAY	CAC-RLY-4A/1234 -4B/1234	283011
AGASTAT RELAY CO.	7012	RELAY	CAC-RLY-CR5A -CR5B -CR6A -CR6B	283013
AGASTAT RELAY CO.	7012AH	TIME DELAY SWITCH	CAC-TDS-1A -1B	338002

REV	BY	DATE	CHECKED	DATE			
0	KRB	10/1/92	[illegible]	1/15/[illegible]	WPPSS WNP-2 SEISMIC QUALIFICATION OF CLASS 1 EQUIPMENT eidis nuclear	JOB NO 0740012 CALC NO 050106-S	PAGE 9 OF 32

SUMMARY QUALIFICATION OF EQUIPMENT

II.4 DEVICES INCLUDED IN HYDROGEN RECOMBINER CONTROL PANEL:

MANUFACTURER	MODEL	NAME	EPN	QID
BAILEY METER CO.	50-701003AAAA1	TEMP. INDICATING CONTROLLER	CAC-TIC-4A -4B	341001
LEEDS & NORTHRUP	SPEEDOMAX H	TEMP. RECORDER	CAC-TR-1A1 -1B1	350003
MOORE INDUSTRIES	RBA/3W-100/D-X1-X4	TEMP. SWITCH	CAC-TS-1A -1B -2A -2B -3A -3B -5A -5B -6A -6B	355007
BABCOCK & WILCOX	50-740320CAAA1	RESISTANCE/CURRENT CONVERTER	CAC-R/I-4A -4B	271001
ITE IMPERIAL	A102D202	CONTACTOR	CAC-CNTR-1A -1B	045002
Moore Industries	DCA/4-20mA/D-X1-X4	Pressure switch	CAC-PS-68A -68B	256012

					WPPSS WNP-2
					SEISMIC QUALIFICATION OF CLASS I EQUIPMENT
0	KRB	10/1/82	MB2	10/15/82	eldis nuclear — JOB NO 0740012 — CALC NO 050106-S — PAGE 10 OF 32
REV	BY	DATE	CHECKED	DATE	

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

IV. EQUIPMENT QUALIFICATION METHOD:

☒ TEST ☐ ANALYSIS ☐ COMBINATION OF TEST & ANALYSIS

QUALIFICATION REPORT*: "DYNAMIC TESTING REPORT FOR HYDROGEN RECOMBINER SYSTEM",

(NO., TITLE & DATE): INCLUDING WYLE TEST REPORT 44835-1, DATED 1-7-80.

COMPANY THAT PREPARED REPORT: APCI & WYLE LABORATORIES

COMPANY THAT REVIEWED REPORT: EDS NUCLEAR

V. VIBRATION INPUT:

1. LOADS CONSIDERED: a. ☒ SEISMIC ONLY

   b. ☐ HYDRODYNAMIC ONLY

   c. ☐ COMBINATION OF (a) and (b)

N/A 2. METHOD OF COMBINING RRS: ☐ ABSOLUTE SUM ☐ SRSS ☐ OTHER (SPECIFY) ________

3. REQUIRED RESPONSE SPECTRA (ATTACH THE GRAPHS): SEE FIGURES 1-6

4. DAMPING CORRESPONDING TO RRS: ☒ OBE 1% ☒ SSE 2%

N/A 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:

N/A

* NOTE: IF MORE THAN ONE REPORT, COMPLETE ITEMS IV THROUGH VII FOR EACH REPORT.

REV	BY	DATE	CHECKED	DATE		
0	KRBrubb	11/1/82	MDC	11/1/82	eds nuclear	JOB NO 0740012 CALC NO 050106-S

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VI. IF QUALIFICATION BY TEST, THEN COMPLETE*:

1. ☐ SINGLE FREQUENCY ☒ MULTI-FREQUENCY ☒ RANDOM

2. ☐ SINGLE AXIS ☒ MULTI-AXIS ☐ SINE BEAT ☐ ______

3. NO. OF QUALIFICATION TESTS: OBE 5 SSE 2 OTHER (SPECIFY) ______

4. FREQUENCY RANGE: 1-250 HZ

5. NATURAL FREQUENCIES IN EACH DIRECTION (SIDE/SIDE, FRONT/BACK, VERTICAL):

S/S = >10.2 HZ F/B = 76.5 HZ V = >11.6 HZ

SEE SUPPORTING CALCULATION 4.1.

6. METHOD OF DETERMINING NATURAL FREQUENCIES:

☒ LAB TEST ☐ IN-SITU TEST ☐ ANALYSIS

SEE SUPPORTING CALCULATION 4.1.

7. TRS ENVELOPING RRS USING MULTI-FREQUENCY TEST: ☐ YES (ATTACH TRS & RRS GRAPHS) ☒ NO

SEE SUPPORTING CALCULATION 4.1.

N/A 8. INPUT g-LEVEL TEST: OBE S/S = ______ F/B = ______ V = ______

SSE S/S = ______ F/B = ______ V = ______

9. LABORATORY MOUNTING: SEE SUPPORTING CALCULATION 4.2.

1. ☒ BOLT (NO. 4, SIZE 1/2") ☐ WELD (LENGTH ______) ☐ ______

10. FUNCTIONAL OPERABILITY VERIFIED: ☒ YES ☐ NO ☐ NOT APPLICABLE

11. TEST RESULTS INCLUDING MODIFICATIONS MADE:

SPECIMEN FUNCTIONED WITHIN SPECIFICATIONS DURING & AFTER SSE TEST WITHOUT MODIFICATION.

12. OTHER TEST PERFORMED (SUCH AS AGING OR FRAGILITY TEST, INCLUDING RESULTS):

N/A

* NOTE: IF QUALIFICATION BY A COMBINATION OF TEST AND ANALYSIS, ALSO COMPLETE ITEM VII:

					eds nuclear	JOB NO 0740012
0	KEBaker	10/1/82	MDK	10/15/82		CALC NO 050106-S
REV	BY	DATE	CHECKED	DATE		

QUALIFICATION SUMMARY OF EQUIPMENT (CONTINUED)

VII. IF QUALIFICATION BY ANALYSIS, THEM COMPLETE: NOT APPLICABLE

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. CRITCAL 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 OPERABILITY

REV	BY	DATE	CHECKED	DATE		
0	KR Backli	10/1/82	MJR	10/13/82	eds nuclear	JOB NO C740012 CALC NO 050106-S

4.1 SPECTRA DISCUSSION

THE CAC HYDROGEN RECOMBINER IS INSTALLED IN REACTOR BLDG. AT ELEVATION 572'. THE REQUIRED RESPONSE SPECTRA ARE FROM ELEVATION 567' FOR SSE, AT 2% DAMPING, FOR THE REACTOR BUILDING. TEST RESPONSE SPECTRA (TRS) FROM REF. 4 DO NOT ENVELOPE REQUIRED RESPONSE SPECTRA (RRS). HOWEVER, THE FOLLOWING DISCUSSION WILL DEMONSTRATE THAT THE WYLE TESTS IN QUESTION DID ADEQUATELY SHOW THAT THE CAC HR CONTROL PANEL COMPOSITE WILL FUNCTION DURING AND AFTER AN SSE EVENT. TWO BIAXIAL SSE TEST RUNS WERE PERFORMED WITH THE PANEL OPERATING: ONE FRONT-BACK/VERTICAL (FB/V), THE OTHER SIDE-SIDE/VERTICAL (SS/V). BY PLOTTING THE RRS OVER THE TRS (FIGURES 3-6), WE FIND THAT THE TRS DOES NOT ENVELOPE THE RRS BELOW 5.5 HZ IN FB DIRECTION, 6.5 HZ IN V DIRECTION AND 7 HZ IN SS DIRECTION. IF IT CAN BE DEMONSTRATED THAT THE CONTROL PANEL COMPOSITE AND EACH DEVICE INCLUDED HAVE NO NATURAL FREQUENCIES IN THE FREQUENCY RANGE WHERE THE TRS DOES NOT ENVELOPE THE RRS, THEN THE TRS DOES SUFFICIENTLY MODEL THE RRS.

ALTHOUGH NO RESONANCE SEARCH TEST WAS PERFORMED ON THE PANEL ASSEMBLY, RESULTS OF THE 2 RANDOM MULTI-FREQUENCY BIAXIAL SSE TEST RUNS MAY BE INTERPRETED TO DETERMINE WHETHER THE PANEL ASSEMBLY WILL RESONATE BELOW THE CUT-OFF FREQUENCIES CITED ABOVE. SINCE THE FREQUENCY CONTENT OF THE RANDOM INPUT MOTION IS NOT KNOWN, IT WILL BE ASSUMED THAT

THE SHAKE TABLE INPUT WAS IN THE FORM OF A SERIES OF HALF-SINE WAVE IMPULSES. THE GRAPH BELOW, EXCERPTED FROM REFERENCE 6, INDICATES THAT FOR A SDOF SYSTEM SUBJECTED TO A HALF-SINE IMPULSE (AT 2% CRITICAL DAMPING) AT RESONANCE ($\tau/T = 1.0$) ONE WOULD EXPECT A DYNAMIC AMPLIFICATION FACTOR OF APPROX. 1.65 OF BASE INPUT MOTION. FIGURES 7-14 PLOT TEST OUTPUT MOTION FOR ACCELEROMETERS MOUNTED ON THE CAC HR CONTROL PANEL DURING THE TWO SSE TEST RUNS. SUPERIMPOSED ON THESE OUTPUTS, THE HORIZONTAL & VERTICAL CONTROL ACCELERATIONS (SHAKE TABLE INPUTS LABELED TRS). HAVE BEEN PLOTTED. IN ADDITION, FICTICIOUS LINES HAVE BEEN PLOTTED TO MARK VALUES OF 1.65 TIMES INPUT MOTION (LABELLED 1.65 TRS). THUS WHEREVER PANEL OUTPUT ACCELEROMETER PLOTS EXCEED THE 1.65 TRS PLOTS, THE PANEL WOULD BE EXPECTED TO HAVE A NATURAL FREQUENCY. FIGURES 7-14 THUS INDICATE THAT THE PANEL NATURAL FREQUENCIES TO BE ABOVE THE FOLLOWING VALUES:

DIRECTION	F_N	DIRECTION	F_N	DIRECTION	F_N
FB	>6.5 HZ	V	>11.6 HZ	SS	>10.2 HZ

HALF-CYCLE SINE PULSE EXCITATION. Figure 8.43 shows the spectra of maximax response for a viscously damped system excited by a half-cycle sine pulse.

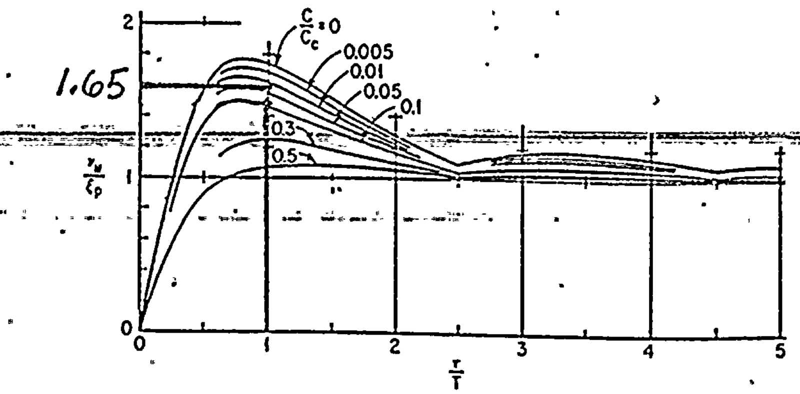


FIG. 8.43. Spectra of maximax response for a viscously damped single degree-of-freedom system acted upon by a half-cycle sine pulse.

					WPPSS	WNP-2	
					SEISMIC QUALIFICATION OF CLASS I EQUIPMENT		
					eidis nuclear	JOB NO 0740012	PAGE 15
0	KRS	10/11/82	PJC	10/15/82		CALC NO 050106-S	OF 32
REV	BY	DATE	CHECKED	DATE			

THUS, FOR THE CONTROL PANEL ASSEMBLY, ALL NATURAL FREQUENCIES ARE EXPECTED TO BE ABOVE THE REGIONS WHERE THE TRS DOES NOT ENVELOPE THE RRS.

NATURAL FREQUENCIES FOR INDIVIDUAL DEVICES MOUNTED ON THE CAC HR CONTROL PANEL ASSEMBLIES HAVE BEEN DETERMINED FROM TESTS ON THE INDIVIDUAL DEVICES, AND ARE SUMMARIZED BELOW:

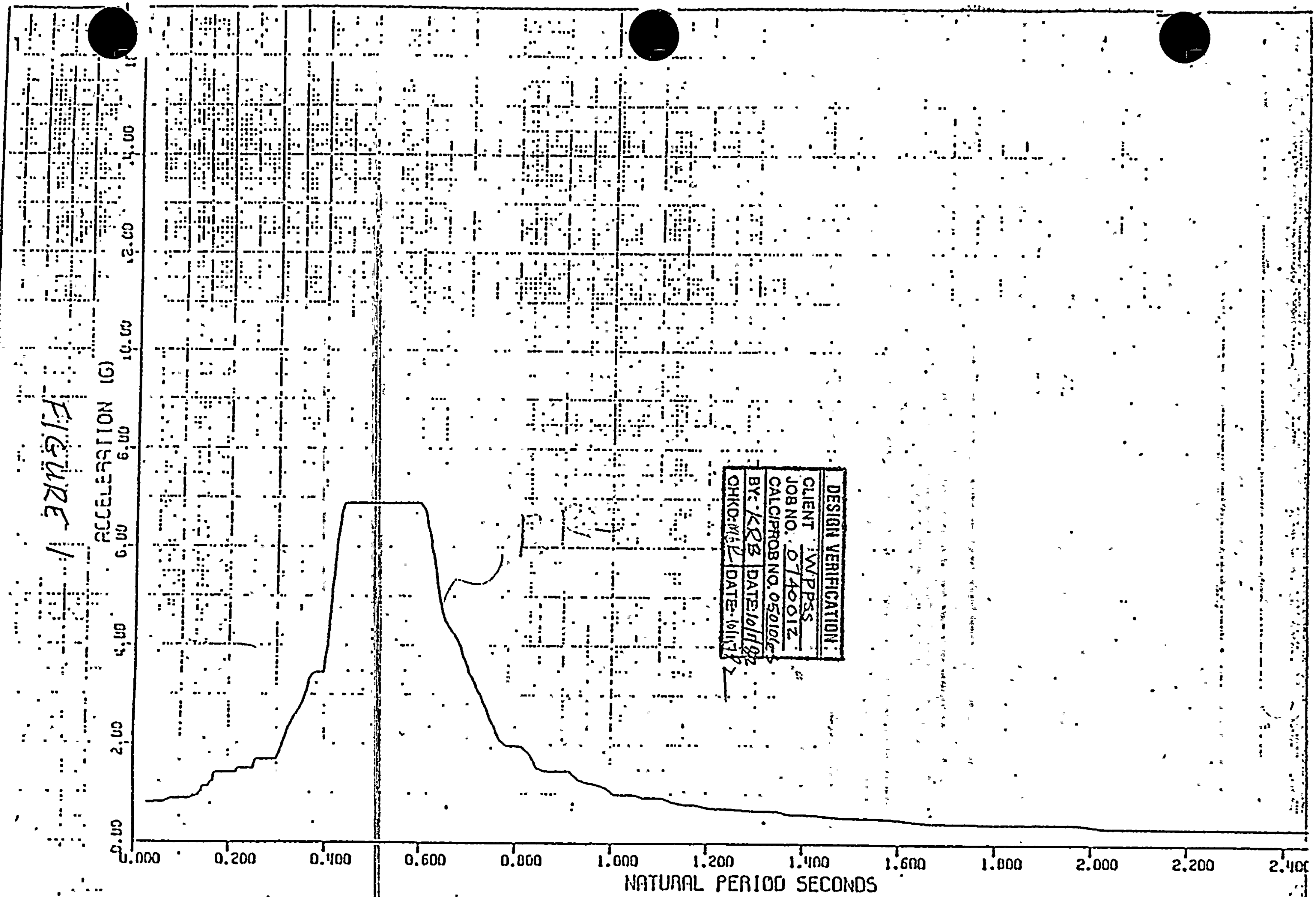
MANUFACTURER	MODEL	NAT. FREQUENCIES	REFERENCE
BAILEY	9T66Y987	NONE	9
BARTON	298	NONE	10
BAILEY	50-730 SERIES	≥ 30 Hz	11
BAILEY	50-701 SERIES	≥ 40 Hz	12
MOORE	DCA/4-20MA/DX2X3	≥ 12 Hz	13
BABCOCK & WILCOX	740 SERIES	≥ 26 Hz	14
MOORE	DCA/4-20MA/DX1X4	≥ 12 Hz	13
ASEA	RK-225 SERIES	NONE *	16
AGASTAT	7012 SERIES	NONE *	17
LEEDS & NORTHRUP	SPEEDOMAX H	≥ 7 Hz	18
MOORE	RBA/3W-100/DX1X4	≥ 12 Hz	13
BABCOCK & WILCOX	50-740 SERIES	≥ 26 Hz	14
ITE IMPERIAL	A102D202	NONE ☆	☆

* RESONANCE SEARCH NOT PERFORMED, HOWEVER NO CONTACT CHATTER OBSERVED THROUGHOUT RANDOM MULTIFREQUENCY TESTING.

☆ ASSUMED – OPEN ITEM.

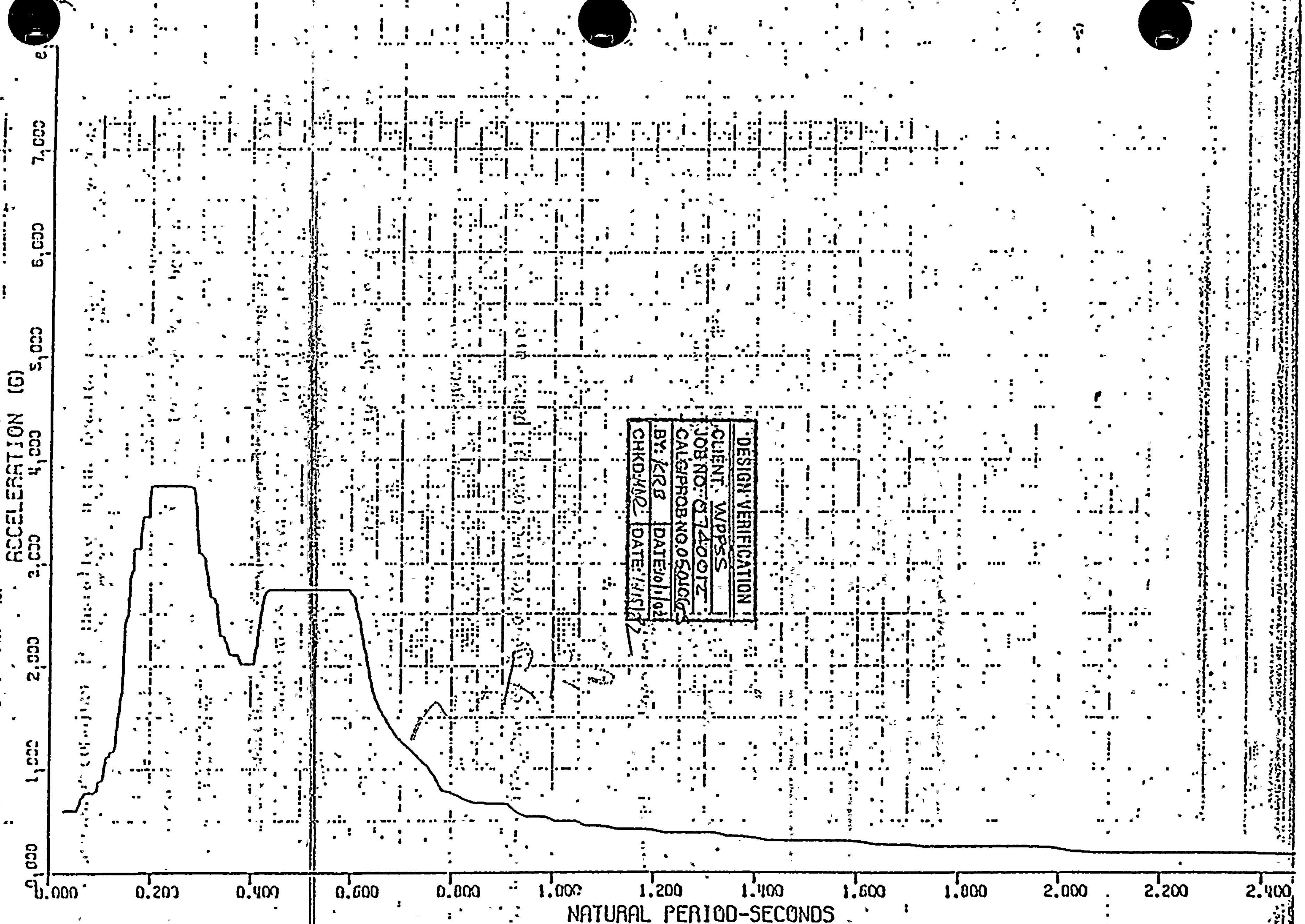
THE ABOVE TABLE (UPON RESOLUTION OF THE NOTED OPEN ITEM) INDICATES THAT NO DEVICE MOUNTED ON THE CAC HR CONTRO PANEL HAS NATURAL FREQUENCIES BELOW 7 Hz WHERE THE TRS DOES NOT ENVELOPE THE RRS. THUS THE TRS DOES ADEQUATELY MODEL THE RRS

THE PRECEEDING DISCUSSION THUS DEMONSTRATES THAT THE TEST RESPONSE SPECTRA ENVELOPES THE REQUIRED RESPONSE SPECTRA OVER A FREQUENCY RANGE. WHICH INCLUDES ALL NATURAL FREQUENCIES OF THE EQUIPMENT (INDIVIDUAL DEVICES AS WELL AS COMPOSITE ASSEMBLY) UP TO 33HZ, IN COMPLIANCE WITH PARAGRAPH 6.6.3.1 OF IEEE STD 344-1975 (REFERENCE 3).



WPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (DBE) FLOOR SPECTRUM - HORIZONTAL
MASS NO.3, EL. 567'-4.5", DAMPING=0.02

FIGURE 2



HPPSS, HANFORD NO.2, REACTOR BUILDING, MODEL NO. 2 REV. 1
SSE (DBE) FLOOR SPECTRUM - COMBINED VERTICAL
MASS NO.3, EL. 567'-4.5", DAMPING=0.02

4835-1

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 □ 10 □ 100 ☒ 1000 □

DAMPING 2%

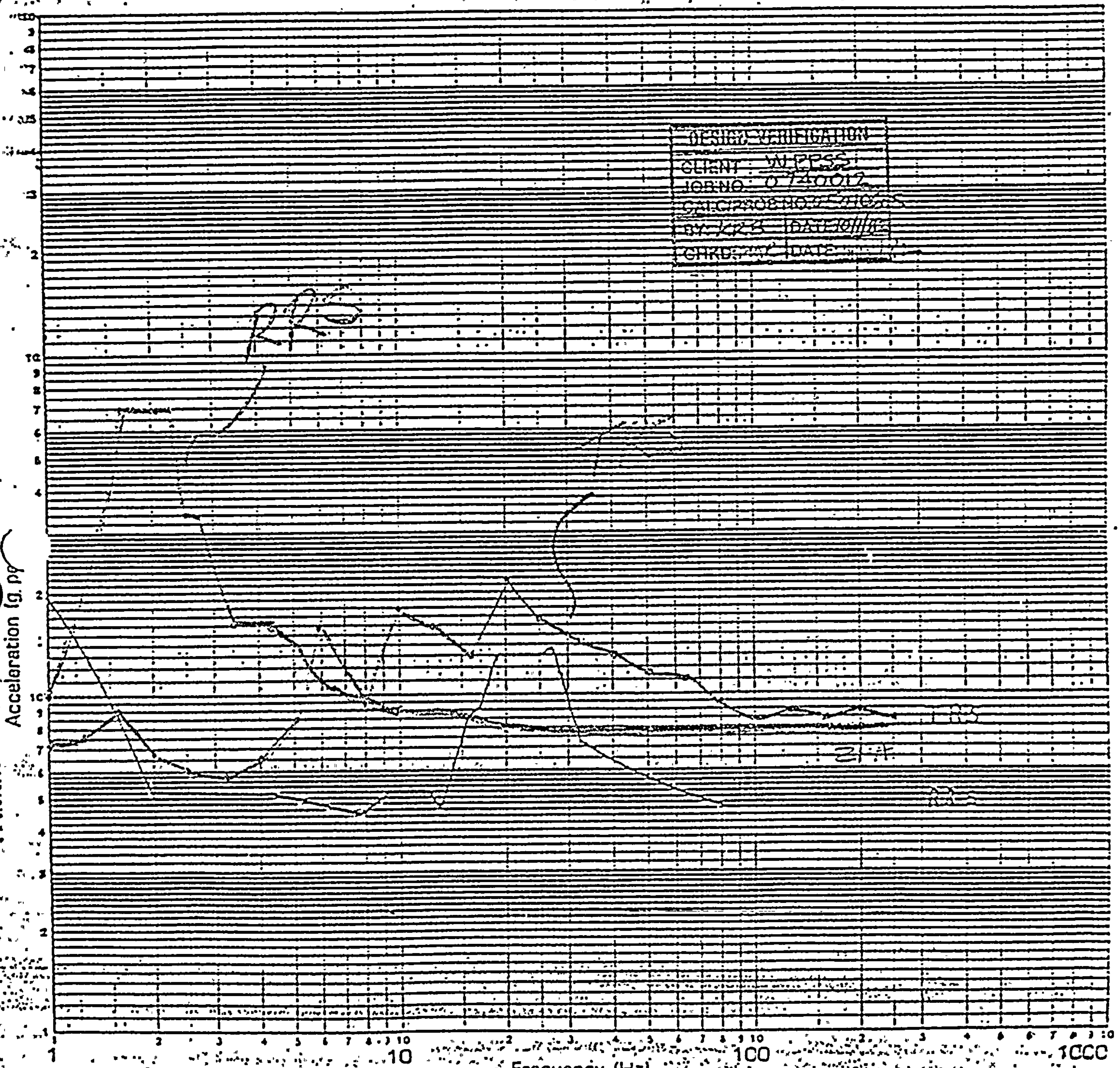


FIGURE 3

LOCATION NO. HCA

AXIS E3 // TEST RUN NO. 9

Hrs

5'7'

R

2%

20/32

FULL SCALE SHOCK SPECTRUM (Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000☐

DAMPING 2 %

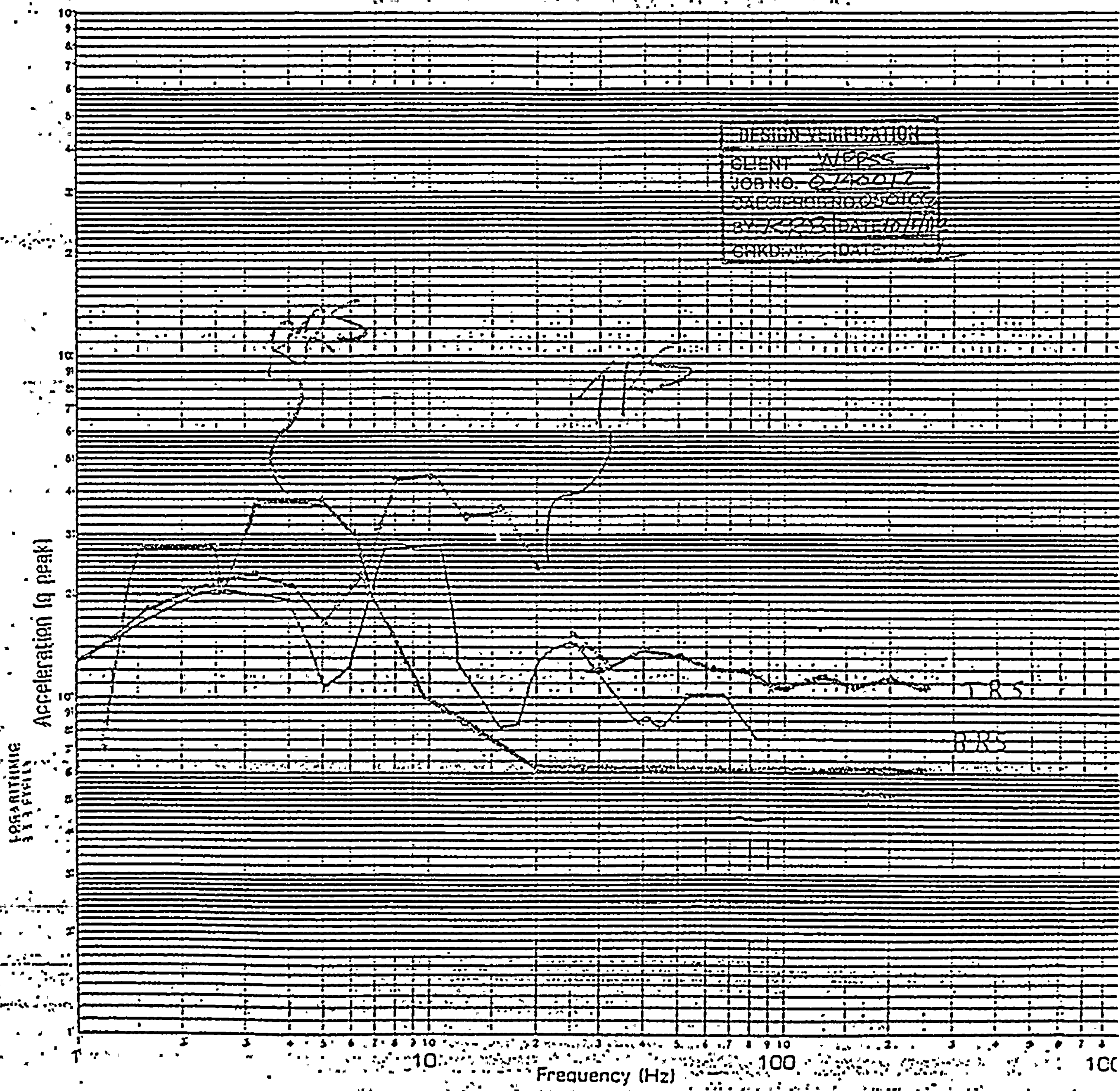


FIGURE 4

Vert

LOCATION NO. VCA

AXIS EF/ / TEST RUN NO. 9

Page. No.. 44
Report No.. 44SIS-I

F . SCALE SHOCK SPECTRUM (g P)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐

DAMPING 2%

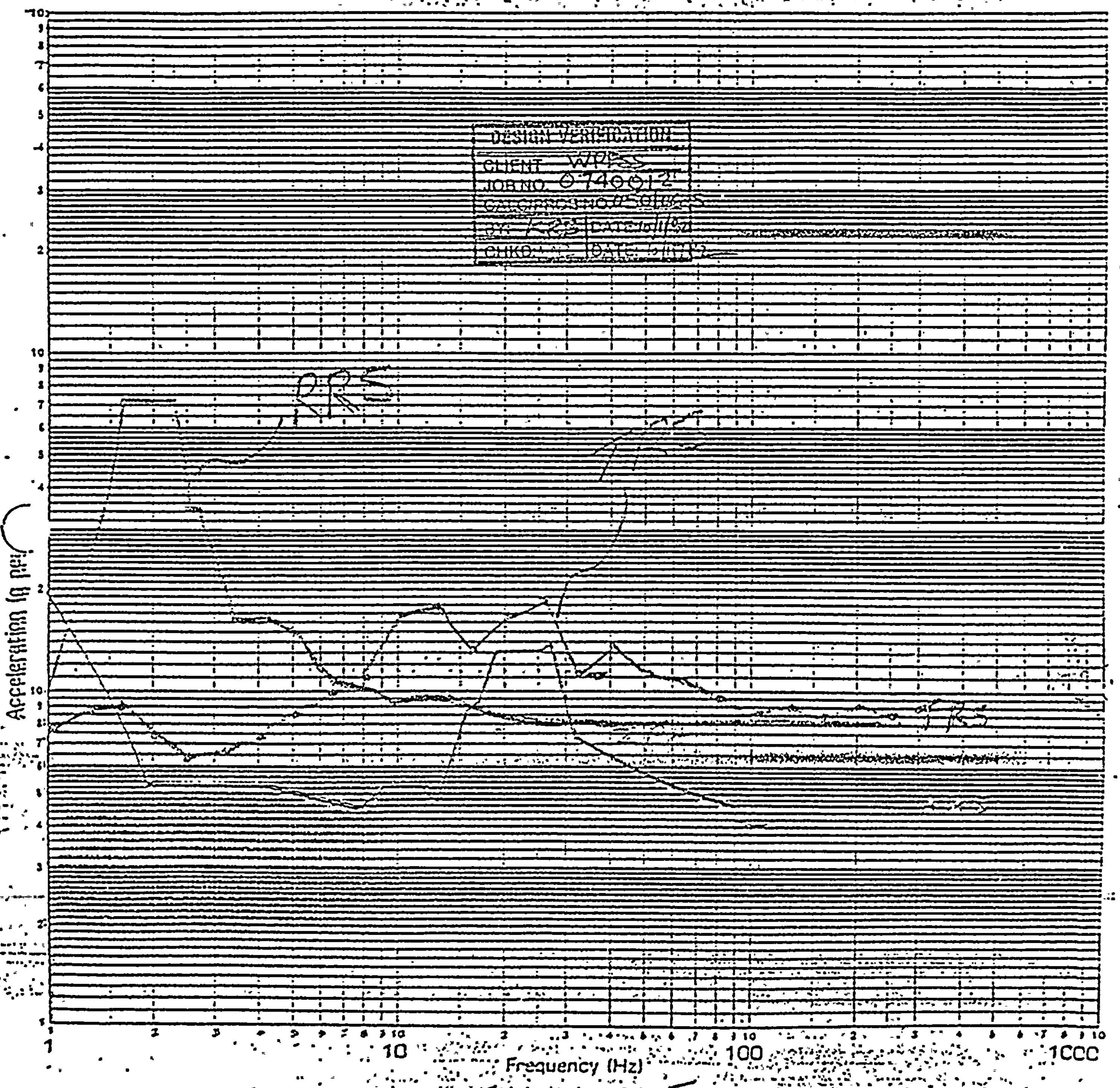


FIGURE 5

LOCATION NO. HCA

AXIS SS/V

TEST RUN NO. 16

22/32

FULL SCALE SHOCK SPECTRUM (Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐

DAMPING 2%

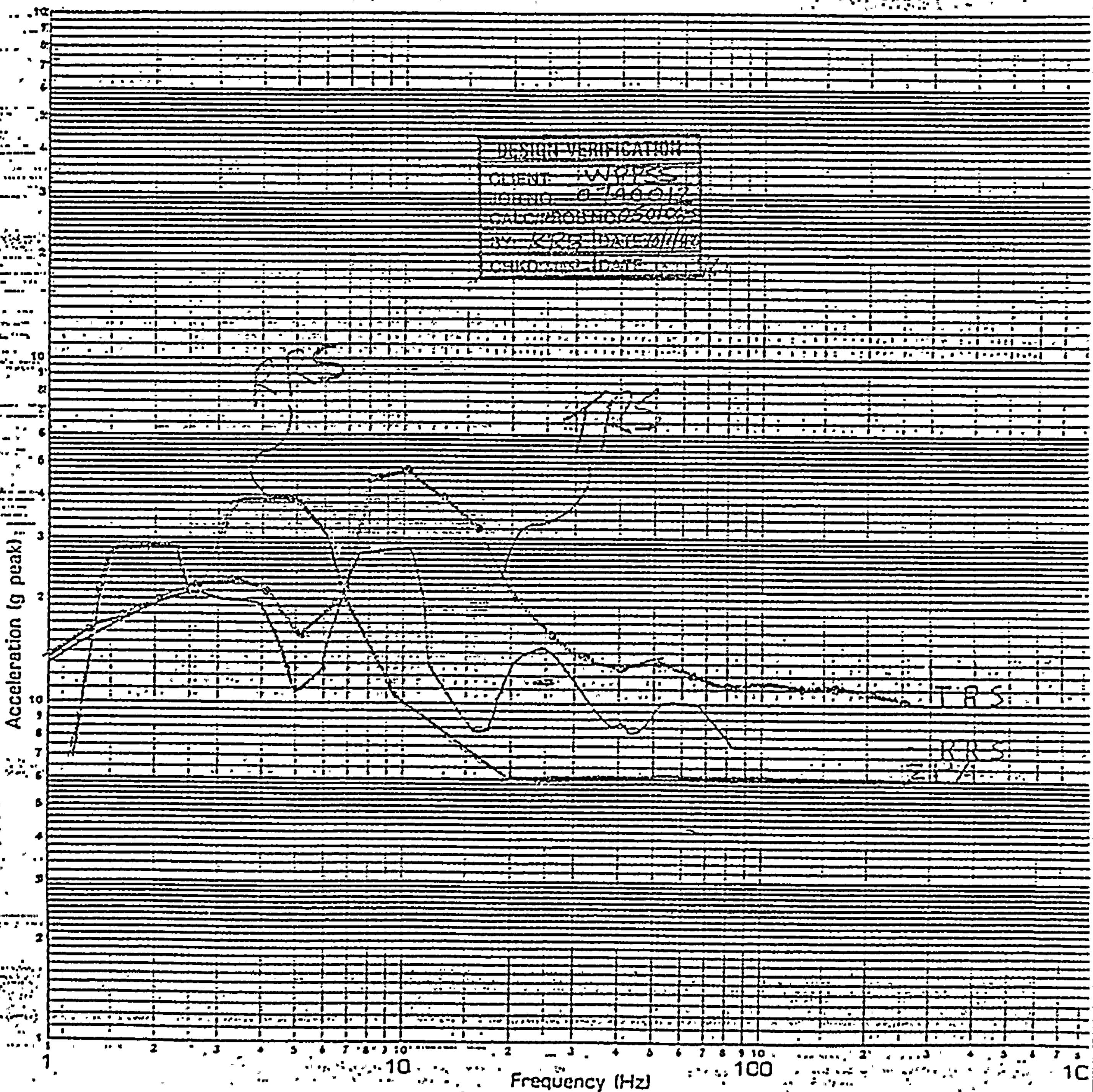


FIGURE 6

LOCATION NO. VCA

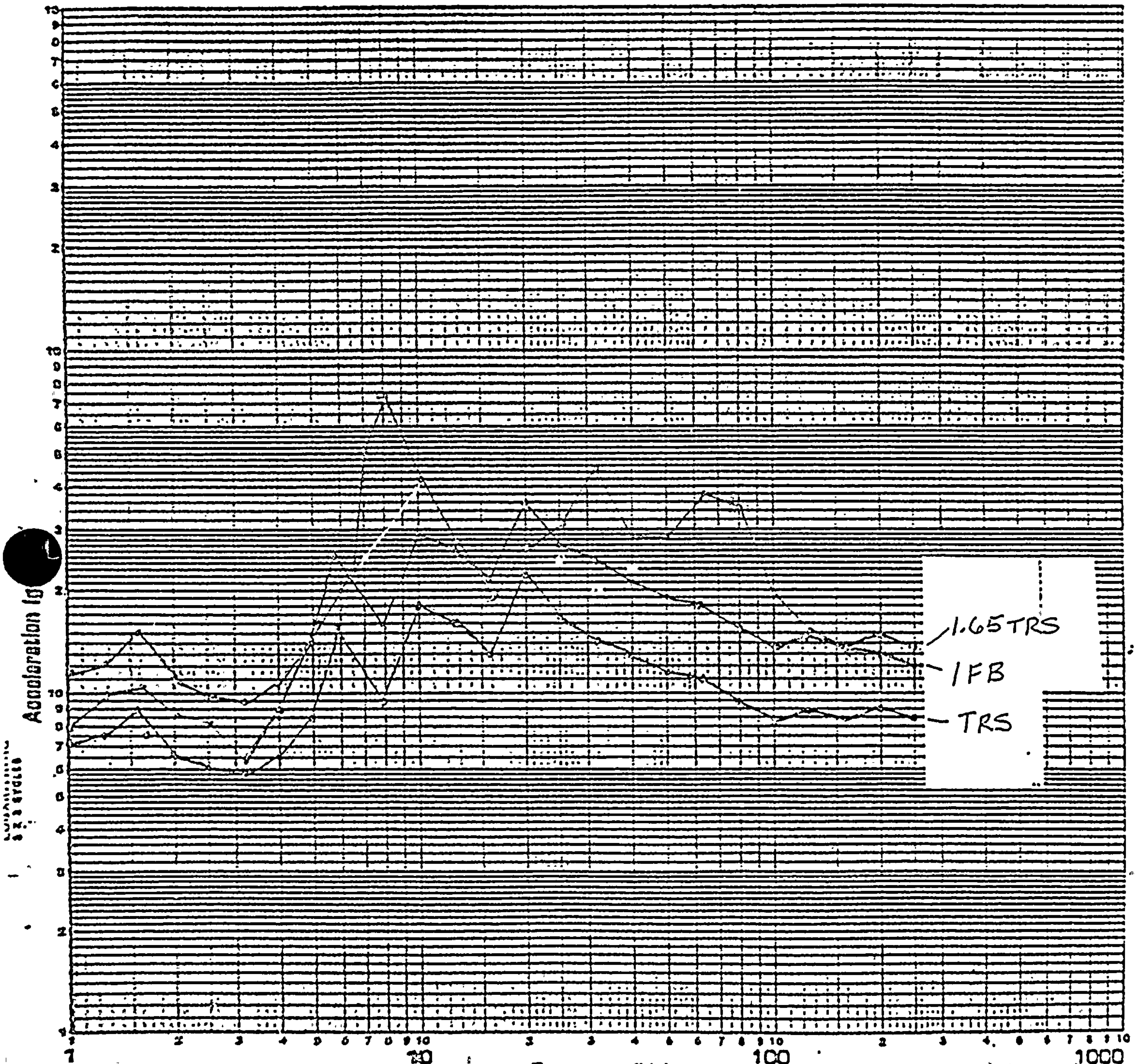
AXIS SSIV TEST RUN NO. 16

23/32

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000☐

DAMPING 2 %



H-2/V-4

SPECIMEN CONTROL PANEL

AXIS EB/V

LOCATION NO. 1 FB

TEST RUN NO. 9

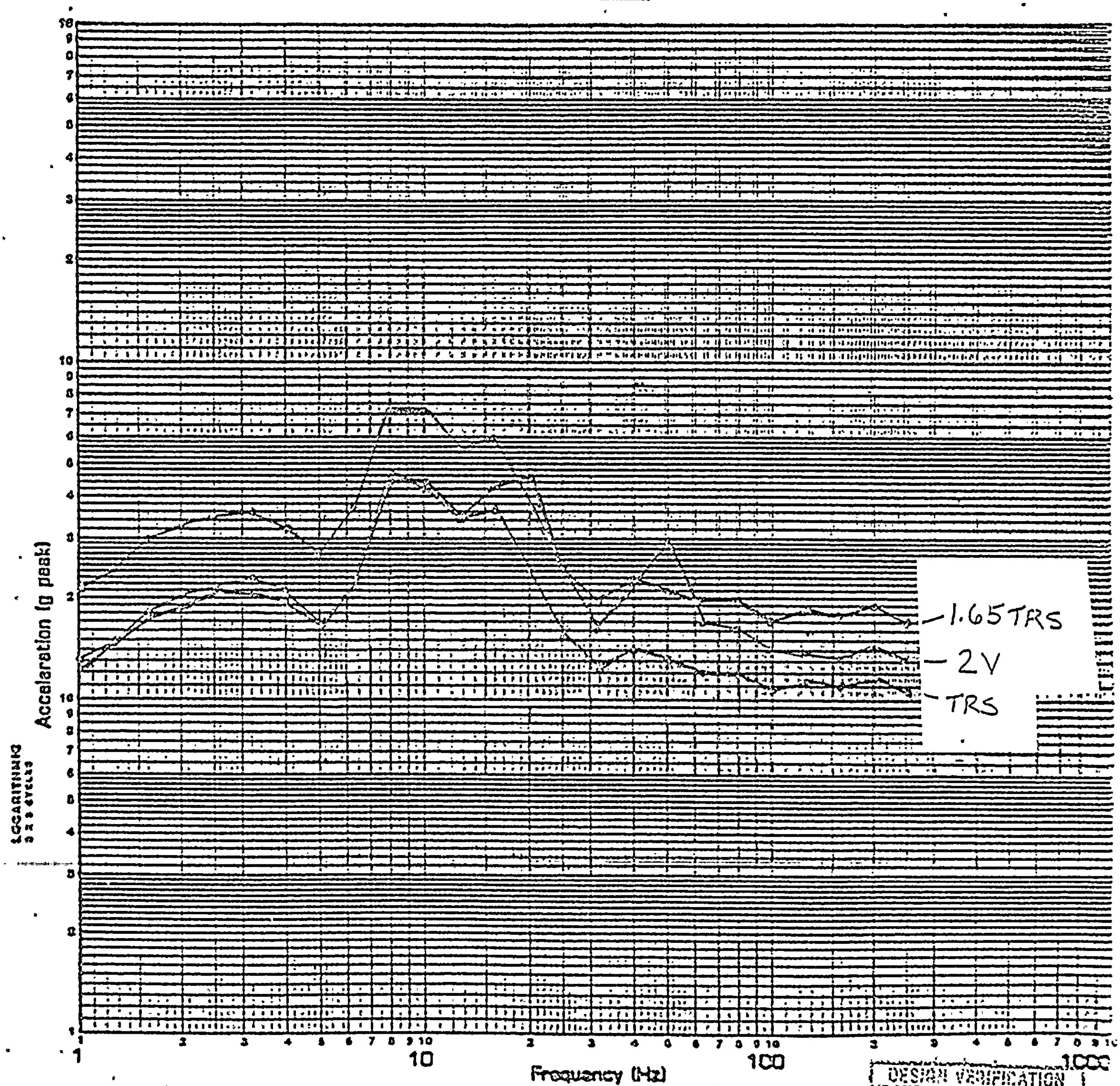
DESIGN VERIFICATION
CLIENT WPPSS
JOB NO. 0740012
CALC/PROB NO. 650106-S
BY KRB DATE 10/1/82
CHK'D MD DATE 10/1/82

FIGURE 7

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐

DAMPING 5%



DESIGN VERIFICATION	
CLIENT	WPPSS
JOB NO.	0730012
CALC/PROB NO.	050106-S
BY: KSS	DATE: 10/1/82
[illegible] MIN	DATE: 10/14/82

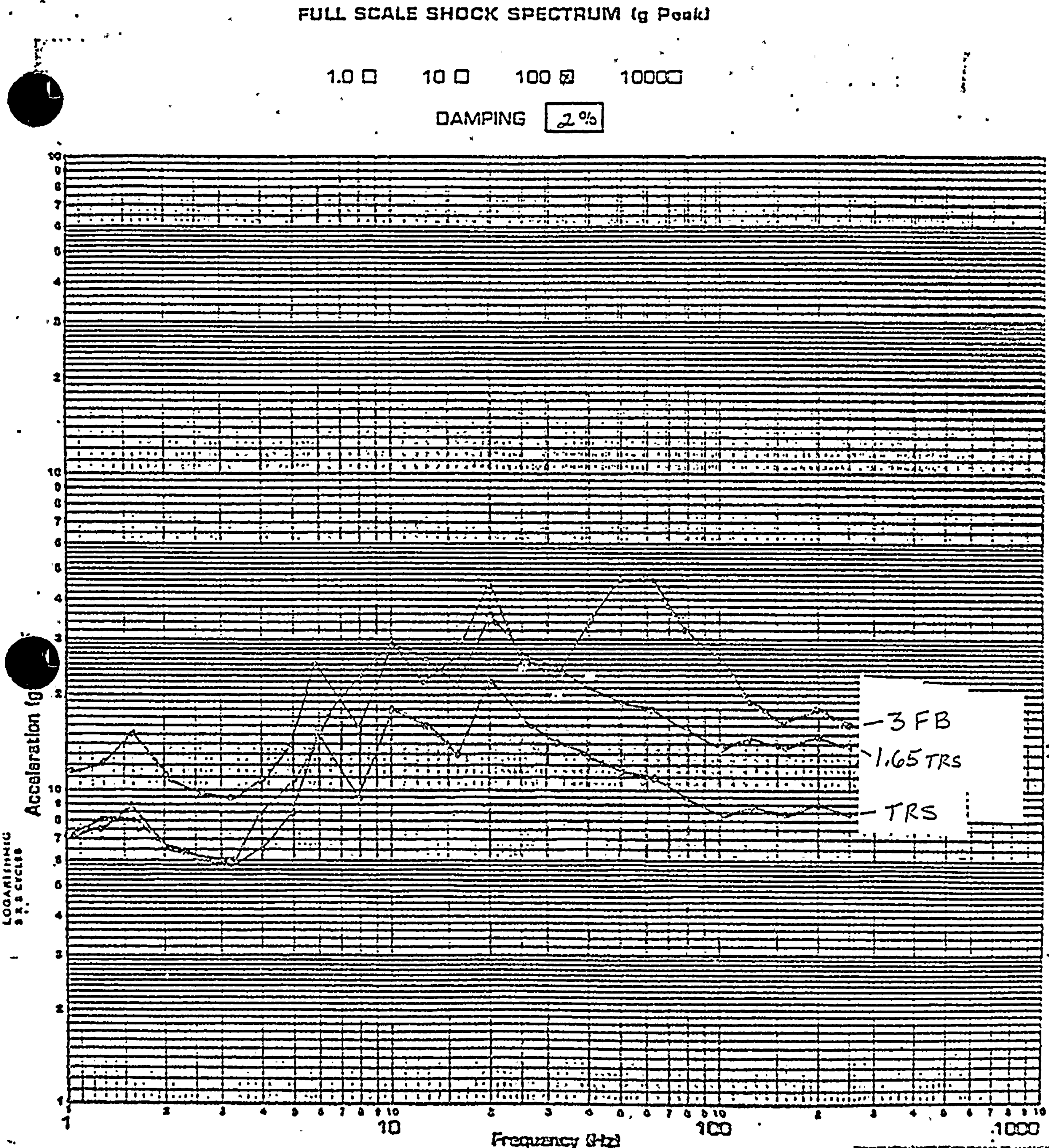
SPECIMEN Control Panel

AXIS EB/ V

LOCATION NO. 2 V

TEST RUN NO. 9

FIGURE 8



SPECIMEN CONTROL PANEL
AXIS F&B/V
LOCATION NO. 3 FB
TEST RUN NO. 9

DESIGN VERIFICATION
CLIENT WPPSS
JOB NO. 0740012
CALC/PROB NO. 050106-5
BY: KRS DATE 10/1/82
CHK'D MD DATE: 10/17/82

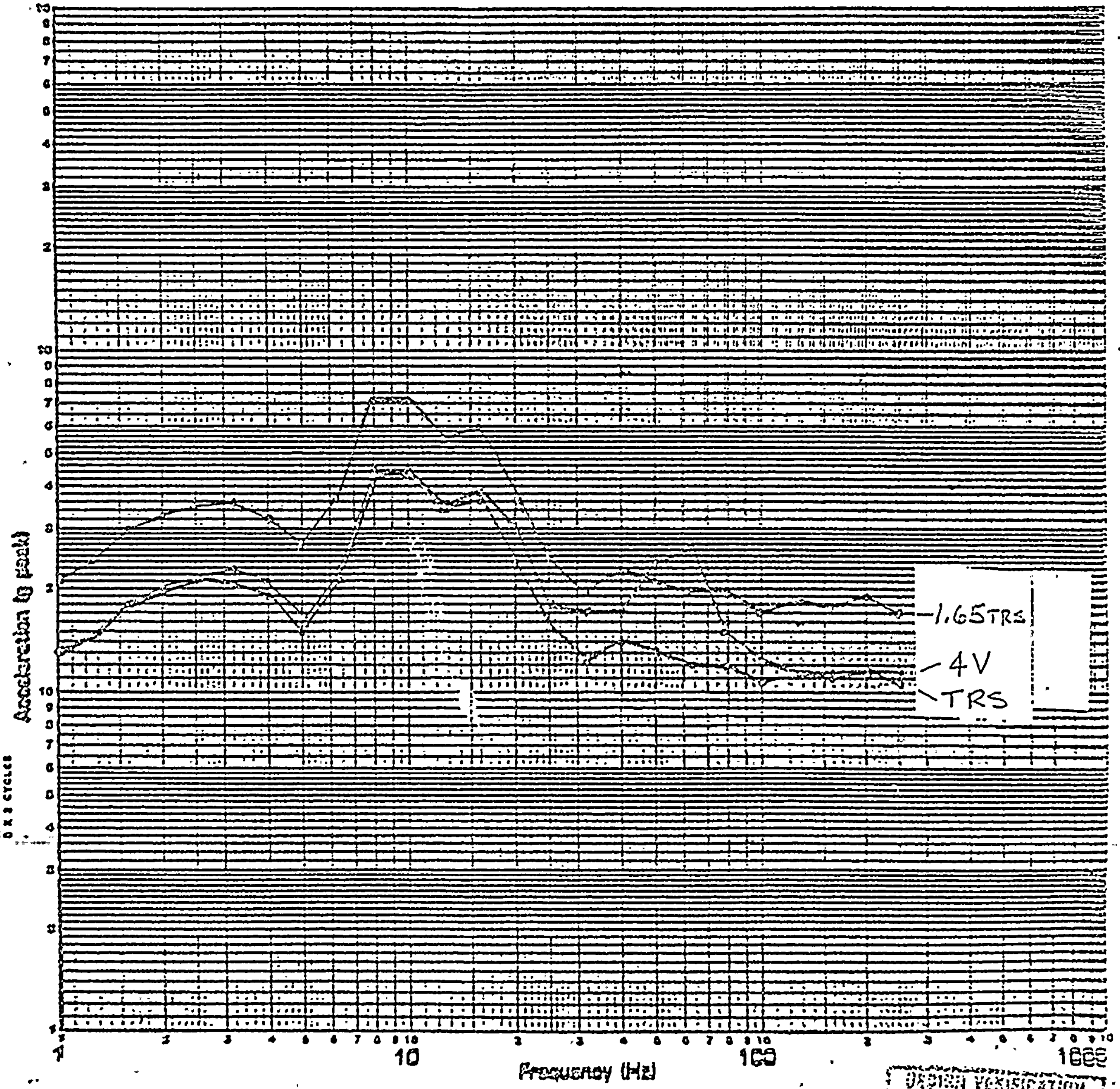
FIGURE 9

H-A 41

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐

DAMPING 2%



DESIGN VERIFICATION
CLIENT WPPSS
JOB NO. 0740072
CALC/PROC NO. 050106S
BY KRS DATE 10/1/92
MDR DATE 10/1/92

SPECIMEN Control Panel LOCATION NO. 4V

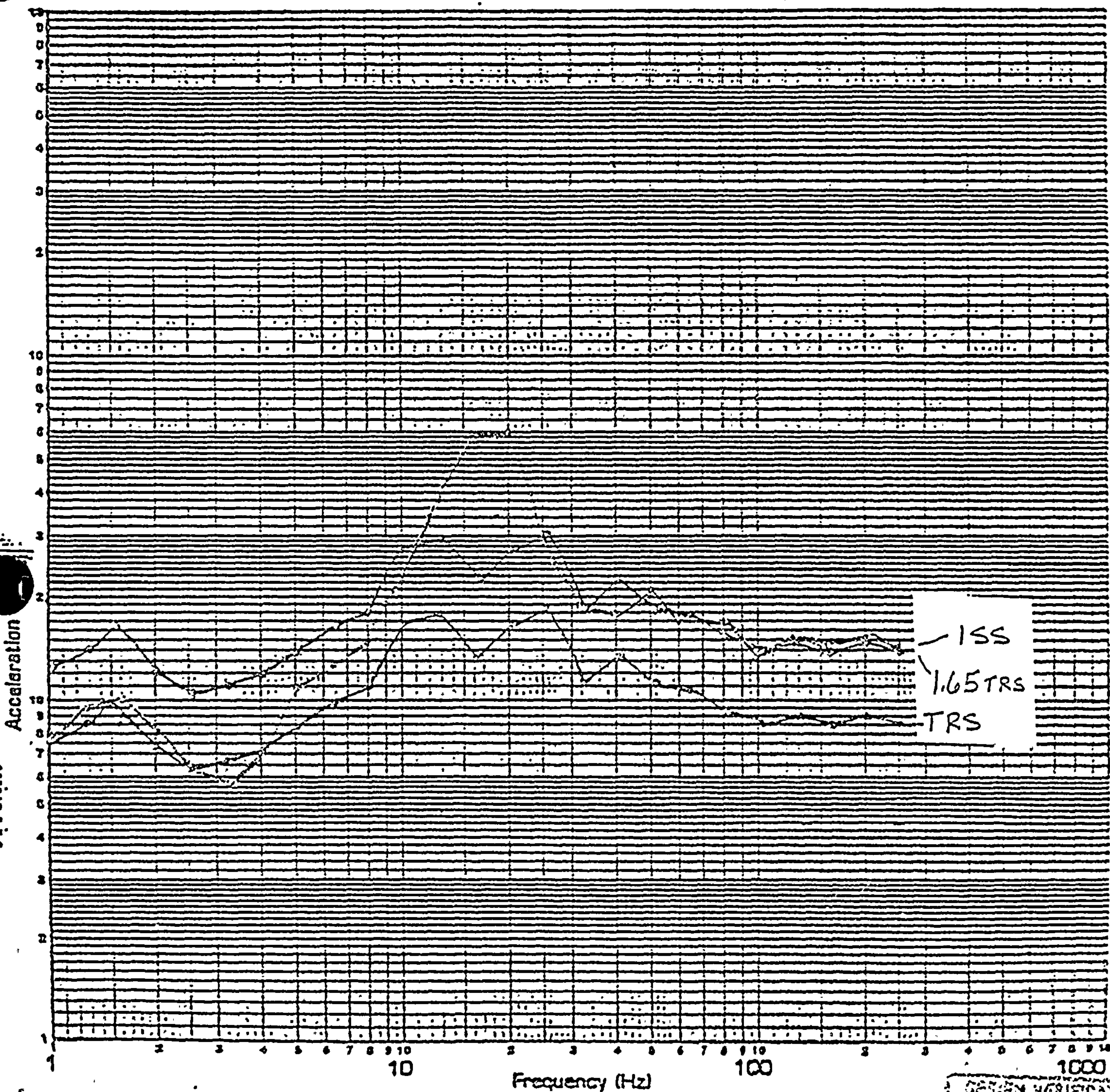
AXIS FB/V TEST RUN NO. 9

FIGURE 10

FULL ALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000☐

DAMPING 2%



SPECIMEN CONTROL PANEL

LOCATION NO. 1SS

AXIS SSLV

TEST RUN NO. 16

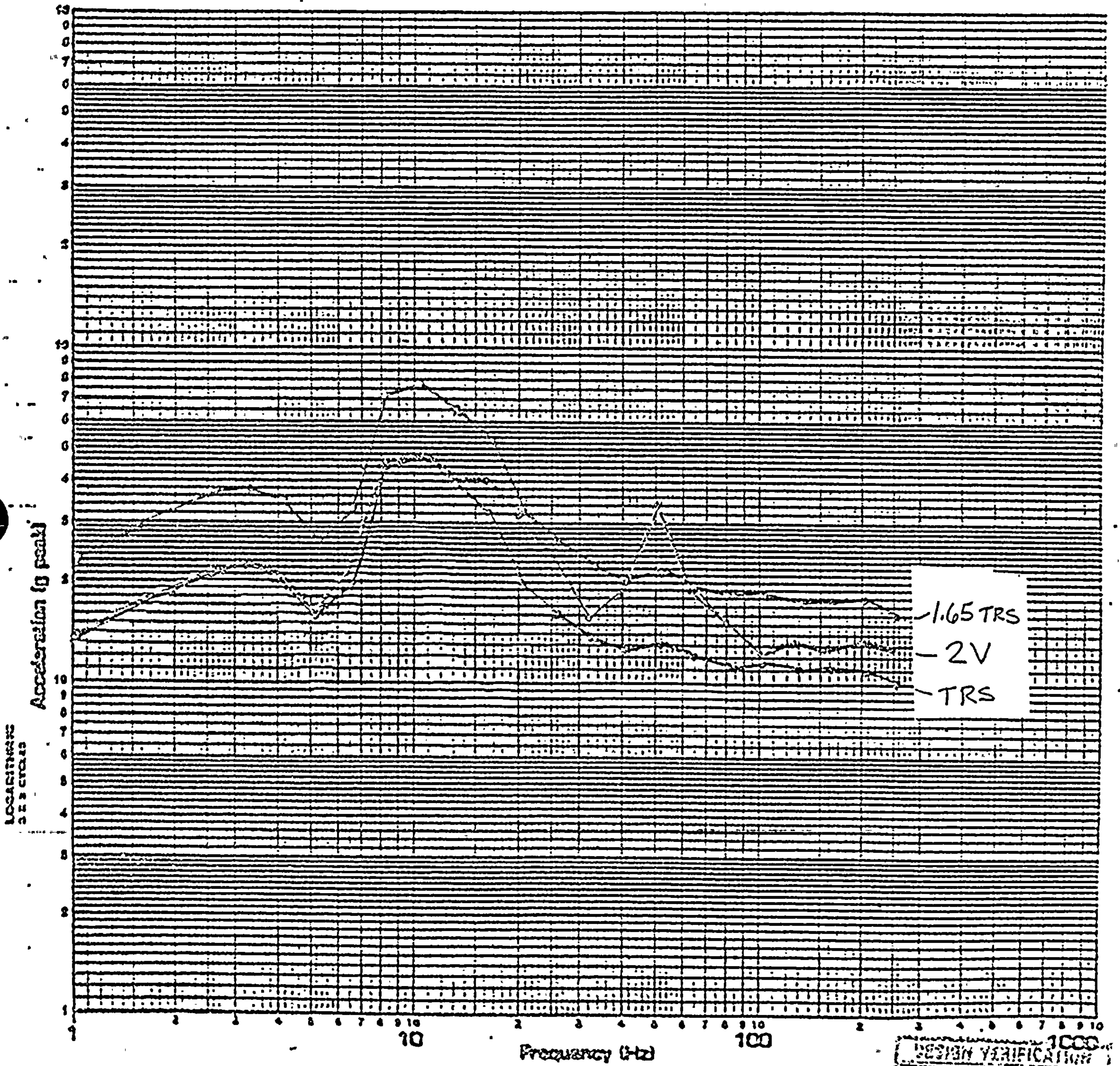
DESIGN VERIFICATION
CLIENT WPPSS
JOB NO. 0740012
CALC/PROB NO. 050100S
BY: KRS DATE: 10/1/82
CHKD: MAK DATE: 10/14/82

FIGURE 11

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000☐

DAMPING 2%



DESIGN VERIFICATION
CLIENT WPPSS
JOB NO. 0740012
CALC/PROC NO. 050106-5
BY KRB DATE 10/1/82
CHKD MJ DATE 10/14/82

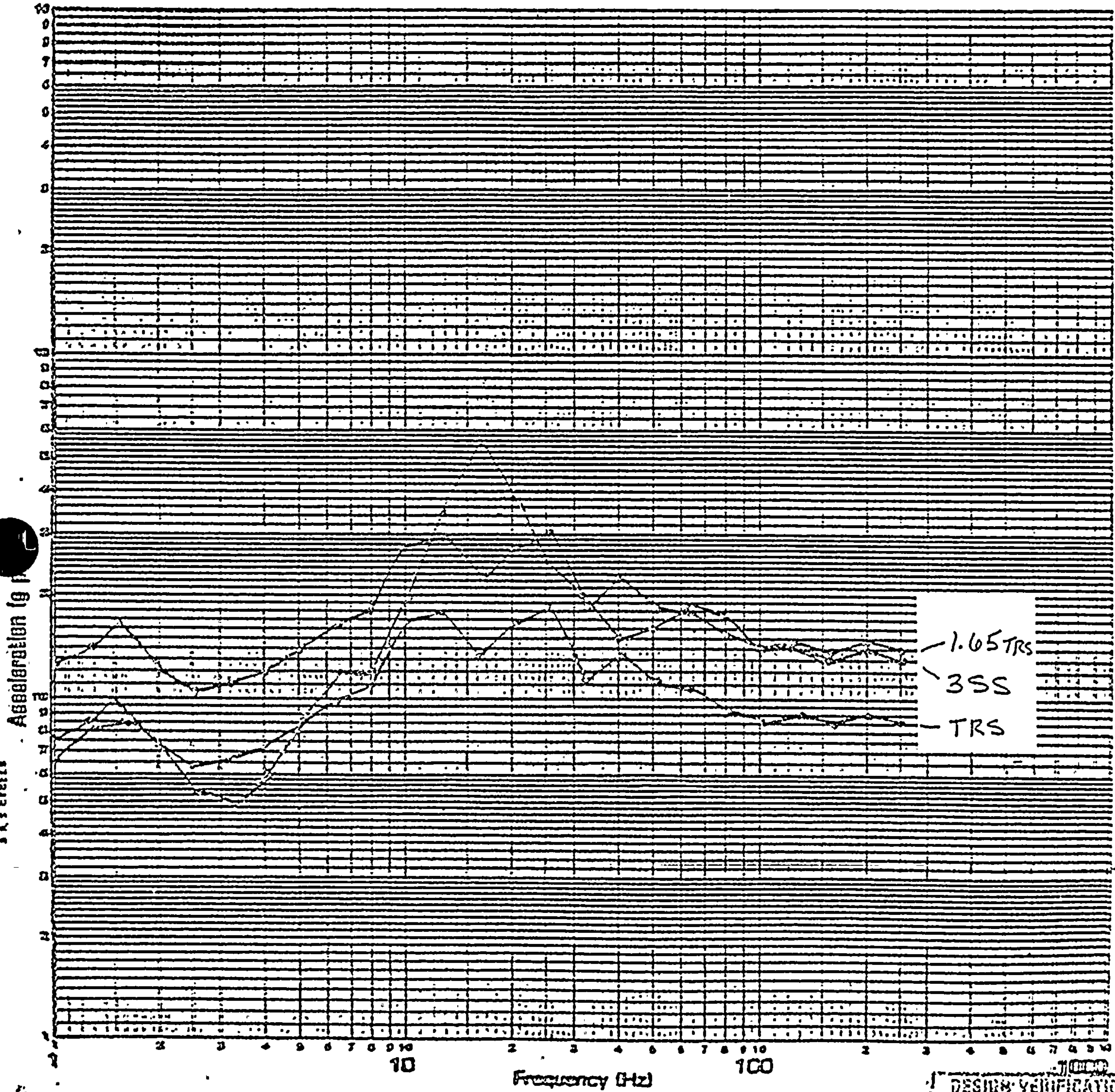
SPECIMEN CONTROL PANEL
AXIS SS/V
LOCATION NO. 2 V
TEST RUN NO. 16

FIGURE 12

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000 ☐

DAMPING 2 %



DESIGN VERIFICATION
CLIENT: WPPSS
JOB NO. 0740012
CALC/PROB NO. C0501CG-S
BY: KRB DATE 10/1/82
CHKD: MDR DATE 10/14/82

SPECIMEN CONTROL PANEL

LOCATION NO. 3SS

AXIS S/S

TEST RUN NO. 11

FIGURE 13

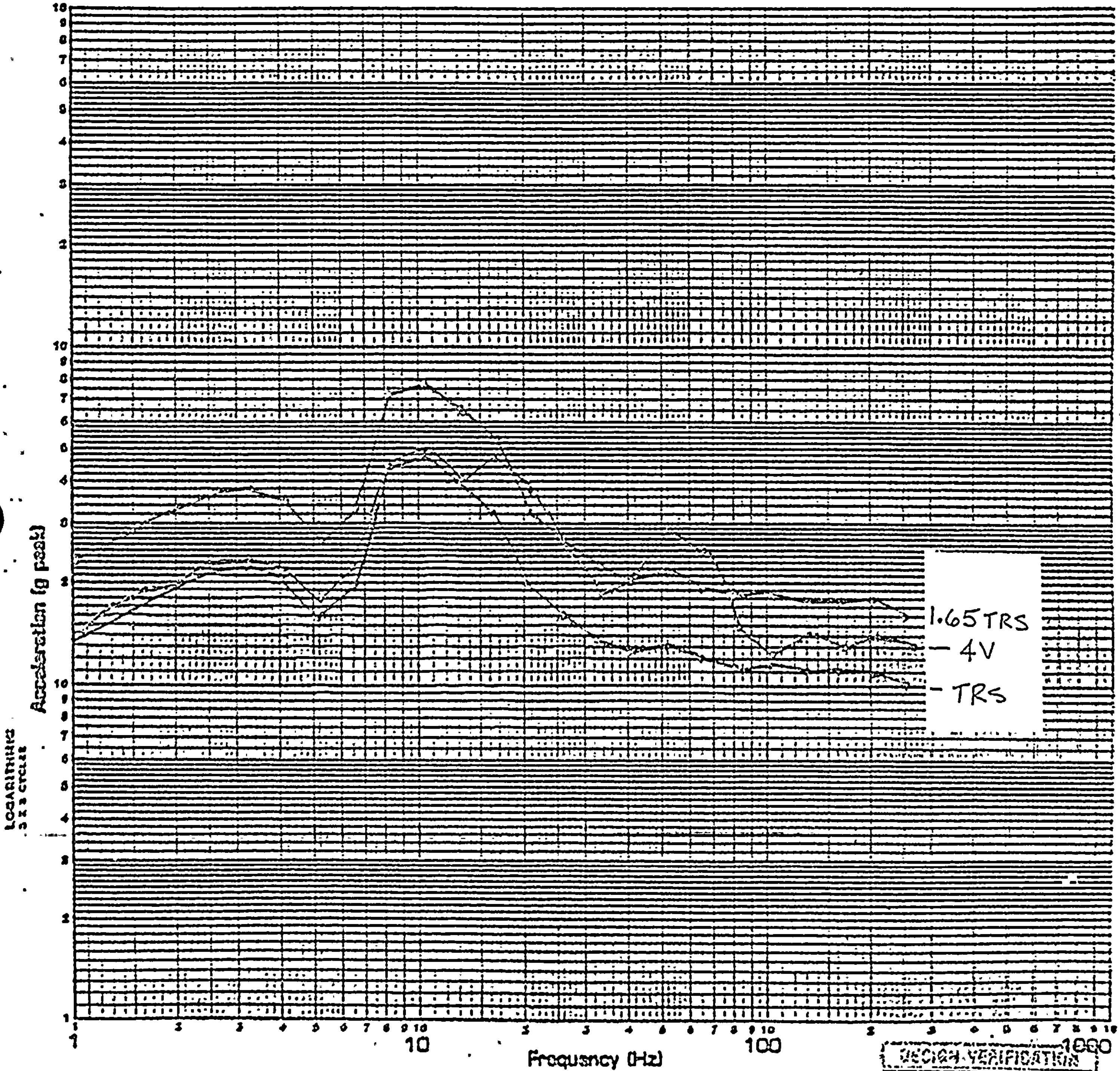
4.2 MOUNTING CONDITIONS

THE TESTED CONTROL PANEL WAS NOT MOUNTED TO THE SHAKE TABLE (REFERENCE 4) EXACTLY AS IT IS INSTALLED IN THE FIELD. APPARENTLY, THE TESTED PANEL WAS BOLTED TO A FIXTURE (USING FOUR 1/2" BOLTS) WHICH WAS THEN WELDED TO THE SHAKE TABLE WHILE, IN THE FIELD, EIGHT 5/8" BOLTS ANCHOR EACH CONTROL PANEL TO THE FLOOR & WALL. THIS DIFFERENCE IS JUDGED TO BE INSIGNIFICANT SINCE FIELD MOUNTING IS MORE RIGID AND WILL NOT INVALIDATE TEST RESULTS.

FULL SCALE SHOCK SPECTRUM (g Peak)

1.0 ☐ 10 ☐ 100 ☒ 1000☐

DAMPING 2%



DESIGN VERIFICATION
CLIENT WPPSS
JOB NO. 0140012
CALC/PROB NO. C50106
KRB DATE 10/1/82
CHKD MJR DATE 10/14/82

SPECIMEN Control Panel
LOCATION NO. 4V
AXIS SS/-V
TEST RUN NO. 16

FIGURE 14