CAROLINA POWER & LIGHT COMPANY
NUCLEAR PLANT ENGINEERING DEPARTMENT
PROCEDURE

Number 3.2

SUBJECT

DESIGN CHANGE CONTROL

3.2.1 APPLICABILITY

All NPED personnel (including NPED managed contract personnel) who are involved with changes to approved designs for Q-List equipment, systems, structures or other work being performed to meet the requirements of ANSI N45.2.11-1974.

3.2.2 PURPOSE

To specify the procedures to be used to evaluate and control changes to approved designs involved with equipment, systems, structures or other work required to be performed in accordance with ANSI N45.2.11-1974.

3.2.3 GENERAL

The need or reasons for changes to approved designs may be identified by NPED personnel or other organizations involved in the review, approval or use of the design documents.

The extent of the design verification required is a function of the importance to safety of the item under consideration, the complexity of the design, the degree of standardization, the state of the art and the similarity with previously proven designs. For minor design changes that do not involve changing the safety review or design calculations or the original design documents, verification may not be required.

Design changes may be implemented in the field prior to any required revision of the original design documents, based on interim design change information released by the Assigned Individual, provided appropriate reviews are conducted before final acceptance as permitted by appropriate site procedures and/or interface agreements.

Changes to Design Documents prepared by one organization may be authorized by another (i.e., CP&L may authorize a change to an AE prepared design document or vice versa) as directed by NPED, provided such changes are developed in accordance with approved design change procedures. The responsible NPED Supervisor will assure that the alternate design agency possesses the necessary background, knowledge, and capability as required by ANSI N45.2.11.

3.2.4 DEFINITIONS

3.2.4.1 Field Change Request — A request for deviation from design drawings and/or specifications normally initiated by the implementing organization prior to implementation or a request for permanent

| | | |
|---|---|---|
| 3.2.4.1 | Field Change Request (Cont'd) | waiver non-conforming items to be "used as-is." Field Change Requests may utilize an "FCR Form" or other controlled means of transmission, such as "Field Memos." |
| 3.2.4.2 | Design Change Notice | A request or notification to change an established design document normally initiated by the design agency as a result of design development or to implement field changes. |
| 3.2.4.3 | Interpretation | Advisory information provided to assist in implementation of design documents which does not violate the limiting criteria set forth in the plant design documents. |

3.2.5 PROCEDURE

| | Responsibility | | Action |
|---|---|---|---|
| 3.2.5.1 | Responsible Supervisor | a. | Assigns the responsibility for handling design change to appropriate individual or organization cognizant of design requirements. |
| | | b. | Provides guidance to initiate the evaluation and development of the design change. |
| | | c. | Provides guidance on the extent of design verification and specifies additional reviews desired. |
| 3.2.5.2 | Assigned Individual(s) or Organization | a. | Performs engineering evaluation of identified problem and/or of proposed design changes. Interpretations may be resolved between the implementing organization and the NPED approving authority without creating design change documentation for approval or record. |
| | | b. | Prepares or revises authorizing documents, as necessary, to effect the change. These may be interim or permanent design documents, as appropriate. Interim documentation may be in the form of approved Field Change Requests, Design Change Notices, or other locally |

| Responsibility | | Action |
|---|---|---|
| 3.2.5.2 | Assigned Individual(s) or Organization | authorized mechanisms as provided for in locally (site) approved procedures. Where NPED is performing the design change activity and permanent documents are involved, the applicable portions of NPED Procedure 3.1 apply. |
| | | c. Obtains appropriate verifications/reviews. Design change documentation which changes the requirements of design specification or procurement documents affecting safety-related, fire protection and radwaste QA programs must be reviewed by the appropriate QA organization prior to implementation. |
| 3.2.5.3 | Responsible Supervisor | a. Reviews design change documents and any reviews/verifications and resolves any concerns. |
| | | b. Obtains or provides necessary approvals for final release of design change documents. Level of approval will be commensurate with approval levels of NPED Procedure 3.1. |
| | | c. Ensures that design change documents are filed and/or distributed as delineated by applicable site procedures, interface documents or distribution lists. |

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.65

Piping Stress Analysis Data, Allowable Flange Moments

The Stress Analysis Data package contains sheets showing moments from Calculation No. 8050-1 and "Allowable Moment"; presumably in units of ft-lb. The allowable moments of 32285 and 64570 apparently were calculated by Eqs. (12) and (13), NC-3658.3 of the present Section III.

Eqs. (12) and (13) can be used only if the flanged joint uses high strength bolts.

(a) What is the basis for the 99214 allowable moment?

(b) Where does the Specification CAR-SH-M-30, Rev. 16 assure that high strength bolts are used in the flanged joints?

RESPONSE:

(a) The 99214 allowable moment is based on the Level C Service Limit of NC-3658.3 of the present Section III.

(b) Specification CAR-SH-M-30, Appendix A, General Requirements, Paragraph VI calls for use of ASTM A-193, Grade B7 bolting which per ASME-III code classification is a high strength bolting material. In addition, the specification allows the use of ASTM A-307, Grade B material for piping Categories 6, 7, and 8 with design pressure 250 psig or less and the design temperature 450° or less.

The latter material spec (A-307-Grade B) as indicated by the M-30 spec., has a limited use. This material was used by Southwest Fabricating only for the nonpressure boundary applications. Refer to the below discussion for more details.

As a followup to this question, the following comments were made by NRC during the meeting on August 16, 1983 in Bethesda, MD:

(1) The CAR-SH-M-30 Specification, Appendix A, Paragraphs VIb states: "---- conforming to ANSI B18.2.1 heavy dimensions and per ASTM A-193, Grade B7 may be used." The staff requested to revise this sentence to read "---- per ASTM A 193, Grade B7 shall be used."

(2) ASTM A-307, Grade B bolting material identified in the CAR-SH-M-30 Specification, Appendix A, General Requirement, Paragraph VI C, is not a high strength bolting material.

(3) Provide assurance that only high strength bolts are being furnished by Southwest Fabricating and by field.

(7876FXTccc)

NRC Question 210.65 (cont'd)

Regarding comment (1), the M-30 Specification will be revised to incorporate the NRC comment.

Related to comments (2) and (3), the concerns were reviewed with Southwest Fabricating and the field. Southwest position is reflected in the enclosed letter dated August 17, 1983 (Item 3). The procurement of bolting materials by field is summarized in the enclosed CP&L letter LS-4995, dated August 19, 1983.

210.6T

# SOUTHWEST FABRICATING & WELDING CO., INC.

August 17, 1983 S-EB-748

Ebasco Services, Inc.
2 World Trade Center, 81st Floor
New York, NY 10048

Attention: Mr. Pete Fiala

Reference: Shearon Harris Nuclear Power Plant
P.O. NY-435035
S.O. 3301-3304 and 4121-4124

Gentlemen:

In response to your telephone request we offer the following:

1. QUESTION: How do you assure that minimum wall thickness is maintained at counterbored ends.

   ANSWER: Where counter bores are a requirement, the counter bore diameter, wall thickness and tolerances are specified on Southwest's detail sheets. Prior to fit up for welding the pipe ends are counter bored to the specified dimension and thickness is checked with a micrometer to verify that the thickness satisfies the specified requirement. Since this check is only to verify that the thickness is adequate, actual thicknesses are not recorded.

2. QUESTION: What tolerance applies at a counter bore when Ebasco specifies a minimum wall?

   ANSWER: When Ebasco specifies a minimum wall, the minimum thickness also applies to counter bored ends.

3. QUESTION: What specification bolting was furnished by Southwest:

   ANSWER: Southwest furnished the grade of material specified by Ebasco. The most frequently specified is SA-193 B7 studs with SA-194 2H nuts for pressure boundry joints. A-307 is the grade commonly specified for machine bolts for nonpressure boundary applications.

7525 Sherman Street · P.O. Box 9449 · Houston, Texas 77261-9449 · (713) 928-3451 · TWX 910 881-1600

210.67

SOUTHWEST FABRICATING & WELDING CO., INC.



4. QUESTION: Did Southwest specify corrosion allowance to the manufacturers of weldolet type fittings?

   ANSWER: I do not believe corrosion allowances were a part of the data furnished to Southwest. If a corrosion allowance was specified, Southwest would impose the same requirement on manufacturers of special fittings. The wall thicknesses specified by Ebasco are included in the requirements imposed on our suppliers.

I trust this will satisfactorily answer your questions. Call if I can be of further help.

Very truly yours,

John E. Harris

John E. Harris
Project Manager

JEH:cp

bcc: B. J. Goodwin
E. R. McAnally
N. H. Moerke
R. P. Barnes
S. M. Goodwin

216.65

CP&L

Carolina Power & Light Company

LS-4995

Mr. Pete Fiala
Ebasco Services, Inc.
Two World Trade Center
New York, New York 10048

TELECOPIED IN

AUG 19 1983

EBASCO PROJ. ENG.

CAROLINA POWER & LIGHT COMPANY
HARRIS PROJECT
1986-1990 - 1,800 MW - UNITS 1 AND 2
BOLTING MATERIAL

Dear Mr. Fiala:

In response to your telephone call of August 19, 1983, we can assure you that only SA-193 B-7 studs and SA-194 Grade 2H heavy hex nuts have been used for permanent bolting in safety-related systems.

Attached is a flange connection inspection form which is used to document all ASME flange connections (WP-129). To date, service water and screen wash are the only permanent, safety-related systems that have been bolted.

Yours very truly,

E. E. Willett
Resident Mechanical Engineer

EEW/jam

Attachment

cc: Mr. W. J. Carmony

411 Fayetteville Street • P. O. Box 1551 • Raleigh, N. C. 27602

Rev. 5
4/83

CAROLINA POWER & LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT

Exhibit 1
HP-129

FLANGED CONNECTION INSPECTION FORM (QC)

LINE NO. _____ CATEGORY _____ PIPE CODE _____

DESIGN: PRESSURE _____ PSIG, TEMPERATURE _____ °F ISO NO. _____

JOINT IDENTIFICATION _____

BOLT/STUD MAT'L/SIZE _____ NUT MAT'L _____

GASKET: LB RATING _____ SIZE _____ TYPE _____

LUBRICANT _____ TORQUE: MAX _____ MIN _____ FT-LB

SPECIAL INSTRUCTIONS (Work Per HP-129, Rev. ____ and CQC 12, Rev. ____)

PREPARED BY _____ DATE _____

CHECKLIST

LIMITED ACCESS _____
FULL VISUAL _____

SYMBOLS: ACCEPT(A) REJECT(R) NOT APPLICABLE (N/A)
(✓)In H Column Indicates Holdpoints For ANI Desired
Reviewed For Holdpoints: ANI _____ Date _____

| | QC INSPECTOR | | | | ANI | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | A | R | DATE | INSP. | H | A | R | DATE | ANI |
| 1. | | | | | | | | | |
| 2. | | | | | | | | | |
| 3. | | | | | | | | | |
| 4. | | | | | | | | | |
| 5. | | | | | | | | | |
| 6. | | | | | | | | | |
| 7. | | | | | | | | | |
| 8. | | | | | | | | | |
| Record Dwg. No./Rev. Used For 7 & 8 Above _____ Rev. _____ | | | | | | | | | |
| 9. | | | | | | | | | |
| 10. | | | | | | | | | |
| 11. | | | | | | | | | |

.Inspect Mating Surfaces
.Verify Flanges: Parallel, Aligned, Clearance
.Inspect Gasket: Rating, Size, Type, Condition
.Inspect Bolts/Studs/Nuts: Mat'l, Size, Condition (Record Heat Code/Heat No. Below)
.Verify Lubricant: Type, Application
.Special Instructions Performed
.Verify Valve/Speciality Items Flow Direction
.Verify Orientation of Valve Stem, Operator, Etc.
.Verify Torque Wrench Calibrated -S/N _____ Multiplier S/N _____
.Verify Torque Sequence, Torque Applied Acceptance, Thread Engagement
.Inspection Indicator Applied

COMMENTS: _____

FINAL QC ACCEPTANCE _____ DATE _____

VERIFIED BY ANI _____ DATE _____

BOLT & NUT TABLE

| DIA. | QTY. | LENGTH | HEAT CODE/NO. |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

If necessary, list others on reverse side.

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.66

Piping Stress Analysis Data, Loads on Pumps Nozzles

The Stress Analysis Data package contains sheets showing loads from Calculation No. 8050-1 and allowable resultant forces and moments. However, there is no check of combination of thermal, weight and either OBE or DBE. It would seem that pump nozzles could be subjected to a combination of these loads. Why are no combined load checks made? (See also 0210.47)

RESPONSE:

Allowable nozzles loads are specified in Appendix C of the Piping Design Specification CAR-SH-M-71. The allowable loads are specified in terms of combinations of loads.

The nozzle load sheet conservatively separates these allowable loads into smaller values applied to uncombined loads for ease of evaluation. If these lower limits are exceeded, then loads are combined and evaluated against the specification.

To illustrate, please note from the typical values below that the specification "Normal" limit is equivalent to the load sheet "Thermal" plus "Weight," the "Upset" limit is equivalent to "Normal" plus "Weight" plus "OBE" and so forth.

TYPICAL ALLOWABLE NOZZLE LOADS

| Design Spec M-71 | | | Nozzle Load Sheet | | |
|---|---|---|---|---|---|
| | Maximum Operating Temperature °F 140° and Above | | | 140° and Above | |
| Operating Condition | F | M | Loading Case | Resultant Force | Moment |
| Normal | 500A | 625Z | Thermal | 400A | 500Z |
| Upset | 700A | 875Z | Weight | 100A | 135Z |
| Emergency | 800A | 1000Z | Seismic OBE | 200A | 250Z |
| | | | Seismic DBE | 300A | 375Z |
| Faulted | 900A | 1125Z | Faulted DBE | 400A | 500Z |

(7876FXTccc)

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.67

Piping Computer Output (8050-1), Allowable Stress, f = 1.0

The allowable stresses agree with generally accepted Section III allowables for Class 3 piping, provided f is equal to unity. Where does the Specification provide the basis for using f = 1.0?

RESPONSE:

The stress range reduction factor of f = 1.0 is not indicated in the specification at this time. However, the next general revision of Ebasco Specification CAR-SH-M-71, Design Specification for Piping, will provide a reference to the 'f' factor and will indicate that for all piping systems on Shearon Harris Project a factor of f = 1.0 should be used.

The use of f = 1.0 is justified by the fact that the total number of full temperature cycles over 40 years during which the various system are expected to be in service is less than 7,000 cycles. This applies to any system on Shearon Harris Project.

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.68

Piping Computer Output (8050-1), i-factor for Weldolets

Apparently, the i-factors for Weldolets were calculated by the equation: $i = 0.9[R/(3.3T)]^{2/3}$. This formula is not now and never has been in Section III. Provide the basis for the i-factor used for Weldolets. (The response should be cognizant that tests on full outlet Weldolets are not representative of the reduced outlets involved; and tests with moment applied to the branch are not representative of moments applied to the run.)

RESPONSE:

The i-factors for Weldolets were calculated based on the stated equation. This formula, which is not in Section III, was derived by Bonney Forge based on test data and empirical relationships and subsequently verified by WFI for their Pipets. To date, only the ANSI B31.3 Code explicitly lists the equation. The i-factor equation is internally stored in the PIPESTRESS2010 computer program and is used whenever the analyst designates a tee connection as a "WELDOLET." The reference for the equation is documented in the PIPESTRESS2010 Verification Manual.

The test method and empirical relationships developed by Bonney Forge are identical to those employed in the development of the Section III factors for other tee connections. As is true for all tee connections, the tests performed on full size connections may not be representative of those for reduced outlets, and tests with moments applied to the branch may not be representative of tests with moments applied to the run. Nevertheless, all of the connections mentioned above have been tested only for full sizes and only for moments applied to the branch.

Because limited test data has indicated the possibility of a generic concern for reducing tee connections, a cooperative effort of the cognizant ASME and PVRC subcommittees is currently reviewing the situation. The recommendations of that study should then become the basis for any evaluation of reducing tee connections.

(7876FXTccc)

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Ouestion 210.69

Piping Computer Output (8050-1), Loading Combinations

The computer output gives stresses for 11 "Cases." Where does the Specification CAR-SH-M-30, Rev. 16 give the analyst instructions as to which Cases to run and how to evaluate them? See also 0210.47.

RESPONSE:

Instruction regarding the required Cases and their evaluation is provided in the Ebasco Piping Design Specification, CAR-SH-M-71. See our reply to Ouestion No. 210.59.

Also, please refer to the Attachment for the Thermal Mode Diagram and Thermal Data for the Service Water System. This diagram and the data information are also part of our Piping Design Specification, CAR-SH-M-71.

(7876FXTccc)

EBASCO SERVICES INCORPORATED

SHEET 1 OF 3

CLIENT CAROLINA POWER & LIGHT CO.

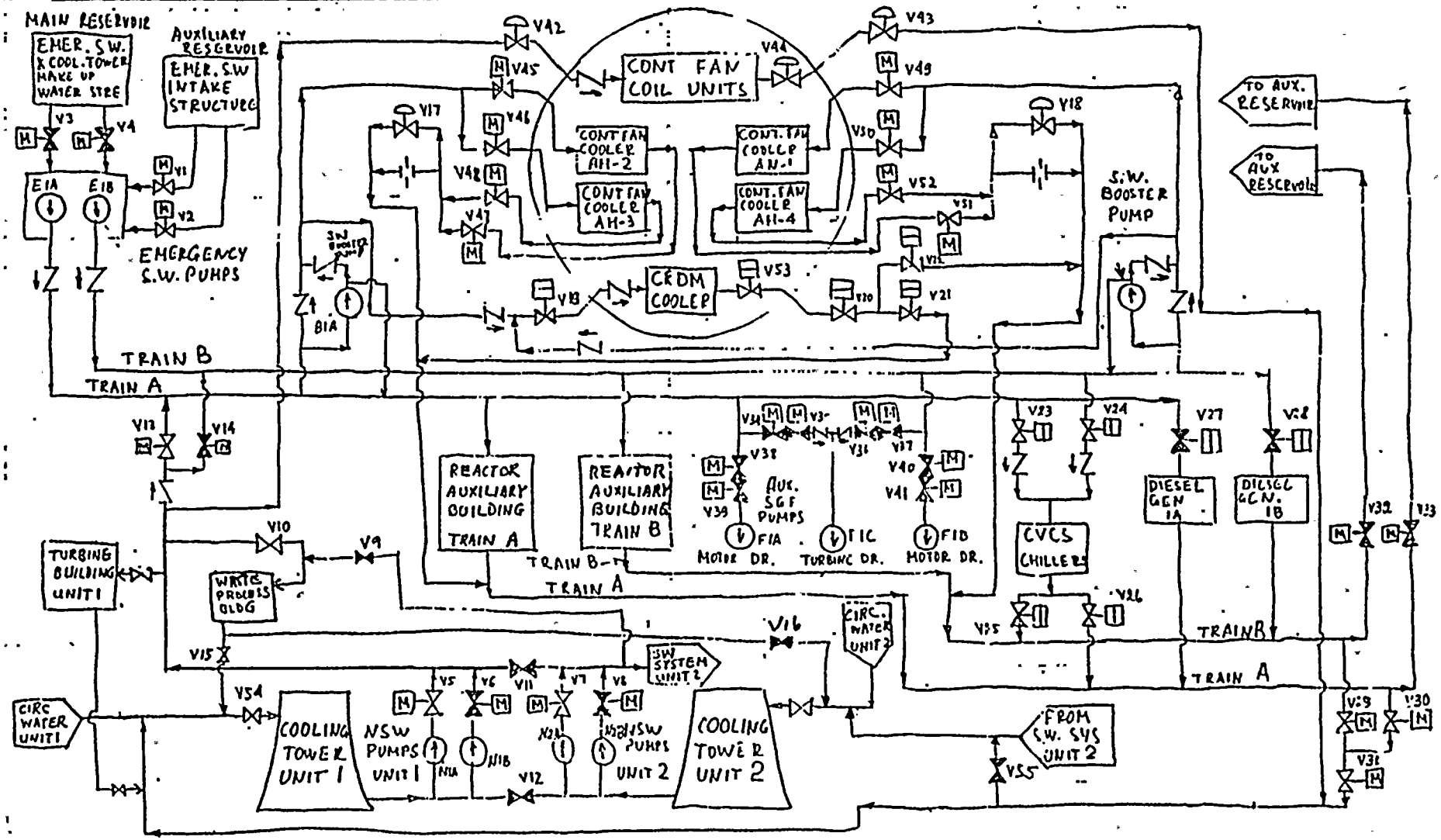
PROJECT SHEARON HARRIS NUCLEAR POWER PLANT

SUBJECT THERMAL MODES OF OPERATION—SERVICE WATER SYSTEM

OPS NO. _____ DEPT. NO. _____

BY R.K. DATE _____

CHECKED BY GLL DATE 1/31/78




9610/5-76

EBASCO SERVICES INCORPORATED

CLIENT CP&L
PROJECT SHNPP
SUBJECT Thermal Modes of Operation - Service water System

OFS NO. _____ DEPT. NO. _____
BY R.K. DATE _____
CHECKED BY Gold DATE 1/31/78

Legend: R= pump is running
S= pump is stand-by
O= valve is open
C= valve is close

Notes: 1) Assumption: Both of Units 1 & 2 are in operation

2) Valves NN 34-41 should be open during Emergency Operation when the Condensate is not available anymore. The auxiliary S.G. Feedwater Pumps are in operation to maintain the proper water level in Steam Generators.

3) During Emergency Operation and availability of Station or off-side Power the Normal Service Water Pump could continue to operate.

4) Anytime when the Auxiliary Reservoir is not available, the Emergency Service Water Pump must be fed by Main Reservoir.

5) During Normal Shut-down two of four Containment Fan Safety Coolers could be shut off by valves V45 & V46 or V49 & V50. It is assumed that both of TRAINS A & B operate.

2.10.6.5

EBASCO SERVICES INCORPORATED

CLIENT CP&L

PROJECT Sheron Harris NPP

SUBJECT Thermal Modes of Operation - Service Water System

SHEET 3

OPS NO. _____ DEPT. NO. _____

BY R.K. DATE _____

CHECKED BY G.L.L. DATE 1/11/88

| N/N | Plant Event | System Operation Mode | S.W. Pumps | | | | | | | | | | Valves | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | N1A | N1B | N2A | N2B | E1A | E1B | B1A | B1B | F1A | F1B | F1C | V1 | V2 | V3 | V4 | V5 |
| 1 | Normal | Start-Up | R N1A or N1B | | Works for Unit 2 only | | S | S | S | S | Working Fluid-Condensate | | S | O | O | C | C | O or C |
| 2 | Normal | Normal Operation | | | | | | | | | S | S | S | O | O | C | C | O or C |
| 3 | Normal | Normal Shutdown | N1A or N1B or Both | | | | | | | | Working Liquid Condensate | | | O | O | C | C | O or C |
| 4 | Cooling Tower failed | Normal Shutdown with use of Unit 2 Cooling Tower | | | | | | | | | | | | O | O | C | C | O or C |
| 5 | One of NSW Pump is not available, second pump failed. Unit 2 in normal Operation | Normal Shutdown with use of Unit 2 NSW Pump | S | S | R | R | | | | | | | | O | O | C | C | C |
| 6 | Emergency Safety Injection Signal | Emergency Shutdown Both of Emergency Service Water Pumps in operation | R N1A or N1B | | Works for Unit 2 Only | | R | R | R | R | Working Fluid Condensate or Service Water | | | O | O | C | C | O or C |
| 7 | Emergency Loss of Power | Emergency Shutdown One or Both of Emergency Service Water Pumps in Operation | S | S | S | S | R | R | R | R | | | | O | O | C | C | C |
| 8 | Emergency Containment Isolation | Emergency Shutdown One or Both of ESW Pumps in Operation | R or S | | Works for Unit 2 Only | | R | R | R | R | | | | O | O | C | C | O or C |
| 9 | Emergency Post Incident | Post Incident Recirculation Full Flow Both of ESW Pumps in Operation | S | S | R | R | R | R | R | R | | | | O | O | C | C | O or C |
| 10 | Emergency | Auxiliary Reservoir failed Main Reservoir must be used. | S | S | R | R | R | R | R | R | | | | C | C | O | | |

EBD/676

EBASCO SERVICES INCORPORATED

SHEET

CLIENT

PROJECT

SUBJECT

OPS NO. DEPT.

BY DATE

CHECKED BY DATE

# VALVES

| V6 | V7 | V8 | V9 | V10 | V11 | V12 | V13 | V14 | V15 | V16 | V17 | V18 | V19 | V20 | V21 | V22 | V23 | V24 | V25 | V26 | V27 | V28 | V29 | V30 | V31 | V32 | V33 | V34 | V35 | V36 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O or C | O or C | O or C | C | O | C | C | O or C | O or C | O | C | O | O | O | O | O | O | O | O | O | O | C | C | O | O | O | C | C | C | C | C |
| O or C | O or C | O or C | C | O | C | C | O or C | O or C | O | C | O | O | O | O | O | O | O | O | O | O | C | C | O | O | O | C | C | C | C | C |
| O or C | O or C | O or C | O | C | C | C | O | O | C | O | O | O | O | O | O | O | O | O | O | O | C | C | O | O | O | C | C | C | C | C |
| O or C | O or C | O or C | O | C | C | O | O | O | C | O | O | O | C | O | O | O | O | O | O | O | C | C | O | O | O | C | C | C | C | C |
| C | C | O | O | O | C | O | O | O | O | C | O | O | O | O | O | O | O | O | O | O | C | C | O | O | O | C | C | C | C | C |
| O or C | O or C | O or C | O | C | C | C | C | C | C | O | C | C | C | C | C | C | C | C | C | C | O | O | C | C | C | O | O | O or C | O or C | O or C |
| C | C | C | C | O | C | C | C | C | O | C | C | C | C | C | C | C | C | C | C | O | O | C | C | C | O | O | O or C | O or C | O or C | |
| O or C | O or C | O or C | O | C | C | C | C | C | C | O | C | C | C | C | C | C | C | C | C | O | O | C | C | C | O | O | O or C | O or C | O or C | |
| O | O or C | O or C | O | C | C | C | C | C | C | O | C | C | C | C | C | C | C | C | C | O | O | C | C | C | O | O | O or C | O or C | O or C | |
| O or C | O or C | O or C | O | C | C | C | C | C | C | O | C | C | C | C | C | C | C | C | C | O | O | C | C | C | O | O | O or C | O or C | O or C | |

EBASCO SERVICES INCORPORATED

CLIENT
PROJECT
SUBJECT

OPS NO.
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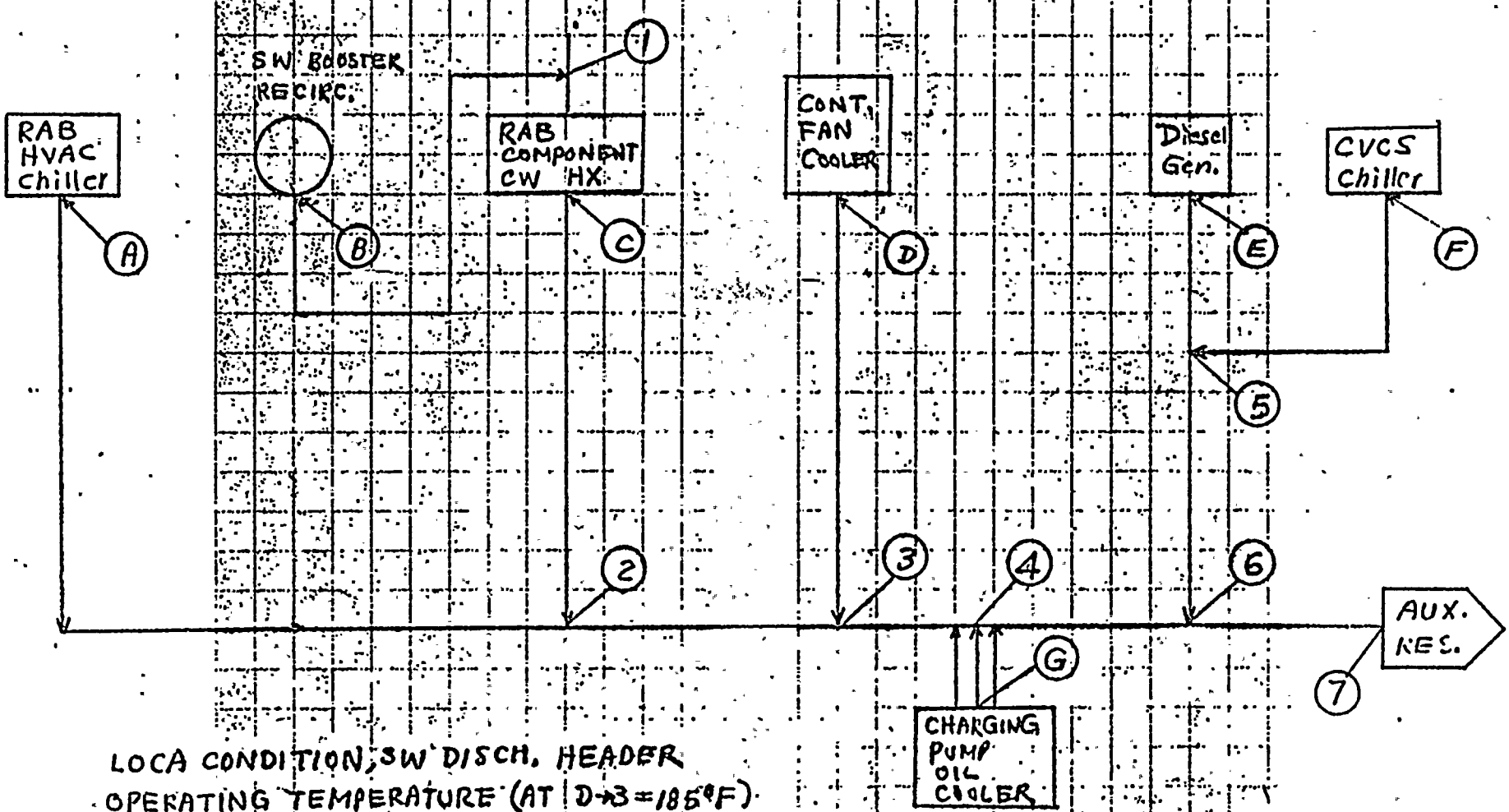
| V36 | V37 | V38 | V39 | V40 | V41 | V42 | V43 | V44 | V45 | V46 | V47 | V48 | V49 | V50 | V51 | V52 | V53 | V54 | V55 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | C | C | C | C | C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | C |
| C | C | C | C | C | C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | C |
| C | C | C | C | C | C | 0 | 0 | 0 | 0 or C | 0 or C | 0 | 0 | 0 or C | 0 or C | 0 | 0 | 0 | 0 | C |
| C | C | C | C | C | C | 0 | 0 | 0 | 0 or C | 0 or C | 0 | 0 | 0 or C | 0 or C | 0 | 0 | 0 | C | 0 |
| C | C | C | C | C | C | 0 | 0 | 0 | 0 or C | 0 or C | 0 | 0 | 0 or C | 0 or C | 0 | 0 | 0 | 0 | C |
| 0 or C | 0 or C | 0 or C | 0 or C | 0 or C | 0 or C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | C |
| 0 or C | 0 or C | 0 or C | 0 or C | 0 or C | 0 or C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | C |
| 0 or C | 0 or C | 0 or C | 0 or C | 0 or C | 0 or C | C | C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | C | 0 | C | |
| 0 or C | 0 or C | 0 or C | 0 or C | 0 or C | 0 or C | C | C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | C | |
| 0 or C | 0 or C | 0 or C | 0 or C | 0 or C | 0 or C | 0 or C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | C | |

9810/6-76

| | A→2 | B→1 | C→2 | D→3 | G→4 | E→5 | F→5 | | 2→3 | 3→4 | 4→6 | 5→6 | 6→7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GPM | 2500 | 750 | 12750 | 3000 | 60 | 1250 | 414 | | 15250 | 18250 | 18310 | 1664 | 19974 |
| °F | 103.8 | 95 | 102.9 | 185 | 111.7 | 128 | 105 | | 103 | 116.5 | 116.6 | 122.3 | 117 |




LOCA CONDITION; SW DISCH. HEADER OPERATING TEMPERATURE (AT D→3 = 185°F)
REF. FLOW DIAG. CAR-2165-G-047

BY LVT DATE 1/15/71 SUBJECT SHNPP SW SYSTEM
CHKD. BY DATE SHEET NO. OF
JOB NO.

CLIENT P&L

PROJECT SHNPP

SUBJECT SERVICE WATER FLOW & HEAT LOAD - NORMAL OPERATION

OPS NO.

BY TJH DA

CHECKED BY GLL DAT

| | EQUIPMENT | Qty | FLOW EACH GPM | TOTAL FLOW GPM | $T_{out} - T_{in}$ °F | HEAT LOAD $10^6$ BTU/HR | INFORMATION SOURCE |
|---|---|---|---|---|---|---|---|
| TB | Turbine Lube Oil Cooler | 2 | 3500 | 8500 | 105 - 95 | 23.5 | Westinghouse Letters dated 4/4/72, 6/28/72 & 8/28/72 |
| TB | Hydrogen Cooler | 1 | 4500 | 4500 | 112.2-95 | 88.7 | |
| TB | Seal Oil Cooler (Air) | 1 | 260 | 260 | 103-95 | 1.04 | |
| TB | Seal Oil Cooler (Hydrogen) | 1 | 100 | 100 | 100-95 | 0.25 | |
| TB | Exciter Air Cooler | 2 | 300 | 600 | 103.1-95 | 2.67 | |
| RAB | RAB HVAC Chiller | 2 | 2500 | 2500 | 103.8-95 | 11.0 | HVAC Dept. |
| WPB | WPB HVAC chiller | 2 | 4300 | 4300 | 106.2-95 | 24.08 | |
| CB | Containment Fan Cooler | 4 | 1500 | 3000 | *98-95 | *4.34 | Spec. CAR-SH-BE-01 |
| CB | Containment Fan Coil Unit | 3 | 800 | 2400 | 99.4-95 | 5.25 | Spec. CAR-SH-BE-18 |
| CB | CRDM Cooler | 1 | 345 | 345 | 115.2-95 | 3.44 | Spec. CAR-SH-BE-08 |
| RAB | CVCS Chiller | 2 | 414 | 414 | 105-95 | 2.07 | Dwg. 1364-2793 R0 |
| RAB | Charging Pump Cooler | 3 | 20 | 60 | 111.7-95 | 0.2 | Dwg. 1364-1908 R4 |
| TB | Condensate Booster Pump Coupling | 2 | 350 | 700 | 112.2-95 | 2.52 | Spec. CAR-SH-M-23 |
| TB | Condenser Vacuum Pump Hx | 2 | 354 | 708 | 101-95 | 1.77 | Spec. CAR-SH-M-7 |

* IN EMERGENCY CASE, $T_{out} = 185°F$ - $Q = 131.8 \times 10^6$ BTU/HR

TB — TURBINE BUILDING

RAB — REACTOR AUXILIARY BUILDING

WPB — WASTE PROCESS BUILDING

DGB — DIESEL ENGINE GENERATOR BUILDING

CLIENT

PROJECT

SUBJECT Sea. Flow & Heat Loads - Normal Operation

OPR NO. | PROJ. NO.

BY | DATE

CHECKED BY GLL | DATE 1/31/78

| EQUIPMENT | Qty | FLOW EACH GPM | TOTAL FLOW GPM | $T_{out} - T_{in}$ °F | HEAT LOAD $10^6$ BTU/HR | INFORMATION SOURCE |
|---|---|---|---|---|---|---|
| TB FW Pump Lube Oil Cooler | 2 | 50 | 100 | 120 - 95 | 1.25 | GPM from IR phone 8/25/76 $T_{out}$ Estimated |
| TB Turbine EHC Cooler | 2 | 20 | 40 | 120 - 95 | 0.5 | GPM from Dwg. 1364-842 R6 $T_{out}$ Estimated |
| TB Heater Drain Pump Cooler | 2 | 10 | 20 | 120 - 95 | 0.25 | Estimate |
| TB Condensate Pump Motor Cooler | 2 | 10 | 20 | 120 - 95 | 0.25 | GPM from Dwg. 1364-2291 R0. $T_{out}$ Estimated |
| TB Air Compressor | 2 | 14 | 28 | 120 - 95 | 0.18 | Spec. CAR-SH-M-25 |
| TB Aftercooler | 2 | 15 | 30 | 125 - 95 | 0.23 | Spec. CAR-SH-M-25 |
| RAB Component Cooling Water Hx | 2 | 12,000 | 12,000 | 103.4 - 95 | 50.05 | Dwg. 1364-2653 R1 |
| WPB WPB Cooling Water Hx | 2 | 10,000 | 10,000 | 104.6 - 95 | 58.07 | Based on Hot side Cooling Water. 6684 GPM, $T_{in}$ = 122.64, $T_{out}$ = 105 & Cold Side CW 10,000 GPM. |
| TB Generator Leads Cooling | 1 | 230 | 230 | 107.6 - 95 | 1.45 | R. Bono of Electrical Dept. Phone call 11/8/77 |
| DGB Diesel Engine Generator | 2 | 1250 | 1250 | 128 - 95 | 20.72 | R. Bono of Electrical Dept. Phone call 11/8/77 |
| TOTAL | | | 47,105 | | 253.78 | |
| AVG. OUTLET TEMPERATURE $\bar{T}_{out}$ | | | | 105.78 °F | | |

8818/8-76

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Ouestion 210.70

Piping Computer Output (8050-1), Seismic Input Data

Where does the Specification CAR-SH-M-30, Rev. 16 give instructions on how to select the specific seismic input data for piping system analyses? Appendix F, "Seismic Consideration for Mechanical Equipment" is included in the Specification but we have not seen any reference to it in the text of the Specification. For example, Appendix F is not referenced in 3. of Part I or in 23.01 or 23.03 of Part II. Further, 2. of Appendix F says that "Safe shutdown earthquake loads for all equipment (except as noted in the specification) are obtained from the attached Floor Response Spectra Curves for Horizontal and Vertical Excitation." The "attached" curves are labeled "Typical . . . Spectra" and, despite what Appendix F says, we assume that these are not the spectra used in, for example, Calculation No. 8050-1.

RESPONSE:

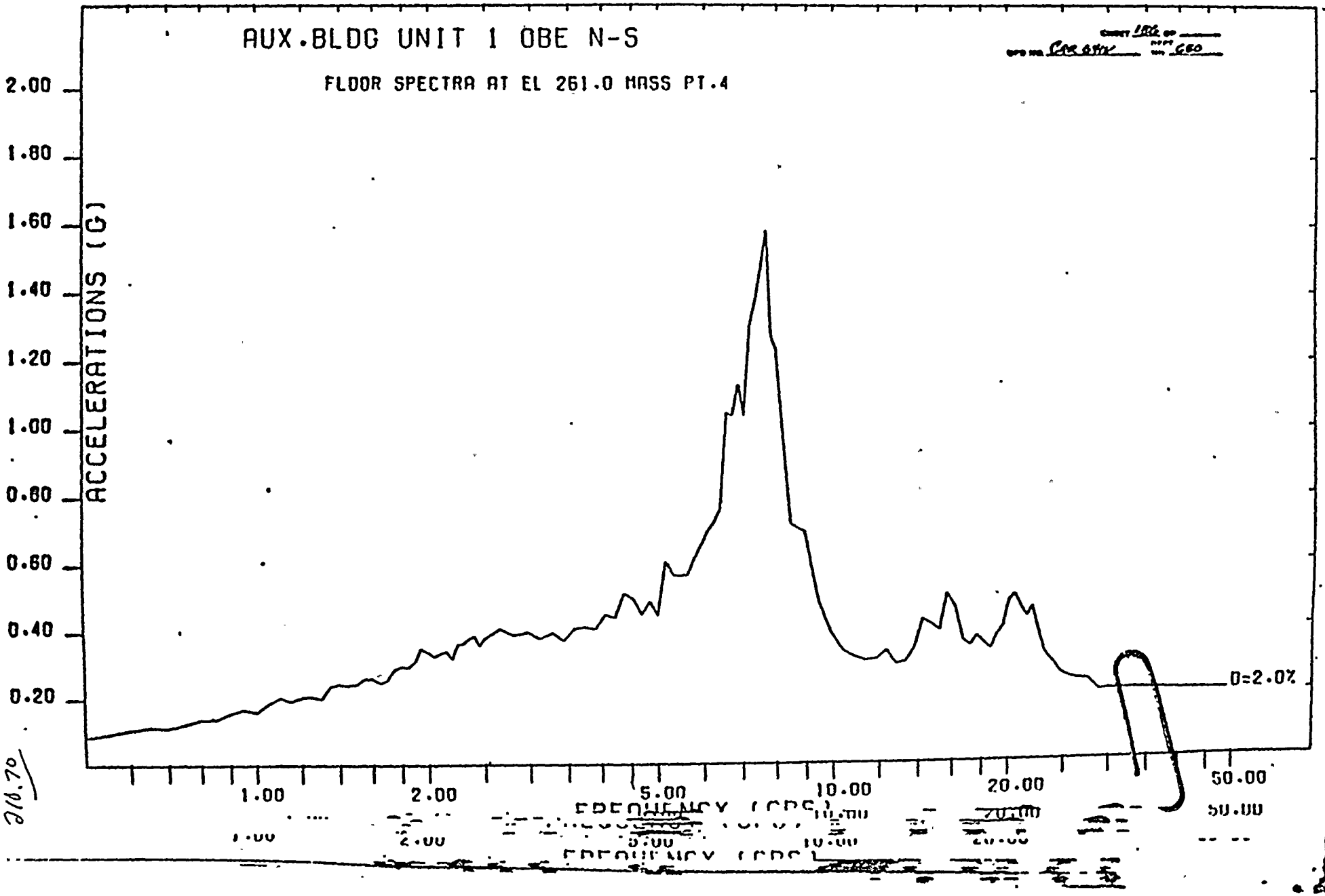
The instructions regarding the specific seismic input data for piping system analyses are given in Ebasco Design Specification for Piping, CAR-SH-M-71. Paragraph 6.11a of this specification states: "All piping covered by this specification is classified as Seismic Category I which shall be analyzed utilizing the response spectra curves and computer output sheets provided in Appendix A of this specification and the seismic criteria set forth in the FSAR."

As a sample, we are enclosing for your information and use, the OBE North-South response spectra which was subsequently enveloped for Calc. No. 8050-1.

(7876FXTccc)

210.70

ATTACHMENT
Question 210.70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ACCELERATIONS (G)
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1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
1.00
2.00
5.00
10.00
20.00
50.00
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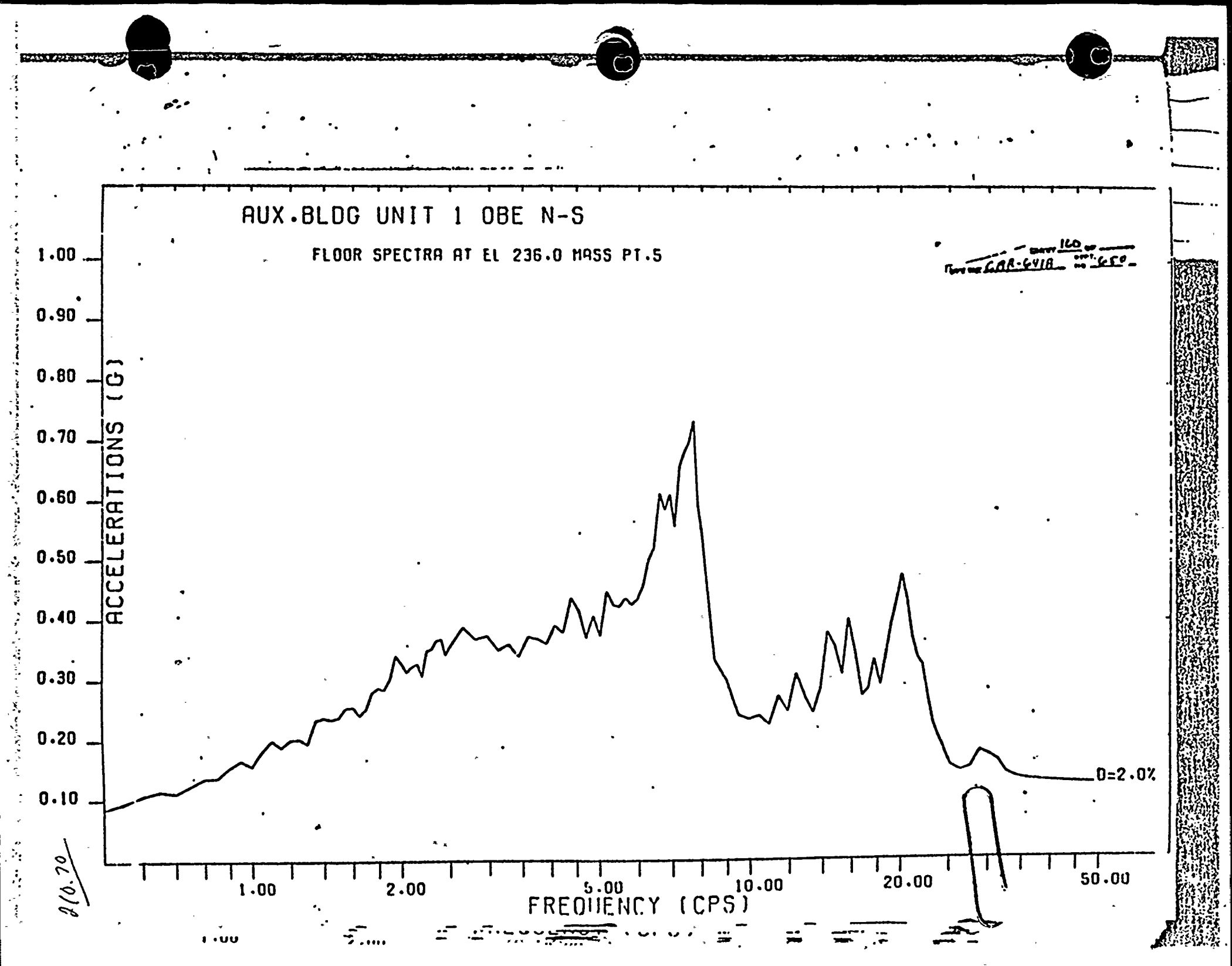
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0.60
0.50
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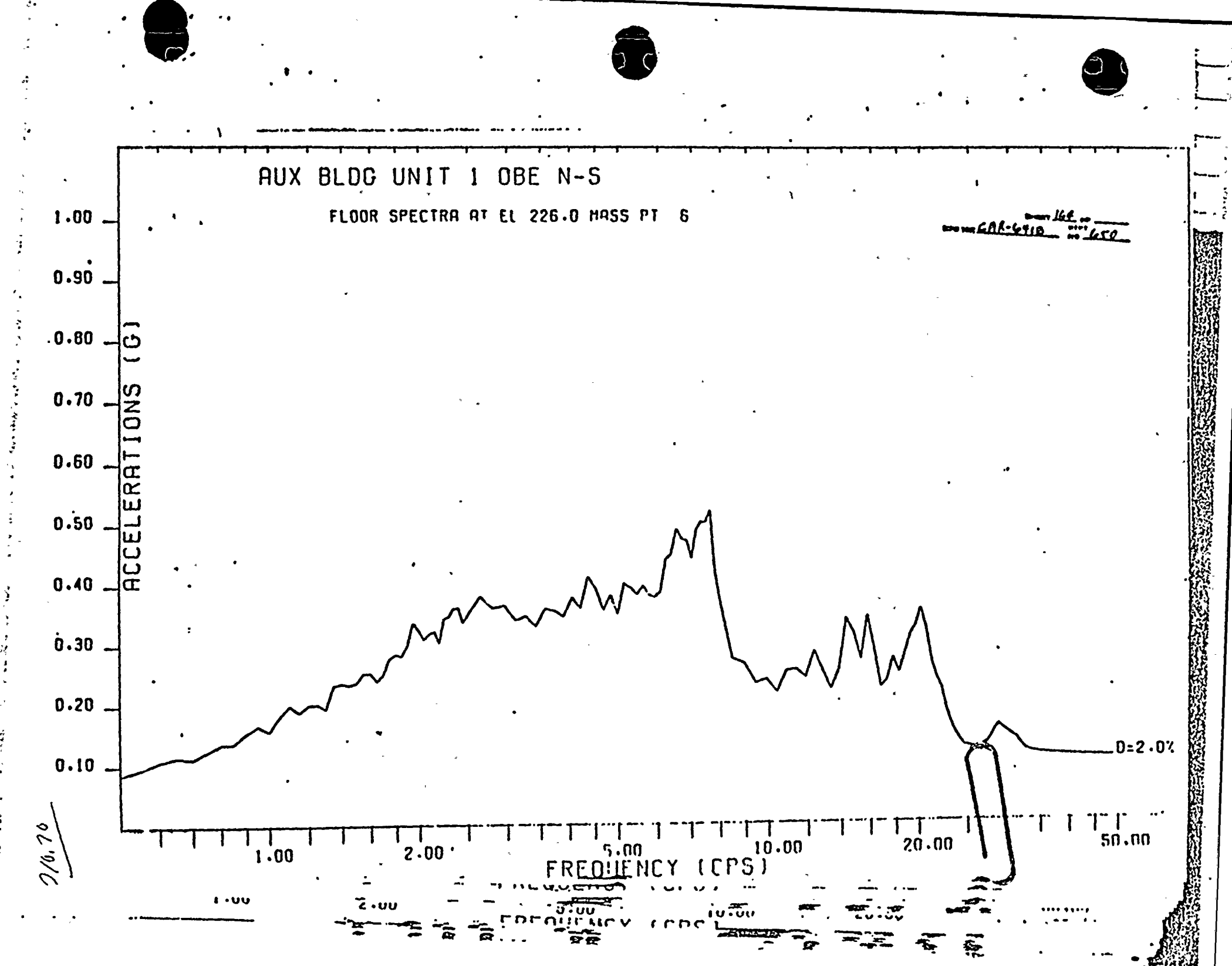
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0.70
0.60
0.50
0.40
0.30
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10.00
20.00
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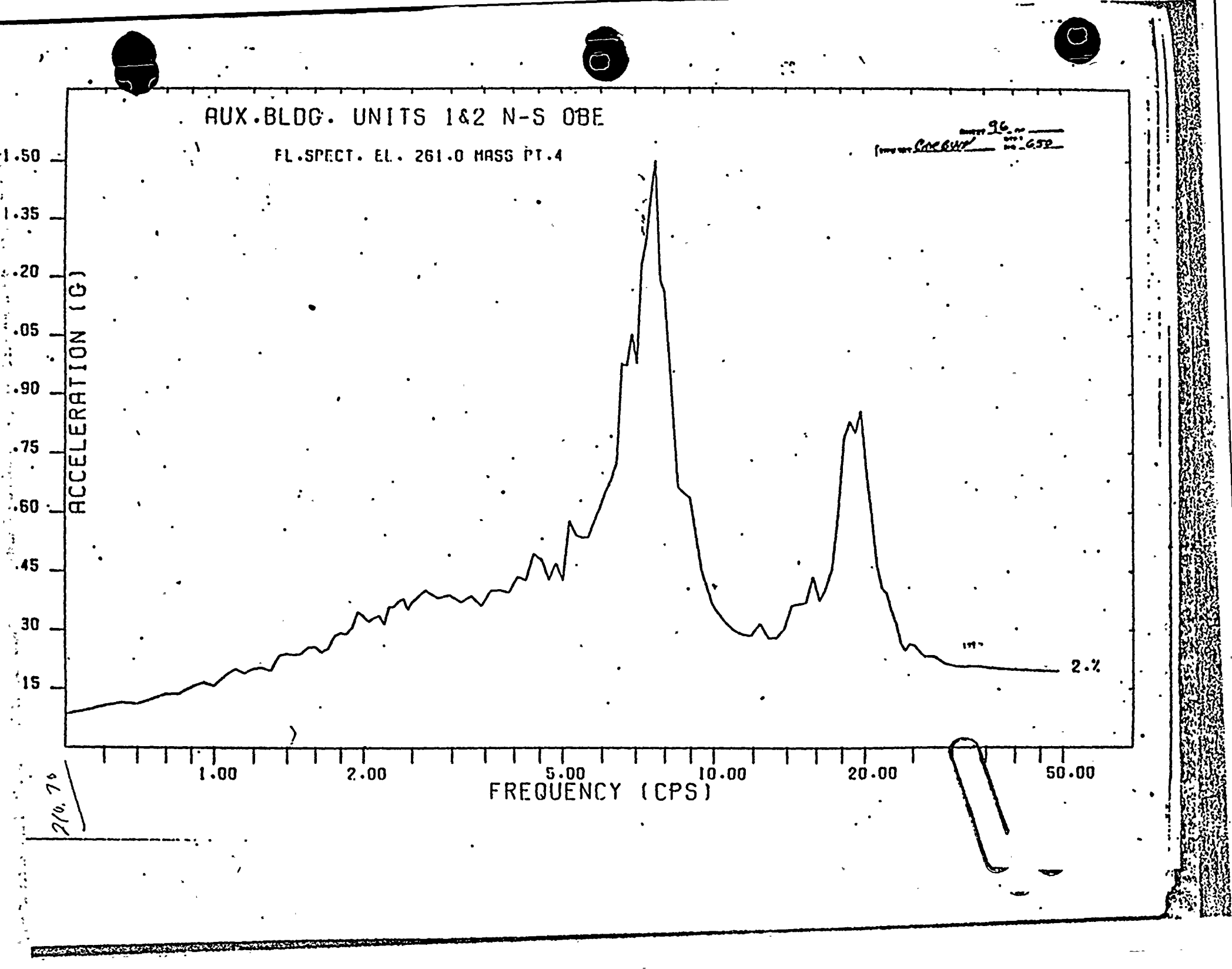
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FL.SPECT. EL. 261.0 MASS PT.4
ACCELERATION (G)
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1.35
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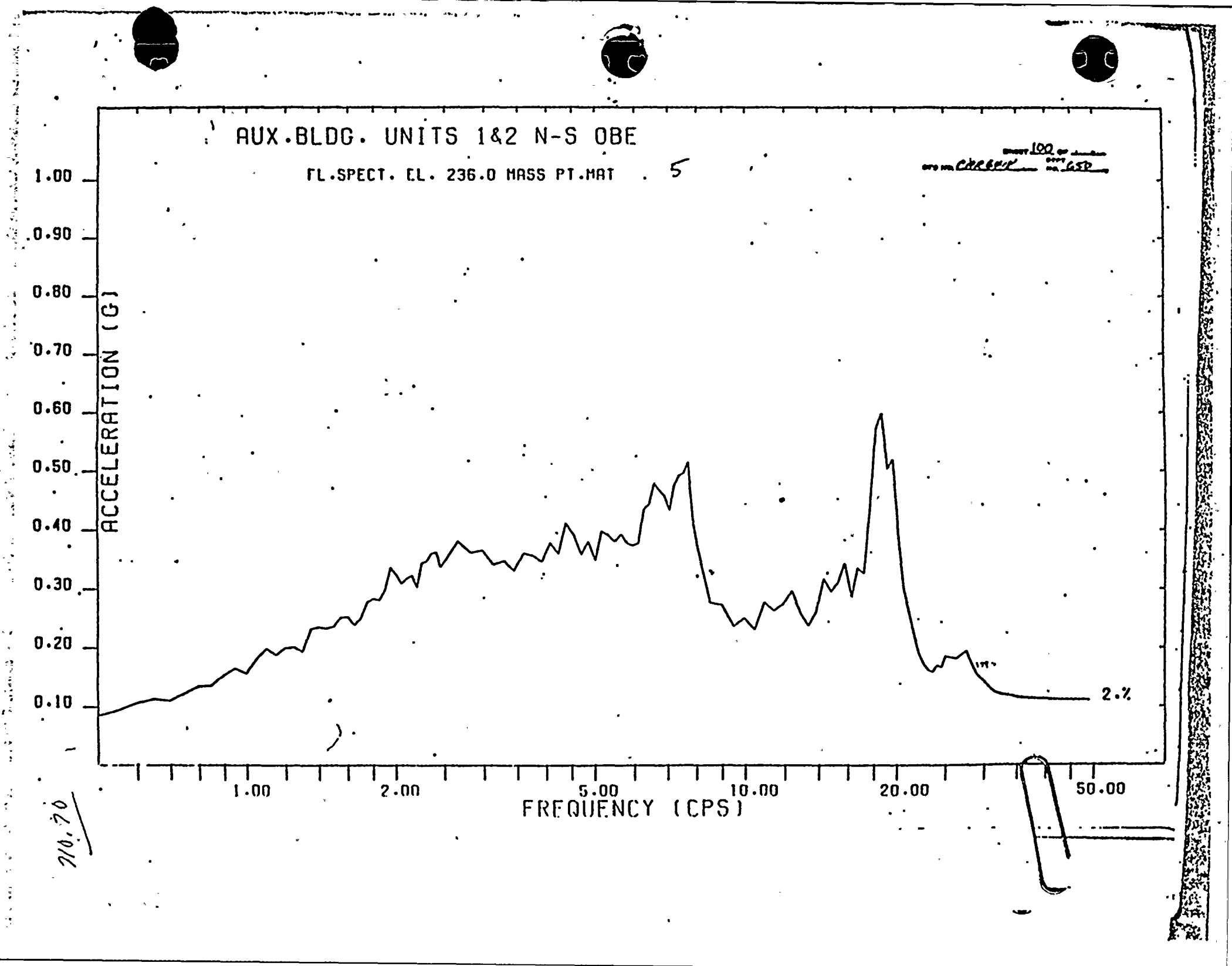
AUX.BLDG. UNITS 1&2 N-S OBE
FL.SPECT. EL. 236.0 MASS PT.MAT . 5
ACCELERATION (G)
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FREQUENCY (CPS)

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Ouestion 210.71

Piping Support Specification, Applicability of Section III

The first sentence of 22.05 in Specification CAR-SH-M-30, Rev. 16 is: "All supports and hanger components shall conform to the requirements R/2 of the ANSI Code for Pressure Piping, B31.1, and ASME Section III, as applicable, . . ." What are the applicable requirements of Section III? Identify by Edition/Addendum date and Section III heading identification; e.g., NC-3674 (1971).

RESPONSE:

The original contract for the design and fabrication of pipe supporting elements involved Section III of the ASME Code to the 1971 Edition with Addenda through Summer of 1973. The rules for component supports and component standard supports (Subsection NF) was still in the preparation stage (Ref: NA-2131.b.1 1971 Edition).

Contractual requirements for design and fabrication of pipe supports was, therefore, referenced to the ANS B31.7 and ANSI B31.1 codes which were in effect at the aforementioned time. In essence, the definitions and references made in the above question were non-existent at the contracted date.

As a side note, the design fabrication process for the vendors standard product is to more recent codes (i.e., Subsection NF 1977 Edition).

Welding where performed by the vendors shop is being performed to procedures qualified to ASME Section IX. Inspection is being performed to a contract document which incorporated NF 5000 and AWS D1.1 requirements.

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Ouestion 210.72

Piping Support Specification, Supplementary Steel Versus Auxiliary Supporting Steel

Paragraph 22.05 of the Specification CAR-SH-M-30, Rev. 16 states that "supplementary steel" shall be in accordance with AWS D1.1, etc. Paragraph 22.16 states that "auxiliary supporting steel" shall be designed on the basis of the allowable stresses as per the AISC specification, etc. What are the definitions of "supplementary steel" and "auxiliary supporting steel?"

RESPONSE:

The terms "supplementary steel" and "auxiliary supporting steel" as used in context of the specification CAR-SH-M-30, are synonymous.

The hanger manufacturer (Bergen-Paterson) does not differentiate between supplementary steel and auxiliary supporting steel.

All Bergen-Paterson designs of steel structures for pipe hangers, supports, restraints, anchors, etc., are based on the AISC specification. The AWS D1.1 code does not offer guidelines for the design of structures.

The chapters in the AWS code dealing with existing structures, new buildings, bridges, and tubular structures are only concerned with the welds, weld details, base metal and welding allowable stresses, fatigue stresses in welds, workmanship and quality of welds.

Except for a limited number of guidelines on welds given in the AISC code which do not conflict with the AWS provisions and are only used in the design of structures there is no overlap of the fields covered by the two codes.

(7876FXTccc)

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.73

Piping Support Specification CAR-SH-M-30, Rev. 16 (22.14)

When shear lugs or fabricated lugs are used, how are the stresses due to these attachments evaluated? See NC3645 (1971) and (1980).

RESPONSE:

The stresses for shear lugs and fabricated lugs are evaluated based on the enclosed procedure. This procedure complies with the requirements of the Welding Research Council Bulletin No. 198. The attached procedure was incorporated into the pipe hanger fabricator (Bergen-Paterson) welded pipe attachment program and is called BPLUG. This procedure is used for evaluating run pipe stresses due to integral lug attachments. Stresses within the run pipe wall due to the integral lug attachment can be found by a review of that procedure.

(7876FXTccc)

210.13

ATTACHMENT

210.73

Subject: STRESSES IN ASME CODE CLASS 2 & 3 AND ANSI B31.1 PIPES DUE TO LUG ATTACHMENT
SHEARON HARRIS NUCLEAR PROJECTS 1 THRU 4 CP&L CO.

The recommended procedure to be used to account for additional stresses induced in the pipe wall due to the integral lug attachment is outlined in subsequent paragraphs of this memorandum.

A. REQUIREMENTS:

The following design requirements must be satisfied in order to use this procedure:

(1) The attachment configuration shall comply with ASME Code, Section III Paragraphs NC/ND 3645 and 4433 and Figure 1 of this procedure.

(2) The attachment material, weld material and pipe material shall have essentially the same moduli of elasticity and coefficient of thermal expansion.

(3) $\beta_1 \leq 0.5$, $\beta_2 \leq 0.5$ and $\beta_1 \beta_2 \leq 0.075$

(4) The attachment (lug) is made on straight pipe at a distance greater or equal to $\sqrt{R_m t}$ from any other discontinuity such as valve, fittings etc.

Where $R_m$ = Mean radius of pipe in inches and

$t$ = Wall thickness of pipe in inches.

(5) The axis of the attachment is normal to the surface of the run pipe.

(6) The clear distance between the adjacent attachments in the longitudinal direction is equal or greater than three times $\sqrt{R_m t}$.

(7) The clear arc distance (measured along the surface of the run pipe) between the attachments in the circumferential direction is equal or greater than $\sqrt{R_m t}$.

(8) $D_o/t \leq 100$ Where $D_o$ = Outside diameter of pipe in inches.

B. DEVELOPMENT OF STRESS INTENSIFICATION FACTORS "i"

Paragraph NC/ND 3673 (b) of ASME code states that for components not shown in Fig. NC/ND 3673.2 (b)-1, the stress intensification factor may be taken as:

$$i = C_2 K_2/2 \text{----------(B.1)}$$

Where $C_2$ and $K_2$ are stress indices for Class 1 components. Code Case 1745 outlines a method for computing $C_T$, $C_L$ and $C_c$. It further recommends to use $K = 1.3$ or 2 depending on geometrical configuration of welded joint. In order to develop required "i" it is assumed that $K_T = K_L = K_c$. Thus,

$$i_T = C_T K_T/2, \text{----------(B.2)},$$

$$i_L = C_L K_L/2 \text{----------(B.3) and}$$

$$i_c = C_c K_c/2 \text{----------(B.4)}$$

For $K_T = K_L = K_c = 1.3$ (See figure 1) and the equations given in code case 1745, the Equations (B.2), (B.3) and (B.4) can be developed as follows:

$$i_T = \frac{1.3}{2} \cdot (7.64)\, \gamma^{1.64} \beta_1 \beta_2 \eta^{1.54} \leq 1.0$$

$$= 5.093\, (\gamma)^{1.64}\, \beta_1 \beta_2 \eta^{1.54} \leq 1.0 \text{----------(B.5)}$$

$$i_L = \frac{1.3}{2}\, (.51)\, \gamma^{1.74}\, \beta_1 \beta_2^2\, \eta^{4.74} \leq 1.0$$

$$= 0.34\, \gamma^{1.74}\, \beta_1 \beta_2^2\, \eta^{4.74} \leq 1.0 \text{----------(B.6)}$$

$$i_c = \frac{1.3}{2}\, (.76)\, \gamma^{1.90}\, \beta_1^2 \beta_2\, \eta^{3.40} \leq 1.0$$

$$= 0.506\, \gamma^{1.9}\, \beta_1^2 \beta_2\, \eta^{3.40} \leq 1.0 \text{----------(B.7)}$$

Where

$$\eta = -(X_1 \cos\theta + Y_1 \sin\theta) - \frac{1}{A_o}(X_1 \sin\theta - Y_1 \cos\theta)^2$$

$$X_1 = X_o + \log_{10} \beta_1$$

$$Y_1 = Y_o + \log_{10} \beta_2$$

| Load | $A_o$ | $\theta$ | $X_o$ | $Y_o$ |
|---|---|---|---|---|
| Thrust | 2.2 | 40° | 0 | 0.05 |
| Longitudinal moment | 2.0 | 50° | -0.45 | -0.55 |
| Circumferential moment | 1.8 | 40° | -0.75 | -0.60 |

C. NOMENCLATURE:

$r$ = mean pipe radius (in.). Same as $R_m$

$t$ = nominal pipe-wall thickness (in.)

$\gamma$ = $r/t$

$\beta_1 = L_1/r$

$\beta_2 = L_2/r$

$L_1$ and $L_2$ are defined in Fig. 1

$L_a$ = lesser of $L_2$ and $t$

$L_b$ = lesser of $L_1$ and $t$

$L_c$ = lesser of $L_1$ and $L_2$

$L_d$ = greater of $L_1$ and $L_2$

$A_1 = 4L_1 L_2$ (in.$^2$)

$Z_{\ell L} = 4L_1 L_2^2 /3$ (in.$^3$)

$Z_{\ell C} = 4L_1^2 L_2/3$ (in.$^3$)

$K_1$ = 1.3 for "ground" fillet welds per Fig. 1

$P_o$ = range of operating pressure (psi)

$D_o$ = outside diameter of pipe (in.)

C. NOMENCLATURE: (cont'd)

$\bar{M}_T$ = greater of $M_T / L_c L_d t (1 + L_c/L_d)$ and

$M_T/(0.8 + 0.05 (L_d/L_c))L_c^2 L_d$

W = Thrust load in pounds. See Fig. 1

$Q_1$, $Q_2$ = Shear loads in direction 1 and 2 respectively, in pounds. See Fig. 1

$M_c$, $M_L$, $M_T$ = Moment loads in in-pounds. See Fig. 1

$S_{sl}$, $S_{ol}$, $S_e$, and $S_{te}$ = Stresses corresponding to Equations 8, 9, 10 and 11 respectively. For detailed definitions refer to NC/ND Section of ASME Section III Code. These stress values are obtained from "PIPESTRESS2010" output.

', '', ''', = primes are used to indicate these stresses may be different for different component conditions even though applicable ASME code equation number is unchanged. For example Equation (9) is used for evaluation against normal, upset, emergency and faulted conditions.

t8, t9, t10, t11 ... = Subscripts indicate, "total" stress in pipe wall for ASME code Equations 8, 9, 10, 10a and 11 respectively.

$F_{1j}$ = Stresses in psi due to lug against ASME code Equation "j". "j" may be 8, 9, 10, 10a, 11 and 12 depending on load combinations and component conditions.

D. COMPUTATION OF ADDITIONAL STRESSES: **

Computation of additional stresses due to lug attachment is to be performed in the following manner:

$$F_{1j} = \frac{i_T W_j}{A_1} + \frac{i_L M_{Lj}}{Z_{1L}} + \frac{i_c M_{cj}}{Z_{1c}} + \frac{Q_{1j}}{2 L_1 L_a} + \frac{Q_{2j}}{2 L_2 L_b} + \bar{M}_{Tj} \quad \text{----------D.1}$$

Repeat (D-1) for each applicable equations of Section E as required.

E. COMPUTATION OF TOTAL STRESSES

Total stresses in the pipe wall at the juncture of pipe and attachment consist of two parts namely (i) stresses in the pipe wall from the output of PIPESTRESS2010 "or" equivalent and (ii) stresses in the pipe wall as computed in Paragraph (D).

E.1 NORMAL COMPONENT CONDITION.

$S_{t8} = S_{s18} + F_{1-8}$ $\leq$ 1.0 $S_h$.....E.1.1

$S_{t9} = S_{o19} + F_{1-9}$ $\leq$ 1.2 $S_h$.....E.2.2

$S_{t10} = S_{e10} + F_{1-10}$ $\leq$ $S_a$.....E.1.3

$S_{t10a} = S_{10a} + F_{1-10a}$ $\leq$ $3S_c$.....E.1.4

$S_{t11} = S_{te11} + F_{1-11}$

$= S_{t8} + S_{t10} \leq (S_h + S_a)$.....E.1.5

Either of Equations E.1.3 "or" E.1.5 must be satisfied.

Only for high energy lines evaluate,

$S_{t12} = S_{t9} + S_{t10} \leq 0.8 \quad (1.2\ S_h + S_a)$.....E.1.6 *

E.2 UPSET COMPONENT CONDITION:

$S'_{t9} = S'_{o19} + F'_{1-9}$ $\leq$ 1.5 $S_h$.....E.2.1

$S'_{t10} = S'_{e10} + F'_{1-10} +$ $\leq$ $S_a$.....E.2.2

$S'_{t11} = S_{t8} + S'_{t10} \leq (S_h + S_a)$.....E.2.3

Either of Equations E.2.2 "or" E.2.3 must be satisfied.

Only for high energy lines evaluate,

$S'_{t12} = S'_{t9} + S'_{t10} \leq 0.8\ (1.2\ S_h + S_a)$.....E.2.4 *

E.3 EMERGENCY COMPONENT CONDITION

$S''_{t9} = S''_{o19} + F''_{1-9}$ $\leq$ 1.8 $S_h$.....E.3.1

E.4 FAULTED COMPONENT CONDITION

$S'''_{t9} = S'''_{o19} + F'''_{1-9}$ $\leq$ 2.4 $S_h$.....E.4.1

E.5 For ANSI B31.1 piping compute stresses for Equations E. .1 thru 4 and E.2.1 and E.2.2.

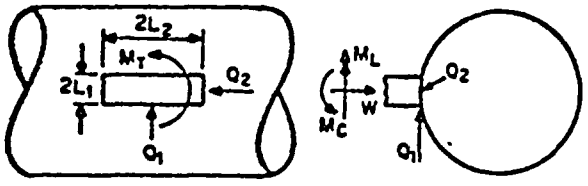
Departmental position in evaluating additional stresses in the pipe wall due to integral attachment is in progress. Considering the critical importance of the project schedule, this interim procedure is to be used for subject work and shall not be construed as department's position.

NOTES:

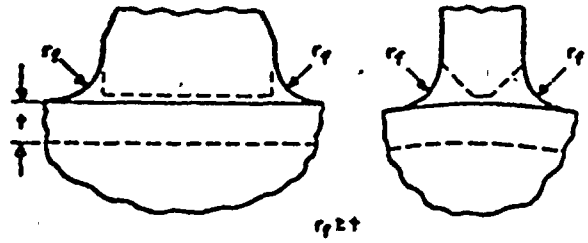
*If calculated stresses exceeds allowable, contact Ebasco prior to modification. This stress value is used in postulating pipe-break location. Even if calculated stresses are within the allowable stress limit, Piping Engineer shall make sure that these stress values are within the limits to maintain the validity of predetermined break location.

**This procedure does not provide guide lines for evaluating structural integrity of lugs, weld connecting pipe and lugs.

260.73




(a) Graphic representation of $L_1, L_2, W, M_L, Q_1, Q_2$, and $M_T$: $L_1$ and $L_2$ are to be measured along the surface of the run pipe. Welds or fillet radii between attachment and pipe are not to be included.




(b) Ground weld or integrally cast attachment; $K_f = 1.3$.

FIG. 1 NOMENCLATURE ILLUSTRATION

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.74

Piping Support Specification CAR-SH-M-30, Rev. 16 (22.08)

The first sentence reads: "The supporting force required and movement at each hanger location shall be determined by Seller through methods of calculation reviewed by Purchaser." This appears to be contradictory to other portions of the Specification where the Purchaser (Ebasco) apparently calculates the forces and movements at each hanger location. What is the intent of the quoted sentence?

RESPONSE:

As noted in Paragraph 23.01 of the Specification, the Purchaser (Ebasco) provides a computer printout to the Seller which contains forces and movements for the restraints on the associated isometric(s). This information is listed for each stress point, in each of three directions, for all the cases analyzed. The intent of the first sentence of Paragraph 22.08 is to make it the Seller's responsibility to determine the total resultant forces and movements upon which to base his design for each hanger. The method of calculation to be used by the Seller is described in the response to Question 210.76.

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.75

Piping Support Specification CAR-SH-M-30, Rev. 16 (23.03)

The first two sentences read: "Unless otherwise noted, the seismic analysis is based on the 1/2 Safe Shutdown Earthquake. Unless noted differently in the analysis, the forces imposed on restraints by the Safe Shutdown Earthquake (SSE) are twice the magnitude of those for the 1/2 SSE." Calculation No. 8050-1 provides data for OBE and DBE; e.g., Cases 10 and 200. Under what circumstances are the provisions of the quoted sentences applied?

RESPONSE:

Per Ebasco Design Specification CAR-SH-M-71 for Piping, Nuclear Safety Class 2 and 3 and ANSI B31.1 (Non Nuclear Safety/Seismic Category I), Page 6, Paragraph 6.11.C, the Safe Shutdown Earthquake (SSE) is conservatively taken to be equal to 2 times the Operating Basis Earthquake (OBE). Thus unless otherwise noted in the analysis, as is the case where Design Basis Earthquake (DBE) loads are given, the provision of the quoted sentences apply.

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Ouestion 210.76

Piping Support Bergen-Paterson Hanger Sketches

The form sheet used by Bergen-Paterson appears to be inappropriate; various lines are marked out and relabeled in an inconsistent and partially illegible manner. The first two lines of loads (with one exception) agree with Calculation No. 8050-1, Case 41 or Case 1. Some of the other entries agree with Calculation No. 8050-1, Cases 10, 200, 11 or 12. Our copy of Calculation No. 8050-1. is identified as Rev. 2, 5/5/81, which is apparently the same as used by Bergen-Paterson. Explain the relationship between the Bergen-Paterson loads and those. given in Calculation No. 8050-1.

Having obtained loads from somewhere, Bergen-Paterson presumably combines them in some manner and applies some criteria to select or design the support. Where does Specification CAR-SH-M-30, Rev. 16 prescribe these load combinations and criteria? If not contained in the Specification, describe the loading combinations and criteria used for Shearon-Harris supports of Section III Class 1, 2, and 3 piping.

RESPONSE:

With each isometric/calculation transmitted from the Purchaser (Ebasco) to the Seller (Bergen-Paterson), there is included a cover letter which contains a listing of the items in the particular transmittal, as well as the applicable analysis cases and the load combination equations to be used. For Calculation No. 8050-1, Rev. 2 that letter is EB-B-3894, dated June 8, 1981, a copy of which is attached hereto.

The legends which are pre-printed on the Bergen-Paterson forms are not all directly applicable to Shearon Harris. Normally, the loads other than weight and thermal for each equation are listed in the order in which each term appears in the equation per the aforementioned letter. For example, SW H 475 4/D, 477 5/D, 479 7/E, 481 6/D and 510 3/D have the loads listed in this manner when compared to Attachment 3 of EB-B-3894. Please note, the sequence in which the load cases appear in the computer print-out is the same as in Attachment 3 and differs from that on the sketches only with respect to weight and thermal, which are clearly labeled on each sketch. When the sequence of the loads differs between the Bergen-Paterson sketch and that of the computer printout, Bergen-Paterson has labeled them with the symbol given in Attachment 2 of EB-B-3894 for the purpose of clarity. (Refer to SW H 2339 1/B)

For all Bergen-Paterson sketches, the loads to be used are defined by the cases identified in Attachment 2 of the transmittal letter. These loads are then combined by Bergen-Paterson, per the equations given in Attachment 3, to determine the largest absolute sum possible for use in their design of the hanger. These combined loads are indicated in the diagram below the table on each sketch. The loading criteria is given in EB-B-173, dated July 9, 1976, a copy of which is attached hereto. In addition, Specification CAR-SH-M-30, Part II, Page 26, Paragraph 22.05 invokes ASME Section III and MSS-SP-58.

NRC Question 210.76 (cont'd)

Finally, in cases where the combined loads per the current revision of a calculation are less than those from a previous revision upon which the hanger is designed, Bergen-Paterson adds the following note in lieu of revising the entire table:

"Loads decreased per revised Iso."

Since in these cases the hangers have been designed by Bergen-Paterson to loads higher than those per the latest calculation, their approach is conservative.

210.7C

ATTACHMENTS

EB-B-3894

210.76

bc: H Oslick
W Szablowski
E Gebet
M Gagliardi/P Fiala
I Grosz
B Teverovsky w/att B.Tw.
R Shah
A Boehm
J Gallagher
File Custodian
Mech File

EBASCO

JUN 08 1981

EB-B-3894
File: 5Q-H-2
5Q-M30-C

Mr N J Nicolich
Bergen-Paterson Pipesupport Corp
50 Clinton Street
Hempstead, NY 11550

Dear Mr Nicolich:

Subject: CAROLINA POWER AND LIGHT COMPANY
SHEARON HARRIS NUCLEAR POWER PLANT
STRESS ANALYSIS TRANSMITTAL
P O NY-435035

The stress analysis calculations and isometrics transmitted by this letter are listed in Attachment 1. All of these analyses are released for engineering work. Attachment 2 lists the analyses performed for each calculation and indicates the analysis abbreviation. The load combinations for the design of hangers and restraints that apply to each calculation are listed in Attachment 3. Force components should be added in accordance with the criteria given at our meeting of April 23, 1976. See EB-B-164, dated May 12, 1976, for the Minutes of the Meeting. The design criteria for the hangers shall be as given in Letter EB-B-173, dated July 9, 1976.

Very truly yours,

E. Gebet

E Gebet
Assistant Project Manager

BT:mc
Attachments: Calc: 8050-1
Isos: 1A-216-SW-1,2 and 1A-236-SW-14,15 all Rev 2

cc: L I Loflin
Plant Manager c/o C R Gibson
R M Parsons
J Harris - SWF
P Blouin
B Burkhart
L H Martin

210.76

EB-B- 3894

ATTACHMENT 1

| Calc No. | Iso(s) No. | Rev |
|---|---|---|
| 8050-1 | 1A-216-SW-1 | 2 |
| 8050-1 | 1A-216-SW-2 | 2 |
| 8050-1 | 1A-236-SW-14 | 2 |
| 8050-1 | 1A-236-SW-15 | 2 |

210.7L

EB-B-3894

ATTACHMENT 2

Calculation 8050-1

| Analysis | Symbol | Normal | Upset | Emergency | Faulted | Accident |
|---|---|---|---|---|---|---|
| Thermal (Case 1) | T | x | | | | |
| 1G Vert Eff/Test Weight (For ref only) | Wt | x | | | | |
| OBE Seis Response (Case 10) | OBE | | x | | | x |
| DBE Response (Case 200) | DBE | | | | x | x |
| 0.3G XYZ Sec Seis Displ (Case 11) | SSD | | x | | | x |
| XYZ Seis Displ Bldg (Case 12) | SDB | | x | | | x |
| XYZ Seis Conn Displ (Case 18) | SCD | | x | | | x |

210,76

EB-B- 3894

ATTACHMENT 3

Calculation 8050-1

All piping shown on this isometric is "essential" and hangers/restraints should be designed in accordance with the load combinations given below:

| Equation | Load Combination | Hanger/Restraint Design Criteria | Structural Steel Design Criteria |
|---|---|---|---|
| 1. | T + Wt | MSS-SP-58 | $S_x$ |
| 2, | T + Wt + OBE + SSD + SDB + SCD | MSS-SP-58 | $S_x$ |
| 3. | N/A | - | - |
| 4. | N/A | - | - |
| 5. | N/A | - | - |
| 6. | T + WT + DBE + 2 (SSD + SDB + SCD) | MSS-SP-58 | $S_x$ |
| 7. | N/A | - | - |
| 8. | N/A | - | - |

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EBASCO SERVICES

July 9, 1976
Ebasco 173
File SQ-11-2

Bergen Paterson Pipesupport Corp.
19 Forbes Road
Braintree Branch
Boston, Massachusetts 02184

Attn: M. L Curcio

Gentlemen:

Re: SHEARON HARRIS NUCLEAR POWER PLANT
HANGER/RESTRAINT DESIGN CRITERIA
P.O. NO. NY-451035

Hanger/restraint design shall be based on the following eight (8) equations (the components for each equation will be provided with the stress analysis transmittals):

Equation 1 = Normal Operating
Equation 2 = Operating Basis Earthquake
Equation 3 = Hurricane
Equation 4 = Pipe or Equipment Accident
Equation 5 = Tornado
Equation 6 = Design Basis Earthquake
Equation 7 = Pipe or Equipment Accident Plus Operating Basis Earthquake
Equation 8 = Pipe or Equipment Accident Plus Design Basis Earthquake

When applying equations 1 through 7 to the design of hanger/restraint components (other than major structural components or supplementary steel) the allowable stress shall be those listed in NF3-1324. For equation 8 the required section strength Zx calculated using the elastic design methods and the allowable stresses defined in Part 1 of the AISC "Steel Construction Manual", seventh edition shall be 1.5Zx.

For major structural components or supplementary steel the required section strength Zx shall be calculated using the elastic design methods and the allowable stresses defined in Part 1 of the AISC "Steel Construction Manual", seventh edition. The table below summarizes the differences between essential and nonessential piping required section strength.

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EBASCO SERVICES

July 9, 1976
Page 2

| Equation No: | Essential | Nonessential |
|---|---|---|
| 1 | 8x | 8x |
| 2 | 8x | 8x |
| 3 | 8x | 8x |
| 4 | 8x | 1.33x |
| 5 | 8x | 1.33x |
| 6 | 8x | 1.33x |
| 7 | 1.33x | 1.33x |
| 8 | 1.33x | 1.66x |

The hanger/restraint must meet these allowables when external loads such as hanger/restraint dead weight or thermal expansion are added to the piping loads.

Please advise us if we can be of any further assistance.

Very truly yours,

A. Cesnavicius
Supervising Mechanical-Nuclear Engineer

by

J M Rapp

ADU:lv

cc: S Hakanson
T M Uyllie
Plant Mgr. c/o M R Banks
J M Bell
J Harris, Proj Mgr-SMF
S Pope
J Brown
M Micelich

bc: L V Thierwechter
R W McCaffrey
A Cesnavicius
J M Rapp
M Lynch
File SQ-M-3
J P Rivera

COPY

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Question 210.77

In our review of your design specifications for ASME Class 1 piping, we expressed a concern regarding the minimum wall thickness permitted at girth butt welds. We would expect this minimum to be controlled for shop fabrication by (Westinghouse) Specification G-678843 and/or G-679187. In Specification G-678843, Section 6.1.7 states: ". . . providing such grinding does not infringe on the required minimum wall thickness of the piping."

(a) Define what is meant by "required minimum wall thickness of the piping." For example, is it the wall thickness calculated by Eq. (1) or Eq. (3) in NB-3600 (1971)?

(b) If the definition of minimum wall thickness is less than (7/8) of the nominal wall thickness used in stresses analyses, indicate what modifications to the Stress Indices are used to account for significantly less-than-nominal wall thickness at girth butt welds.

(c) Indicate what action is required by your specifications should localized areas of girth butt welds be inadvertently ground beyond the "required minimum wall thickness." Is repair welding always required in such situations or is further evaluation without repair welding permitted? If so, what criteria are applied to determine when repair welding is necessary.

RESPONSE:

(a) The Shop Fabrication Specification G-678843 references the Piping Specification G-678866. This piping specification is provided to the piping assembly fabricator and is referenced in the purchase order as a contract document. Paragraph 3.1.3 of G-678866 defines the calculated and nominal wall thickness for the cold leg (27 1/2"), hot leg (29") and crossover leg (31") piping. Please note that Paragraph 3.1.1 of G-678866 states that the calculated wall thickness is derived from ASME Code Section III, Paragraph NB-3641.1(3).

(b) The table in Paragraph 3.1.3 of G-678866 shows that the minimum wall thicknesses are not less than 7/8 of the nominal wall thicknesses. Therefore, modifications to the stress indices based on wall thicknesses at girth butt welds are not necessary.

(c) If the fabricator violates the calculated minimum wall thickness specified in Paragraph 3.1.3 of Equipment Specification G-678866, the vendor is required by the contract to file a deviation notice (DN) which requests Westinghouse disposition prior to any action being taken by the vendor. It has been Westinghouse policy not to accept a minimum wall thickness violation at a vendor's plant. Westinghouse dispositions of these conditions require weld repair of the area to return it to compliance with the noted specification with subsequent smooth blending of the area to the surrounding surfaces.

(7876FXTccc)

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 354
NRC Ouestion 210.78

In our review of your design report for the reactor coolant loop piping, we found that only Volume 1, "Structural Analysis of the Reactor Coolant Loop for Shearon Harris Nuclear Station, Units 1, 2, 3, 4," was available for review and that it was preliminary. We were informed that the complete stress report would consist of five volumes.

The following information is required to complete our review. Provide a schedule of when the following information will be available for our review:

(a) Complete Stress Report (not necessarily final in representing the as-built) of the Reactor Coolant Loop Piping for Shearon Harris.

(b) If not included in the Stress Report, a tabulation of numerical values of all Stress Indices used in the analysis.

(c) If Stress Indices are used that are not obtained from Table NB-3683.2-1 (1971) or analogous tables from later Code editions, a description of the technical basis for those Stress Indices.

(d) If not included in the Stress Report, details of the fatigue evaluation of that location which gives the highest usage factor. Those details are to include pressure ranges, moment ranges, thermal stress ranges and the number of assumed cycles of each.

RESPONSE:

A complete stress report for ASME Class 1 components on Shearon Harris will be available by December 1984.

At that time, additional details of the analysis such as usage factors, etc., will be available for review at the Westinghouse files.

(7876FXTccc)