

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Suction System for the Low Pressure Safety Injection Pump from the Refueling Water Storage Tank T-006 to the inlet of the LPSI Pump P-016.

REQUIREMENT REFERENCE DOCUMENTS:

1. PSAR SEcs. 6.3.1.4 and 3.9.3
2. CE General Engineering Specification for Safeguard Pumps No. 00000-PE-410
3. CE Project Specification for Safeguard Pumps No. 1370-PE-410 Rev. 07.
4. Safeguard Pumps NPSH with Suction from Refueling Water Tank BPC Calc. File No. S023-451A

BASIC REQUIREMENT:

- A. The minimum available NPSH shall not be less than 20 feet under all operating conditions including a design basis earthquake.
- B. The pump NPSH requirement should be specified such that the effects of an earthquake are included.

DESCRIPTION OF POTENTIAL FINDING:

- A. The referenced calculation (4) does not consider the effect of seismic excitations on the available pump NPSH. Design basis earthquake excitations may reduce the available NPSH below the minimum 20 foot requirement for reasons given on the attached sheet.  
The pump specifications (Refs. 2 & 3) are deficient in that they do not specify the NPSH requirement during a seismic event.

PREPARED BY: L. Penzes

DATE: 3/12/82

REJECTION OF GATASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GATASK LEADER

COMMENTS

This revision of PFR-F039 pertains to Item B above which affects the CE portion of the LPSI pump design review.

☒ AGREE PF IS VALID

BY [Signature]

DATE 3/12/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

1. The hydrostatic head is significantly reduced by vertical acceleration. As an illustration, a vertical acceleration of  $1g$  in the downward direction would negate the hydrostatic head due to elevation ~~of~~ difference. The accelerations to be considered are the ZPA multiplied by the spectral magnification factor .
2. The refueling water tank and suction pipeline with fluid have natural frequencies which produce spectral magnification greater than 1.
3. The response of the tank to vertical accelerations may result in less than atmospheric pressure at the tank outlet to the suction line.
4. Horizontal accelerations reduce the pressure in horizontal portions of the suction line in the same manner that vertical accelerations reduce the head in vertical segments.
5. The effects of horizontal and vertical accelerations must be combined.

3/2/82

Rechtel Response to  
2408-PFR-7039

There is no statement in the "Requirement Reference Documents" specifying that the NPSH must be greater than 20 feet during a design basis earthquake. Reference documents 1, 2 and 3 address only system physical integrity during a design basis earthquake, not system performance during said event; reference document 4 is the actual low pressure safety injection pump NPSH calculation.

NPSH variation resulting from the response of the flowing fluid to seismic acceleration is considered a secondary effect, and is not normally included in NPSH calculations, since:

1. The theoretical momentary reduction in NPSH would merely result in a momentary reduction in system flow. The duration of the flow reduction would be negligible with respect to the RCS heat-up rate; and, due to the nature of seismic motion, would be countered by a similar, if not equal, increase in flow due to the increase in suction head which results from the reversal in direction of the seismic acceleration.
2. Any flashing which might occur at the pump impeller due to a seismically induced momentary reduction in NPSH would be of too short a duration to damage the pump.

*7/13*

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

PFR NO. 2408 PFR-F041

REVISION \_\_\_\_\_

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Safety Injection System Piping Stress  
Analysis Package PSG-245

REQUIREMENT REFERENCE DOCUMENTS:

San Onofre 2 & 3 FSAR Section 3.9.3.2.2.3.2

BASIC REQUIREMENT: C.E. Valves 2HV-9341 and 2HV-9342 be subject to effective accelerations of 3 G's or less.

DESCRIPTION OF POTENTIAL FINDING: If calculated using the same method as that used in packages PSG-56 & 78 i.e. by adding the ZPAs to the X, Y, Z components then SRSS for the resultant, the effective accelerations for valves 2HV-9341 and 2HV-9342 would be 3.09 and 3.50 G's - DBE. Outside the allowable. In package PSG-245 the effect of ZPA was ignored for these valves.

PREPARED BY: N. I. Marsh

DATE: 2-9-82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☐ AGREE PFR IS VALID BY \_\_\_\_\_ DATE \_\_\_\_\_

☐ REQUEST RE-REVIEW BY \_\_\_\_\_ DATE \_\_\_\_\_

☐ DISAGREE BY \_\_\_\_\_ DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

# POTENTIAL FINDING REPORT

## SONGS 2&3 SEISMIC DESIGN VERIFICATION

REPARATION BY GA INITIATOR

AFFECTED ITEMS: Safety Injection System Piping  
Stress Analysis Packages PSG-56, 57, 78, 82, 117, & 245

## REQUIREMENT REFERENCE DOCUMENTS:

None

BASIC REQUIREMENT: When calculating valve effective accelerations (G's) the method used should be consistant throughout the piping stress packages.

## DESCRIPTION OF POTENTIAL FINDING:

In the 6 piping stress packages referenced above, 3 different methods were used to arrive at the Valve Effective Accelerations (G's). Packages 56 and 78 added ZPAs to components then SRSS for resultant. Packages 57, 82 and 245 did not add ZPAs to the components. Package 117 added the ZPAs to the components but not the resultant. This is inconsistant.

PREPARED BY: N. J. MarshDATE: 2-8-82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

## COMMENTS

Dr's method of accounting for the ZPAs, and the basis for the methodology, in calculating effective accelerations (G's) in the piping analysis require clarification.

☒ AGREE PF IS VALIDBY [Signature]DATE 2/10/82☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

2408 PFR NO. F049

REVISION - -

A. PREPARATION BY GA INITIATOR

SELECTED ITEMS: Bechtel Site audit No. 1567, conducted 8/28-29/79.

REQUIREMENT REFERENCE DOCUMENTS:

- 1) Bechtel QA Standard No. 5.1, Rev. 13, issued 5/10/79, "Project QA Audits", Section 4.2 "auditors"
- 2) Peabody Testing/X-ray Engineering Co., QA Plan, Rev. C, per audit checklist 5-3.
- 3) Corrective action statement for characteristics 24 and 25 from the audit check list.

BASIC REQUIREMENT:

SEE ATTACHMENT I

DESCRIPTION OF POTENTIAL FINDING:

Corrective action taken was inappropriate, since it failed to correct the deficient requests for examination.

PREPARED BY: Robert A. Sweet

DATE: 3/5/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY

J. Blum

DATE

3/15/82

☐ REQUEST RE-REVIEW

BY

DATE

☐ DISAGREE

BY

DATE

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

## ATTACHMENT I

## BASIC REQUIREMENT:

- 1) "Review results of the audit, identify individuals responsible for actions to be taken and establish due dates. In the event corrective action cannot be completed within 30 days, the audited organization's response shall include a scheduled date for the corrective action."
- 2) (From Audit Checklist)  
Characteristic 24, procedure paragraph 6.1.1, "Requests for Radiographic Examination. The client will submit a written list of weld joints to be radiographed. The list will indicate the following:
  - a) Weld joint identification
  - b) Weld joint size
  - c) Wall thickness
  - d) Weld joint location
  - e) Code or Specification to which radiography is to be performed
  - f) Other information that may apply to the radiography, i.e., Repair No."

(Auditor's Remark for Characteristic 24)

"OBSERVATION: requests written by D. Bently 8/22/79 and M. Sibley 8/22/79, 8/23/79 do not contain"...subparagraph 6.1.1 e) required data.

(From Audit Checklist)

Characteristic 25, procedure paragraph 6.2.1, "Requests for Other Nondestructive Examinations. Requests will be received in writing or verbally from the client and shall include the following information:

- a) Type of nondestructive examination to be performed
- b) Identity of item(s)
- c) Location of item(s)
- d) Weld or material thickness (for MT and UT only)
- e) Weld configuration (for UT only)
- f) Applicable Code or Specification
- g) Any other information that may apply.

(Auditor's Remark for Characteristic 25)

"OBSERVATION: requests for MT or UT examinations do not contain weld or material thicknesses."

- 3) "LWQCE, D. Martin has instructed the responsible personnel to comply with sub para...."

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

2408

PFR NO. F050

REVISION

A. PREPARATION BY GA INITIATOR

SELECTED ITEMS:

Bechtel Site Audit No. 1855, conducted 12/9-11/80

REQUIREMENT REFERENCE DOCUMENTS:

- 1) Bechtel QA Standard No. 5.1, Rev. 14 issued 8/39/79 "Project Quality Assurance Audits," Section 4.2 "Auditors."
- 2) WPP/QCI-006, Appendix I, Rev. 6, per audit checklist G-6-2, processing of NCRs relating to CE NSSS equipment.
- 3) Same as (1).

BASIC REQUIREMENT:

SEE ATTACHMENT 1

DESCRIPTION OF POTENTIAL FINDING:

- 1) No CAR was issued but deficiency, discovered under characteristic 4, was handled as a minor deficiency.
- 2) No action was taken at all to correct characteristic 4 deficiency noted for NCR (nonconformance report) 731 and NCR 748.

PREPARED BY: Robert A. Sweig

DATE: 3/5/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PFR IS VALID

BY

J. Beavel

DATE

3/5/82

☐ REQUEST RE-REVIEW

BY

DATE

☐ DISAGREE

BY

DATE

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_



## ATTACHMENT I

## BASIC REQUIREMENT:

- 1) "When the deficiency is minor and is corrected prior to completion of auditing, a CAR need not be issued. However, the deficiency and action taken shall be documented in the audit checklist or data collection sheet.

For other deficiencies prepare a CAR in accordance with procedure No. 7.10 and submit to the lead auditor and his immediate supervisor for review."

(Audit checklist)

- 2) Characteristic 4, procedure paragraph 3.1.4, "The Lead Nuclear Field engineer (LNFE) shall transmit a copy of the NCR and a memo recommending a disposition for the NCR to the CE Site Representative."

(Audit checklist)

Characteristic 6, procedure paragraph 3.1.6, "The LNFE shall review and concur with the CE disposition memo and document the disposition and memo file no. in block 23 of the NCR. The LNFE shall also record CE's corrective action to prevent recurrence, as applicable, in block 21 of the NCR. A copy of CE's disposition memo shall be attached to the NCR for permanent record."

- 3) "Review results of the audit, identify individuals responsible for actions to be taken and establish action due dates. In the event corrective action cannot be completed within 30 days, the audited organization's response shall include a scheduled date for the corrective action."

## POTENTIAL FINDING - DISCUSSION:

This audit found that, under characteristic 4, "three NCRs (nonconformance reports) N-751, N-749 and N-748 have not been sent to CE as yet", 12/10/80. The auditor treated this as a minor deficiency and informed LNFE of deficiency. The following corrective action was noted on the check sheet:

"A speed memo was transmitted from the LNFE to CE and return for NCRs N-749 and N-751."

The check sheet for characteristic 4 was completed 12/10 and 11/80, and showed an intent to write a CAR for NCRs not being sent to CE for dispositioning at least for NCRs N-731 and N-748. The auditor noted on the check sheet:

"This is finding No. 1 CAR No. \_\_\_\_."

## ATTACHMENT I

However, the above quoted line was crossed out by the auditor on 12/22/80. Why was N-731 mentioned? Why wasn't N-748 mentioned in the speed memo above? How were N-731 and N-748 NCRs dispositioned?

Under characteristic 6 these remarks were recorded: "The memo file no. in block 23 of NCRs No. N-749 and N-751 is not shown as required by this procedure paragraph No. 3.1.6." "These NCRs were corrected when the discrepancy was brought out." What about NCRs N-731 and N-748?

Two CARs were issued in conjunction with this audit, CAR F1178: unauthorized use of stick-on decals on a QA document, and CAR F1179: lack of hold tag evidence. The above deficiency was as serious or more so than these, why wasn't a CAR issued?

No action was taken to correct NCR-748 contrary to reference (3) requirements. What of NCR-731, was it deficient also?

POTENTIAL FINDING REPORT  
SONGS 2& SEISMIC DESIGN VERIFICATION

REVISION \_\_\_\_\_

A. PREPARATION BY GA INITIATOR

SELECTED ITEMS: The following 5 BPC Site audits started on the date shown: 1476, 3/15/79;  
1567, 9/15/79; 1567, 8/28/79; 1855, 12/9/80 and 2053, 12/10/81.

REQUIREMENT REFERENCE DOCUMENTS: 1) ANSI N45.2 - 1971, "19 Audits." 2) Same  
document as (1), "18 Quality Assurance Records." 3) BPC Quality Assurance Standard  
No. 5.1, Rev. 12/ 3/6/78, "4.2 Quality Assurance Engineers." 4) BPC QA Standard No. 5.1,  
Rev. 13, 5/10/79, Rev. 14, 8/30/79 and Rev. 15, 11/16/81, "4.0 Responsibilities."  
5) Same documents as (4) Revisions 14 and 15, 6.0 & 7.0, "Audit Records."

BASIC REQUIREMENT:

See Attachment I

DESCRIPTION OF POTENTIAL FINDING: (1) A Trend - all of these audits had nonconformances  
or deficiencies which, were not reported as required per references (1, 3 and 4). Audits  
1567 (see PFR-F049) and 1855 (see PFR-F050) treated deficiencies as minor deficiencies,  
recording results only in the checklist. (2) Since 8/30/79 (reference 5) audit check  
lists or marked up controlling procedures are nonpermanent records. These audit results  
are not being stored as required per reference (2).

APPROVED BY: Robert G. Smith DATE: 3/3/82  
REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY J. Bernal

DATE 3/3/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

C. REVIEW BY ORIGINAL DESIGN ORGANIZATION

## COMMENTS

SEE ATTACHMENT II

☐ AGREE PF IS VALID☒ DISAGREEBY: C. J. Thibault for F. B. Markham  
L. W. HurstDATE: 3/10/82D. RECOMMENDATION BY FINDINGS REVIEW COMMITTEE

DEFINITION ADEQUACY:

☐ ADEQUATE☐ INADEQUATE

VALIDITY:

☐ VALID☐ INVALID

CLASSIFICATION:

☐ OBSERVATION☐ FINDINGJUSTIFICATION:

CLASSIFICATION CRITERION NO. RESULTING IN "FINDING" \_\_\_\_\_

COMMENT ON "OBSERVATION" CLASSIFICATION

BY: \_\_\_\_\_ DATE: \_\_\_\_\_

E. GA PROJECT MANAGER☐ ACCEPT☐ REJECT

BY: \_\_\_\_\_ DATE: \_\_\_\_\_

## ATTACHMENT I

**BASIC REQUIREMENT:**

- 1) "...Audit results shall be documented and reviewed by management having responsibility in the area audited. Responsible management shall take the necessary action to correct the deficiencies revealed by the audit..."
- 2) "...the records shall include, ...audits,...In general, records which correctly identify the "as-built" condition of items in the plant should be maintained for the life of the plant...these records should include... records of nonconformances and their resolution..."
- 3) "Prepare QAFs ...(Quality Assurance Finding)...identifying nonconformances and deficiencies. QAFs are distributed as attachments to the audit report... The report shall be addressed to the project manager for design office audits with copies to the project engineer and project quality assurance supervisor. For field office audits the report shall be addressed to the field construction manager..."
- 4) "Lead Auditor...prepares a monthly audit report"...containing a "...summary of audit results..." and a "summary of (for Rev. 13, a description of) deficiencies..."
- 5)
  - \* o Completed audit element checklist used or
  - \* o Copy of controlling document as completed by the auditor.

\*Non-permanent" (quality assurance record)

**AUDITS REVIEWED:**

<u>Audit No</u>	<u>Deficiency or Nonconformance not Reported (as Required per reference 3 or 4</u>
1476	3 of 60 white drawings and 10 of 140 pink drawings in stick files not to current revision.
1555	ICFE not maintaining missing items list for instruments which are required for panels.
1567	LWQCE not providing vendor with all data required to perform nondestructive examinations.
1855	LNFE not submitting NSS equipment NCRs to CE for dispositioning.
2053	Electrical department not sending any FCR log sheets to CDM.

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

2408PFR NO. F052

REVISION --

A. PREPARATION BY GA INITIATOR

SELECTED ITEMS: The following 9 BPC site audits started on date shown: 914, 10/12/27; FQA161, 1/15/76; 345, 2/14/77; 601, 5/2/77; 1072, 1/18/78; 1104, 2/7/78; 1555, 7/16/79; 1596, 9/26/79 and 1855, 12/9/80.

REQUIREMENT REFERENCE DOCUMENTS:

- 1) ANSI N45.2-1971, "19 Audits"
- 2) Same as (1), "17 Corrective Action"
- 3) BPC Quality Assurance Standard No. 5.1, Rev. 9, 11/29/76 through Rev. 12, 3/6/78
- 4) Same as (3), Rev. 13, 5/10/79 through Rev. 15, 11/16/81

BASIC REQUIREMENT:

SEE ATTACHMENT I

DESCRIPTION OF POTENTIAL FINDING:

A trend - nine of the nine audits concerning deficiencies, deviations or nonconformances by Field Engineers accepted inappropriate corrective actions (see discussion in Attachment I).

PREPARED BY: Robert R. Riving

DATE: 3/5/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY J. Brunel

DATE 3/9/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

**BASIC REQUIREMENT:**

- 1) "...Audit results shall be documented and reviewed by management having responsibility in the area audited. Responsible management shall take the necessary action to correct the deficiencies revealed by the audit..."  
  
"Deficient areas should be re-audited until corrections have been accomplished."
- 2) "Measures shall be established and documented to assure that conditions adverse to quality, such as ..., deficiencies, deviations...and nonconformances, are promptly identified and corrected as soon as practicable. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition..."
- 3) "Perform follow-up of open items to assure a written response is received, cause is identified, acceptable corrective action is defined, scheduled date of implementation is designated, and verify that corrective action is implemented. Verification actions will be documented..."
- 4) "Review results of the audit, identify individuals responsible for actions to be taken and establish action due dates. In the event corrective action cannot be completed within 30 days, the audited organization's response shall include a scheduled date for the corrective action."

**POTENTIAL FINDING DISCUSSION:**

A random sample of 72 audits were reviewed of the 2053 BPC site audits conducted. Nine of these, see attached summary, involved deficiencies, deviations or nonconformances by Field Engineers (CFE, ICFE and LNFE). For 7 of the 9 audits, no action was taken to correct Field Engineer's lack of compliance with procedure. Audit 601 stated that correction would be made as time allows, this is not prompt corrective action as required per Reference (2). Audit 1104 did not determine how many supports were changed by CFEs, and take action to get their drawings revised and reissued. No evidence could be found in the audit log of a follow up audit to see if the memo to pipe support CFEs had any effect on their field practice. Corrective action concerning Field Engineers was ineffective and inappropriate to correct their deficiencies.

AUDIT DEFICIENCY FOUND AND CORRECTIVE ACTION ACCEPTED, SUMMARY

AUDIT NO.	DEFICIENCY OR NONCONFORMANCE BY FIELD ENGINEER	CORRECTIVE ACTION ACCEPTED	ACTION REQUIRED BY FIELD ENGINEERS
914	No CFE present at initiation of work.	It is intended that CFE be present. Foreman to be sure they have dwgs. etc.	None
FQA 161	Work proceeding before authorized via CIDR by CFE.	Procedure changed to conform to field practice.	None
345	CFE not performing progressive verification to assure compliance.	Procedure changed to conform to field practice	None
601	Work proceeding before "Q" and seismic classes indicated on ICC and authorized by CFE.	"Q class is being input on ICCs as time allows" (What about seismic class?)	None
1072	Fab shop CFE not sending master marked-up pink drawing stamped "Fabrication complete" to piping isometric group.	Procedure changed to conform to shop practice	None
1104	CFEs marking up ASME pipe support drawings and pipe fitters are instructed to work to them, this is contrary to procedure requiring drawing revision and reissue.	A memo was sent to pipe support CFEs telling them to have drawings revised before the work is performed. (No reaudit of this area noted in audit log.)	Stop Practice
1555	ICFE not maintaining missing items list for instruments required for panels.	Procedure changed to conform to field practice.	None
1596	Originating CFE shall forward copy of QC Class II FEWR to lead QCE as notification, prior to issue to field. Of 5 FEWRs sampled none was sent to QCE prior to issue to field.	Changed procedure to start a FEWR log book and to call QC prior to start of work. (This does not correct lack of notification.)	None
1855	LNFE not sending NSSS nonconformance reports (NCR) to CE site representative for dis-positioning.	2 of 4 NCRs corrected via speed memo during the audit. (What about the other two?)	None



# POTENTIAL FINDING REPORT

## SONGS 2&3 SEISMIC DESIGN VERIFICATION

REVISION A

Page 1 of 9

This PFR was revised to more clearly describe and define the PF)

### A. PREPARATION BY GA INITIATOR

- AFFECTED ITEMS: 1) SCE Audit Reports (See Attachment II)  
 2) SCE Engineering Drawing/Document Management Center (EDM)  
 at the SONGS 2&3 construction site.

#### REQUIREMENT REFERENCE DOCUMENTS:

- 1) SCE QA Procedures Manual, Procedure N18.04 Rev. 18  
 2) SCE QA Procedures Manual, Procedure N16.03 Rev. 3

#### BASIC REQUIREMENT:

SEE ATTACHMENT I

#### DESCRIPTION OF POTENTIAL FINDING:

- 1) SCE audits of the Engineering Drawing/Document Management Center (EDM), SCE & BPC site and the Bechtel Design Office (Norwalk) identified numerous deficiencies during the period of 1974 to 1980. Some of these deficiencies were inadequately corrected and/or resolved in a timely manner by effective corrective action (see Att. II for specific cases).  
 2) As a result of the above, these audit reports indicate the potential that preparation, distribution and retention of project documentation was not in conformance with procedural requirements during the period of 1974-1980.

PREPARED BY: J. K. [Signature] DATE: 3/11/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

### B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY J. Burrell

DATE 3/11/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

## ATTACHMENT I

## SCE AUDIT REPORTS - SUMMARY

## BASIC REQUIREMENT:

## 1) - SCE QA Procedure N18.04 (underlines added)

## Para. 1.2 and 1.3

"1.2 To provide for communication of deviations from the quality assurance program requirements discovered as a result of an audit and associated followup corrective action verification.

1.3 This procedure is intended to satisfy Criteria XVI and XVIII of 10CFR50, Appendix B, Regulatory Guide 1.33 and ANSI N45.2.12 with respect to planning, performance, documentation and followup action associated with corrective action."

## Para. 3.3

"3.3 The Quality Assurance Organization personnel assigned to perform audits are responsible for preparation of specific audit plans, performance of audits in agreement with the audit plans, documentation of audit results, initiation and completion of appropriate logs, and follow-up action, including re-audit as appropriate, associated with corrective action."

## Para. 4.5 and 4.6

"4.5 Management having responsibility in the areas audited shall review the results of audits and shall provide appropriate corrective action as denoted on the Corrective Action Request or the Nonconformance Report.

4.6 QA organization personnel shall provide followup on corrective action items as necessary to assure timely implementation."

## ATTACHMENT I

## Para. 5.4.3 and 5.4.4

"5.4.3 Objective evidence shall be documented in the Audit Report to address each item of the audit plan. This documentation shall provide sufficient detail, to allow management to evaluate the effectiveness of the quality assurance program implementation.

5.4.4 Should areas be discovered during the audit which appear to present deficiencies, the auditor shall bring this to the attention of the audit team leader (as appropriate) and the management representative escorting the auditor. This communication is considered necessary in order to provide a meaningful discussion during the exit interview and to provide a basis for required corrective action recommendations."

## Para. 5.5.2

"5.5.2 Deviations resulting from the audit shall be handled using the Nonconformance Report (NCR) or the Corrective Action Request (CAR) in accordance with applicable QA Manual requirements. The associated NCR or CAR number(s) shall be noted in the appropriate block on the Audit Report."

## Para. 5.6

## "5.6 Followup

5.6.1 The audit team leader is responsible to provide appropriate followup action to assure that:

- 1) The organization audited responds to the recommendations, Corrective Action Requests and the Nonconformance Reports.
- 2) The responses are adequate and address the problems discovered during the audit with regard to cause, corrective action to correct problems and to prevent recurrence, and
- 3) Corrective action is accomplished in accordance with the established effectivity date.

Followup action may be accomplished through written communication, reaudits or other means appropriate to the circumstance. Reaudits shall be performed in accordance with the requirements of this procedure."

## ATTACHMENT I

## 2) SCE QA Procedure N16.03

## Para. 2.0

"2.0 RESPONSIBILITY

2.1 The SCE Quality Assurance Organization is responsible for identifying and documenting conditions adverse to quality, requesting corrective action from the responsible organization, evaluating the corrective action for acceptability, providing appropriate verification of corrective action, and for notifying affected organizations of conditions adverse to quality and associated corrective action resolutions.

2.2 Contractor personnel and SCE organizations are responsible for completing the CAR and for providing cause of condition, action taken to resolve problem and corrective action to prevent recurrence, as applicable.

2.3 SCE Project Engineering (Engineering and Construction Project) or Steam Generation Engineering (Operation) is responsible for evaluating corrective action for acceptability associated with contractor source nonconforming items discovered by SCE, where such evaluation is specified in procurement documents."

## ATTACHMENT II

<u>AUDIT #/DATE</u>	<u>DEFICIENCY</u>	<u>CORRECTIVE ACTION TAKEN</u>	<u>GENERAL COMMENTS</u>	<u>RELEVANCY TO PFR ITEM</u>
SCES-10.0.17.17.0 3/31/75	All Project Documentation is not being submitted to the EDM Center	(10) Recommendations (C.A.)	None	(Initial Problem Identification)
SCES-10-75 12/11/75	Followup Audit of SCES-10.0.17.17.0 No deficiencies reported	None	None	1 & 2
SCES-06-75 9/15/75	<ul style="list-style-type: none"> <li>o Const. Mgmt. Spec. files not current/controlled</li> <li>o No formal procedures to keep spec. files current</li> </ul>	None	Failure to follow procedural reqmts in initiating corrective action per N18.04	1&2
SCES-01-77 1/13/77	Lack of Quality Record Control	1 CAR issued	None	2
SCES-GP-2-79 7/18-20/79	<ul style="list-style-type: none"> <li>o Bechtel originated Quality Surveillance Reports could not be retrieved from EDM.</li> <li>o SCE G.O. encoded documents differently</li> </ul>	<ul style="list-style-type: none"> <li>o Jobsite EDM Center to request Bechtel place EDM on distribution</li> </ul>	None	2
SCES-01-80 12/10-12/79	<ul style="list-style-type: none"> <li>o Procedure for Mtl. Control S023-X1-16 not issued</li> </ul>	<ul style="list-style-type: none"> <li>o Generate common station procedures for SONGS 1, 2 &amp; 3</li> </ul>	<ul style="list-style-type: none"> <li>o Violation of SCE QA Program requirements.</li> </ul>	2

<u>AUDIT #/DATE</u>	<u>DEFICIENCY</u>	<u>CORRECTIVE ACTION TAKEN</u>	<u>GENERAL COMMENTS</u>	<u>RELEVANT TO PFR II</u>
SCES-05-79 12/26-27/79	Listed vendor FCRs do not have approval in Block 8, 502-26-8-13	Delete require- ments from Pro- cedure	Deletion is con- trary to reqmnts of Appx. B, Criteria 3 & 6.	1&2
SCES-04-80 9/15-18/80	Various violations of ANSI N18.7-1976 & 10CFR50, Appx. B Criterion XVI	7 CARs issued	S023-P-13	1&2
BPC-29-0 6/16-19/75	Lack of procedural requirement to address a time response to incorpor- ate FCRs into original documents	2 CARs issued	Deficiency of long duration. FCR 183-C, Rev.2 (10/7/74) has more than 25 FCRs against it. Rev. 3 completion date by 7/30/75	1&2
BPCS-29-76 8/2-3/76	QA Program QA Records	1 CAR issued	CAR adequately addresses finding	2
BPCS-33-76 8/17-20/76	o BPC Procedural deficiencies o BPC procedural violation & conflicts o BPC personnel errors	7 CARs issued	Additional train- ing. Instruction of personnel is required per CARs	2
BPCS-44-76 11/11-12,15/76	o Lack of interface (Design) procedures (BPC/CE) o PIPM procedural deficiencies	9 CARs issued	CARs adequately address findings Implementation of corrective action verification per CAR.	2

<u>AUDIT #/DATE</u>	<u>DEFICIENCY</u>	<u>CORRECTIVE ACTION TAKEN</u>	<u>GENERAL COMMENTS</u>	<u>RELEVANT TO PFR 1</u>
BPCS-15-77 5/18/77 5/27/77	Lack of procedural requirements. Assure jobsite control of specs/changes.	2 CARs issued	Deficiencies of long duration.	2
BPC-6-77 6/14-16/77	Violation of QA Program requirements. Ref. Criterion III, App. B Reg. Guide 1-29	2 CARs issued	CARs adequately address findings	2
BPC-9-77 7/26-28/77	Incomplete Calculations and calculation control logs. Criterion III Appendix B.	BPC to complete calculations & required approvals obtained	Areas of QA program not implemented.	2
BPC-10-77 10/11-12/77	Violation of QA program Procedures. Ref. Criterion III, App. B	5 CARs (see comments for Audit History)	1. BPC-11-76 (9/76) 1 CAR 2. BPCS-44-76 (11/76) 7 CARs 3. BPC-2/77 (2/77) 3 CARs 4. BPC-4/77 (4/77) 4 CARs 5. BPC-8/77 (6/77) 1 CAR 6. BPC-9/77 (7/77) 2 CARs	2
BPC-11-77 10/13/77	Violation of PSAR requirements (App. A Att. 2, Pages A2-4, A2-14	Project Trend Analysis initiated 10/17/77	Violation of Long duration.	2
BPC-12-77 10/9/77 12/6/77 12/13/77	Violation of QA program procedures (BPC/supplier) Ref. ANSI N45.2 Sections 7 & 9	5 CARs	CARs adequately reflect findings	2

<u>AUDIT #/DATE</u>	<u>DEFICIENCY</u>	<u>CORRECTIVE ACTION TAKEN</u>	<u>GENERAL COMMENTS</u>	<u>REFERENCE TO PFR ITEM</u>
BPC-F-SHP-1-77 11/2/77	Violation of App. B Criterion XVII. No receipt Insp. of safety related items	Fisher to inspect, test and provide records to BPC	Were the require- ments included in purchase Documents Final resolution?	1&2
CAR SO23-S-392 BPC-Meeting Minutes 11/1/78	Violation of AWS D1.1-1972 Welding procedures	Survey Audit to be performed	Verified Corrective Action implemented 3/21/80. CA untimely.	1&2
BPC-8-78 1/4/79	Violation of FCR processing time Ref. PIPM Sec. 26	Delinquent FCRs incorporated into basic documents. BPC resp. Grp. Engrs to monitor	Evidence of lack of document control	2
SDDR-1613-1630 1/16/79	Violation of PQPM Procedure 6 Rev. 4 (11/15/77)	Addendum G (3/8/79) of Spec. 507-5 References SDDR 1613-1630	Corrective Action implementation verified 4/30/79	2
BPC-02-80 2/14/80	Violation of PIPM 31 Exh. 31-A, DCPs	DCPs to be transmitted to Record Retention	Procedural inadequacy. PIPM 31, Exh. 31-A	2



POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

PFR NO. 2408-PFR-F058

REVISION \_\_\_\_\_

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Control Room Relay Panels 2L-71 and 3L-71

REQUIREMENT REFERENCE DOCUMENTS: Quality Class II Specification for Quality Class II Panels, Relays, and Devices for the Southern California Edison Company San Onofre Generating Station, Units 2 & 3, San Onofre, California. Specification Number S023-306-1, SCE Number 3274, July 31, 1975.

BASIC REQUIREMENT: All Seismic Class I equipment must be qualified by analysis or test.

DESCRIPTION OF POTENTIAL FINDING: Paragraph 4.6.3.5 of the referenced specification states that the Purchaser will determine the specific panel configuration to be tested and will supply a representative sample of panel mounted equipment to be included in the panel test program.

1. There is no requirement or information furnished to assure that qualification of the representative equipment can be extended to cover all Seismic Category 1 equipment in the panel.
2. For the resistor sub-panels specified in Section 4.8.6 of Addendum No. 2 of the specification:

there is no requirement for their qualification as part of the panel 2L071, nor is there

PREPARED BY: H. Rakowski DATE: 2/25/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PFR IS VALID

BY [Signature] DATE 2/24/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_ DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_ DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

C. REVIEW BY ORIGINAL DESIGN ORGANIZATION

## COMMENTS

See attached sheet.

☐ AGREE PF IS VALID☒ DISAGREEBY: Fred B. MarshDATE: 3/3/88D. RECOMMENDATION BY FINDINGS REVIEW COMMITTEE

DEFINITION ADEQUACY:

☐ ADEQUATE☐ INADEQUATE

VALIDITY:

☐ VALID☐ INVALID

CLASSIFICATION:

☐ OBSERVATION☐ FINDINGJUSTIFICATION:

CLASSIFICATION CRITERION NO. RESULTING IN "FINDING" \_\_\_\_\_

COMMENT ON "OBSERVATION" CLASSIFICATION

BY: \_\_\_\_\_

DATE: \_\_\_\_\_

E. GA PROJECT MANAGER☐ ACCEPT☐ REJECT

BY: \_\_\_\_\_

DATE: \_\_\_\_\_

Description of Potential Findings (Continued)

- b) a required maximum in-panel g-level for separate seismic qualification of these panels.
- 3. There is no requirement in this specification that the vendor mount the representative equipment at the cabinet locations having the highest response for all of the equipment which it represents. Therefore, this vendor could have placed it in a low response region of the structure and met the specification requirements while not properly exciting the equipment.
- 4. There are no requirements for minimum contact chatter duration to be verified during qualification testing.

## References

(Attachments are excerpts from references and have the same number as references)

1. Spec. S023-306-1 dated July 31, 1975 (Sheet 1 of 2)  
Spec. S023-306-1, Add. 2 dated Feb. 2, 1978 (Sheet 1 of 2)
2. Not Used
3. Seismic Qualification of Relay Panels 2L-71 and 3L-71 NMC Control, Inc. - S023-306-1-37-1
4. Procedure for the Seismic Qualification of NMC Control, Inc. (with Field Changes 1) Control Room Relay Panels, 27-71 and 3L-71 - S023-306-1-43-0 Acton Procedure No. 13844
5. Acton Technical Report "Seismic Vibration Analysis of NMC Controls, Inc. Control Room Relay Panels, 2L-71 and 3L-71 (with Field Changes 1)" - S023-306-1-44-0 Acton Report No. 13844
6. "Functional Testing of Components Relay Panels 2L-71 and 3L-71" - S023-306-1-32-0
7. Spec. S023-306-1, Add. 2 SCN E-02 dated 7/18/77
8. Component Layout of Panel Load GRP "B" - S023-306-1-34-6

## Responses

1. Attachment 4, Sheet 8 furnishes the basic requirement for Seismic Category I qualification. Attachment 3, Sheet 2 shows the panel mounted equipment that were tested.

Attachment 8, Sheet 1 and Attachment 7, Sheet 2 shows equipment that are actually mounted on the panels. The tested equipment are identical or similar to those installed on the panels, and are representative of all Seismic Category I equipment in the panel test program. Test plan (including specimen for testing) have to be approved by design engineer prior to test.

2. Attachment 4, Sheet 2 and Attachment 7, Sheets 1 and 3 shows that there is such a requirement. Attachment 5 Sheet 1 shows that the resistor panel was included in the analysis.

Attachment 5, Sheet 4 provides the results of the analysis and tests and shows the G-level for the resistors.

3. Attachment 4, Sheet 7, Sections 2.7 and 2.8 shows that there are requirements for the structure excitation. Attachment 5, Sheet 4 shows that the tested G-levels of the components in the panel at various critical locations are equal to or greater than the response level computed from the analysis.

4. Attachment 6, Sheet 2 provides the basic requirements for verifying relay chatter. Attachment 3, Sheet 3 provides test procedures and criteria for monitoring contact chatter.

Additionally, the relays with the chattering problem are not installed in the safety related sections ("A" and "B") of the panel but are actually installed in the non-safety related section (X) which should be excluded in the qualification test.

~~7/2/82~~  
3/3/82

# POTENTIAL FINDING REPORT

## SONGS 2&3 SEISMIC DESIGN VERIFICATION

REVISION \_\_\_\_\_

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Control Room Relay Panels 2L-71 and 3L-71

REQUIREMENT REFERENCE DOCUMENTS: Quality Class II Specification for Quality Class II Panels, Relays and Devices for the Southern California Edison Company, San Onofre Nuclear Generating Station, Units 2 and 3, San Onofre, California. "Specification Number S023-306-1, SCE Number 3274, July 31, 1945".

BASIC REQUIREMENT: A. Section 3.10A, 3.3.1.1 of Appendix B.10A of the FSAR defines two methods for test qualification of assemblies, i.e., fully operational assemblies versus cabinet testing with dummy weights. B. Section 3.10A.3.3.2 states that the assembly shall be mounted to the vibration generator in a manner that simulates the intended service mounting.

DESCRIPTION OF POTENTIAL FINDING: A. The method of testing assemblies with dummy weights is to be used if the fully operational test is not practical, however, in this case it is practical. Hence, by providing representative equipment as stated in Paragraph 4.6.3.5 of the specification, with no requirement for the vendor to install dummy weights elsewhere, the vendor could have interpreted the specification to call for a cabinet test with only the representative equipment installed. If this was the case, the test was not valid because the amplitude and frequency content of the test configuration may be quite different from the installed in the plant and equipment operability would not be verified. (See attached net).

PREPARED BY: J. Rakowski DATE 2/25/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALIDBY BoyerDATE 2/24/82☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

C. REVIEW BY ORIGINAL DESIGN ORGANIZATION

## COMMENTS

See attached sheet.

☐ AGREE PF IS VALID☒ DISAGREEBY: Frederick MarchDATE: 3/2/82D. RECOMMENDATION BY FINDINGS REVIEW COMMITTEE

DEFINITION ADEQUACY:

☐ ADEQUATE☐ INADEQUATE

VALIDITY:

☐ VALID☐ INVALID

CLASSIFICATION:

☐ OBSERVATION☐ FINDINGJUSTIFICATION:

CLASSIFICATION CRITERION NO. RESULTING IN "FINDING" \_\_\_\_\_

COMMENT ON "OBSERVATION" CLASSIFICATION

BY: \_\_\_\_\_

DATE: \_\_\_\_\_

E. GA PROJECT MANAGER☐ ACCEPT☐ REJECT

BY: \_\_\_\_\_

DATE: \_\_\_\_\_

Description of Potential Finding (Continued)

- B. Purchaser determination of a specific <sup>test</sup> panel configuration indicates that either panels 2L-71 and 3L-71, the only panels covered by this specification, are different, or only one dissimilar section of the overall panel need be tested. Paragraph 4.1.2 indicates that dissimilar panel sections may make up 2L/3L-71. There is no requirement that the test configuration determined by the Purchaser is to be representative of all fully assembled panels covered by this specification. If only one panel section is to be tested, there is no requirement that the qualification remain valid when the sections are joined together.



Relay panels 2L-71, 3L-71 and their components were seismically qualified by combined analysis and type testing which is acceptable. The design engineer approved the above approach based on detailed reviews and evaluations with the vendor as indicated in the following documents.

- a. NMC telexes to Dave Morrow and Perry Kine dated 2/1/77, 2/2/77 and 1/26/77
- b. NMC letter to Bechtel dated 10/24/77, 11/8/77, 12/14/77 and 12/1/78

The following are additional documents which substantiate the method chosen and the qualification of the panels.

- a. Test procedure for the seismic qualification (BPC Log S023-306-1-8-2).
- b. Seismic qualification of relay panels 2L-71 and 3L-71 (BPC Log S023-306-1-37-1).
- c. Seismic vibration analysis of control room relay panels 2L-71 and 3L-71 (BPC Log S023-306-1-37-2).
- d. Procedure for the seismic qualification of control room panel 2L-71 and 3L-71 (BPC Log S023-306-1-43).
- e. Seismic vibration analysis of panel 2L-71 and 3L-71 (BPC Log S023-306-1-44-0).

The above documentation clearly indicate that qualification tests and analyses were completed to include all configurations appropriate. The purchase specification need not include a complete detailed discussion of these considerations so long as the post-procurement documentation properly addresses the design requirements and is reviewed for acceptability by Bechtel.

~~7044~~  
3/3/82

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

PFR NO. 2408-PFR-F071

REVISION \_\_\_\_\_

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS (1) Ref. 1

(2) Ref. 2

(3) Refueling Water Tank S21203MT006

REQUIREMENT REFERENCE DOCUMENTS:

Ref. 1: Design Report for 245,000 Gallon Refueling Water Tank, BPC Log No. 407-13-110

Ref. 2: BPC Design Specification S023-407-13 including addenda 1, 2, 3, 4, 5, 6, and 7

Ref. 3: ASME Code Section III including Appendix F and Code Case 1657.

BASIC REQUIREMENT: To meet the buckling requirements according to ASME Code Section III.

DESCRIPTION OF POTENTIAL FINDING:

The buckling criteria of the ASME Code Section III was not appropriately applied in the analysis of the Refueling Tank T006 (see attached).

PREPARED BY:

L. E. Penzes

DATE:

Feb 19, 1982

REJECTION OF GA TASK LEADER COMMENTS BY:

DATE:

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY:

DATE:

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PFR IS VALID

BY

*F. J. P. [Signature]*

DATE

2/19/82

☐ REQUEST RE-REVIEW

BY

DATE

☐ DISAGREE

BY

DATE

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY:

DATE:

# POTENTIAL FINDING REPORT

## SONGS 2&3 SEISMIC DESIGN VERIFICATION

REVISION \_\_\_\_\_

**A. PREPARATION BY GA INITIATOR**

AFFECTED ITEMS: Terminal Boxes 2XB5RZTB03, 2BB4RZTB03 and 2ABRZTB09

## REQUIREMENT REFERENCE DOCUMENTS:

1. Calculation for junction box supports C270-01-03 Sheets 25 thru 76.
2. Explanation Report Drawing 34702 (Rev. 83 Run 148, Page 14) HV9345.
3. Explanation Report Drawing 34717 (Rev. 85 Run 151, Page 50) HV9344.
4. Explanation Report Drawing 34705 (Rev. 83 Run 146, Page 11) HV9341.

## BASIC REQUIREMENT:

~~Not Applicable~~

The seismic design adequacy of components should be documented.

## DESCRIPTION OF POTENTIAL FINDING:

We agree that the supports are rigid by inspection for wall-mounted junction boxes, however, adequate verification of rigidity is not provided where these boxes are attached to structural steel.

PREPARED BY: R. D. Darrin DATE: 2-24-82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

**B. REVIEW BY GA TASK LEADER**

COMMENTS

☒ I AGREE PF IS VALIDBY [Signature]DATE 2/24/82☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

C. REVIEW BY ORIGINAL DESIGN ORGANIZATION

## COMMENTS

Terminal boxes can be mounted either on concrete surfaces or attached to structural steel numbers. We have reviewed the location of terminal boxes 2XB5RZTB03, 2BB4RZTB03, 2BB5R2TB03 which are attached to structural steel members and they will not experience higher acceleration levels than assumed in the analysis.

☐ AGREE PFR IS VALID☒ DISAGREEBY: Fred B. MarshDATE: 3/2/82D. RECOMMENDATION BY FINDINGS REVIEW COMMITTEE

DEFINITION ADEQUACY:

☐ ADEQUATE☐ INADEQUATE

VALIDITY:

☐ VALID☐ INVALID

CLASSIFICATION:

☐ OBSERVATION☐ FINDINGJUSTIFICATION:

CLASSIFICATION CRITERION NO. RESULTING IN "FINDING" \_\_\_\_\_

COMMENT ON "OBSERVATION" CLASSIFICATION

BY: \_\_\_\_\_

DATE: \_\_\_\_\_

E. GA PROJECT MANAGER☐ ACCEPT☐ REJECT

BY: \_\_\_\_\_

DATE: \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

PFR NO. 2408-PFR-FO78

REVISION \_\_\_\_\_

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Refueling Water Tank S21203MT006

REQUIREMENT REFERENCE DOCUMENTS:

Ref. 1: Design Report for 245,000 gallon Refueling Water Tank. BPC Log No. 407-13-110,  
Ref. 2: BPC Design specification S023-407-13 including addenda 1, 2, 3, 4, 5, 6, and 7.

BASIC REQUIREMENT: The tank shall be designed to withstand the wave motion of stored liquid, at design level, during the design basis earthquake, and to function after being subjected to the design basis earthquake (par. 4.7.5.1 of Ref. 2).

DESCRIPTION OF POTENTIAL FINDING: The seismic analysis of the tank does not adequately consider the response of the stored liquid in a DBE and may be unconservative for reasons given on the attached sheet.

PREPARED BY: L.E. Penner

DATE: 2/22/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PFR IS VALID

BY BS7612

DATE 2/27/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

C. REVIEW BY ORIGINAL DESIGN ORGANIZATION

## COMMENTS

The BMT Design Report dated 10/76 utilized seismic design bases in accordance with the industry accepted practice at the time of design and in conformance with NRC recommended practice per Reference 8 of the BMT Report. The literature cited as References 1, 2, 3 and 4 in PFR-F078 augments in part the Housner approach used by BMT in their Design Report, but it is not expected to render the existing design deficient.

If the more current literature provides substantial evidence that earlier design practice could result in design deficiencies both Bechtel and the NRC have mechanisms to advise

☐ AGREE PFR IS VALID

owners/licensees of the need to reevaluate their older installations. Such notices on the subject or revisions to the original document have not been issued.

☒ DISAGREE

BY: Fred B. Marsh

DATE: 3/2/82

D. RECOMMENDATION BY FINDINGS REVIEW COMMITTEE

DEFINITION ADEQUACY:

☐ ADEQUATE

☐ INADEQUATE

VALIDITY:

☐ VALID

☐ INVALID

CLASSIFICATION:

☐ OBSERVATION

☐ FINDING

JUSTIFICATION:

CLASSIFICATION CRITERION NO. RESULTING IN "FINDING" \_\_\_\_\_

COMMENT ON "OBSERVATION" CLASSIFICATION

BY: \_\_\_\_\_

DATE: \_\_\_\_\_

E. GA PROJECT MANAGER

☐ ACCEPT

☐ REJECT

BY: \_\_\_\_\_

DATE: \_\_\_\_\_

Description of Potential Finding

The use of the Housner approach by BMT to determine fluid sloshing loads is not appropriate and may be unconservative in this specific case. There is a large amount of interaction with the roof of the tank which is not covered by the Housner formulation. Additionally, Refs. 1 through 4 indicate that the Housner approach may be unconservative.

References

- Ref. 1: R. W. Clough and D. P. Clough: "Seismic Response of Flexible Cylindrical Tanks". 4th International Conference on Structural Mechanics in Reactor Technology. August 1977. Paper No. K5/1\*.
- Ref. 2: R. W. Clough, A. Nima and D. P. Clough: "Experimental Seismic Study of Cylindrical Tanks." Journal of the Structural Division, ASCE 105, ST12, Proc. Paper 15062, Dec. 1979 (2565-2590).
- Ref. 3: G. W. Housner and M. A. Haroun: "Vibration Tests of Full-Scale Liquid Storage Tanks." 2nd U. S. National Conference on Earthquake Engineering.
- Ref. 4: R. P. Kennedy: Aboveground Vertical Tanks. Section 3630. Standard Provisions/Commentaries. Nov. 10, 1981. American Society of Civil Engineers, Structural Division.

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

2408 PFR NO. F079

REVISION --

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS:

Combustion Engineering Component Specifications - see attached

REQUIREMENT REFERENCE DOCUMENTS:

PE-001, Rev. 1, Section 6.1.4.3 (Combustion Engineering Procedure)

BASIC REQUIREMENT:

"The Design Requirements document will specify functions, definitions, performance requirements, compliance with codes, standards, regulations, mechanical and material considerations, interface and testing requirements, and other design basis to the level of detail necessary to permit the design activity to be carried out in a correct manner and to provide a consistent basis for making design decisions, accomplishing design verification

DESCRIPTION OF POTENTIAL FINDING: measures, and evaluating design changes."

(SEE ATTACHMENT I)

PREPARED BY: George Stankovic

DATE: 4/1/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY J. Brever

DATE 4/26/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_



ATTACHMENT I

DESCRIPTION OF POTENTIAL FINDING:

Design input was not available as required in PE-001. It is recognized that certain of the attached items may have been prepared prior to the issuance of PE-001. However, PE-001 is being used as the basic criteria as specified in the Project 2408 Program Plan, and no evidence could be found that the basic requirement was met in any manner.

The point of concern is the control of design input in the 1969-1975 period. Design input by today's standards must be available when design work commences, must be reviewed and approved and must be controlled as changes occur.

Components examined which had design work in the 1969-1975 period were:

- Safety Injection Tank T008
- LPSI Pump P016
- Valves 2FV-0306 Spec. 1370-PE-704 (SI 306)
- 2HV-9342 Spec. 1370-PE-704 (SI 611)
- 2HV-9341 Spec. 1370-PE-704 (SI 618)
- 2HV-9322 Spec. 1370-PE-705 (SI 635)
- Reactor Coolant Pump
- Reactor Vessel Supports
- Pressurizer Unit 2
- Pressurizer Unit 3
- Containment Spray System Pump
- Boric Acid Make-up Tank - Unit 3

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS:

Combustion Engineering Balance of Plant Design Criteria

REQUIREMENT REFERENCE DOCUMENTS:

Combustion Engineering Specs. PE001, Section 6.2.6.5

BASIC REQUIREMENT:

"Design verification and approval of Balance of Plant Design Criteria sections will be performed as described in Section 6.3" (Section 6.3 requires reviews and approvals).

DESCRIPTION OF POTENTIAL FINDING:

The BOP Design Criteria carries no approval cycle, change control, review, issue date, or document number, as required by PE-001, 6.2.6.5.

PREPARED BY: INDEPENDENT

DATE: 2-26-82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY S. Burrell

DATE 3/3/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

2408 PFR NO. F081REVISION --POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATIONA. PREPARATION BY GA INITIATOR

## AFFECTED ITEMS:

Project Manager provides Design Bases (Combustion Engineering)

## REQUIREMENT REFERENCE DOCUMENTS:

QADM, Section 5.1.2 (Combustion Engineering)

## BASIC REQUIREMENT:

"Prior to commencement of the design effort, the Project Manager supplies information regarding any design bases specified in the contract documents, regulatory guides, and/or industry standards to be employed in the design."

## DESCRIPTION OF POTENTIAL FINDING:

No evidence was found that this was done.

PREPARED BY: [Signature]DATE: 3/1/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

## COMMENTS

☒ AGREE PFR IS VALIDBY [Signature]DATE 3/1/82☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION.

PFR NO. 2408-PFR-F083

REVISION \_\_\_\_\_

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: CE Local Panels 2L123, 2L127, and 2L147

REQUIREMENT REFERENCE DOCUMENTS:

IEEE 344-1971 ; Section 3.2.1

BASIC REQUIREMENT: Seismic tests should be performed by subjecting equipment to vibratory motion which conservatively simulates that to be seen at the equipment mounting during a DBE.

DESCRIPTION OF POTENTIAL FINDING.

CE specification 1370 ICE 0005 specifies a 2g input in the range 5 - 35 Hz. CE document CEN-948 shows a summary that the representative cabinet was tested to 1g.

PREPARED BY: J. Rakowski

DATE: 2/26/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY [Signature]

DATE 3/3/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

PFR NO. 2408-PFR-F084

REVISION \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION.A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Foxboro Power Supply 2ARPS

REQUIREMENT REFERENCE DOCUMENTS:

IEEE 344-1971, Section 3.2.2.3

## BASIC REQUIREMENT:

Test devices using a continuous sine or sine beat, the magnitude of the acceleration should be chosen to be that for which the device is to be qualified.

## DESCRIPTION OF POTENTIAL FINDING:

The test qualification summary in CE document CEN94s states that the qualification g-level was as low as 1g. CE specification 1370ICE0005, covering the associated panel, specifies a 2.0g input in the range of 5-35 Hz. Considering panel flexibility, which is indicated by virtue of (1) other devices qualified to levels up to 10g, and (2) the statement on the attached CE transmittal which states that panel devices were qualified to the local response g-levels of the cabinet, this device was under tested with respect to input acceleration magnitude.

PREPARED BY J. Rakowski

DATE: 2/26/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY

DATE

☐ REQUEST RE-REVIEW

BY

DATE

☐ DISAGREE

BY

DATE

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

PFR NO. 2408-PFR-F085

REVISION \_\_\_\_\_

PREPARATION BY GA INITIATOR

AFFECTED ITEMS: 1. Rosemount Temperature Transmitter 442H-82-A  
2. Foxboro Resistance to Voltage Converter 2AI-P2V

REQUIREMENT REFERENCE DOCUMENTS:

- a) IEEE 344, 1975
- b) IEEE 344, 1971 Section 3.2.2.3

BASIC REQUIREMENT:

- a) The TRS shall envelope the RRS at the equipment mounting location.
- b) Test the devices using a continuous sine or sine-beat input with an acceleration magnitude for which the device is to be qualified.

DESCRIPTION OF POTENTIAL FINDING: Item 1 was separately tested using the method of IEEE 344, 1975 while the panel was tested in accordance with IEEE 344, 1971. Considering panel flexibility, the TRS shown in GEN-94S may not envelope an in-panel RRS as required in a). Since a spectrum does not specify wave shape, a sine beat or dwell at particular frequencies may not have been performed as required in b). Hence, the seismic adequacy of item 1 has not been verified. Item 1 was replaced by item 2 per the attached telegram and no qualification data for item 2 is presented to verify its seismic adequacy.

PREPARED BY: J. Rakowski DATE: 3/3/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY [Signature]

DATE 3/3/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

# POTENTIAL FINDING REPORT

## SONGS 2&3 SEISMIC DESIGN VERIFICATION

REVISION \_\_\_\_\_

VARIATION BY GA INITIATOR

AFFECTED ITEMS: (1) Pipe Support Assembly at Node 117, Tag No. 043-H-021 (Calculation No. P450-150-170). (2) Pipe Support C/S Criteria & Procedure Calc. No. P-450-1.10, Rev. 1. (3) Specification No. CS-C8, Rev. 9, Design Installation & Testing of Concrete Expansion Anchors.

REQUIREMENT REFERENCE DOCUMENTS:

Not Applicable

BASIC REQUIREMENT: Structural criteria must be consistently applied in accordance with industry standards.

DESCRIPTION OF POTENTIAL FINDING: The rock bolt loads are not checked in the pipe support calc. For rock bolts, Calc. No. P-450-1.10 allows full tension and shear capacity simultaneously. BPC Spec. CS-C8 contradicts Calc. P450-1.10 by having a criterion for rock bolts that requires the use of a quadratic interaction formula to evaluate the combined effect of tension and shear. Both documents differentiate between rock bolts and other concrete expansion anchors, requiring the use of a linear interaction formula for the latter. The use of a linear interaction formula is the industry standard for all concrete embedments as indicated by ACI-349 App. B. There is no justification presented to differentiate between rock bolts and other concrete expansion anchors. If the linear interaction formula is applicable, the rock bolts for the affected pipe support may be overstressed.

PREPARED BY: R. Saville DATE: 3-3-82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALIDBY [Signature]DATE 3/3/82☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

REVISION \_\_\_\_\_

## A. SEPARATION BY GA INITIATOR

AFFECTED ITEMS: Seismic Class 1 Pipe Support Assembly PSG-82; Node 93  
Tag No: S2-S1-004-H-013

Ref. Calc. No. P-450-1.44-211

## REQUIREMENT REFERENCE DOCUMENTS:

1. AISC Manual of Steel Construction; 7th Ed.
2. Spec. S023-409-2 Nucl. Serv. Pipe Supports
3. Pipe Supports c/s Criteria and Procedure P-450-1.10

## BASIC REQUIREMENT:

Calculation should be complete and representative of as-built condition and satisfactorily demonstrate the design adequacy.

## DESCRIPTION OF POTENTIAL FINDING:

see attachment.

PREPARED BY: H. Denck *Harm Denck* DATE: 3/2/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

## B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALIDBY *Boyer*DATE 3/8/82☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_



## Description of PFR:

The original calculation P-450-1.44-211 shows the stresses in members A to be excessive. (Attachment P.2-5).

The revised calculations, (Attachment P.2-5), does not adequately document the following:

1. The stresses in member A at joint No. 2, due to friction loads (Attachment P.3 of 5).
2. The stresses in the welds, connecting vertical members A to horizontal member A at elevation <sup>(-)</sup>4'- 6 3/4". (the weld symbol is missing on drawings). (Attachment P.2 of 5).
3. The stresses in the 1/4" welds connecting members A to the wall base plates. (Attachment P-2 of 5).
4. Torsional stresses in members A, due to friction loads.
5. The stresses in the 3/16" welds connecting member B to A ( Attachment P.2, 3, 4, of 5).

When all these factors are considered, the members and welds may be overstressed.

support member modifications on Attachment P-5 of 5 do not appear on the drawings.

BECHTEL POWER CORPORATION NORMAN, CALIFORNIA	DATE 10/07/79	APPROVED
FILE	SOUTHERN CALIFORNIA EDISON COMPANY SCALE MTS LOS ANGELES 900	
PIPE SUPPORT ASSEMBLY	SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1	


0	ISSUED FOR CONSTRUCTION	DATE	1-13-72	TIME	11:00 AM	DATE	1-13-72	TIME	11:00 AM	DATE	1-13-72	TIME	11:00 AM	
NO	1	ISSUED FOR CONSTRUCTION	DATE	1-13-72	TIME	11:00 AM	DATE	1-13-72	TIME	11:00 AM	DATE	1-13-72	TIME	11:00 AM

53-ST-004-11-013

1000

7/1/72

CONFIDENTIAL



100-000000-1

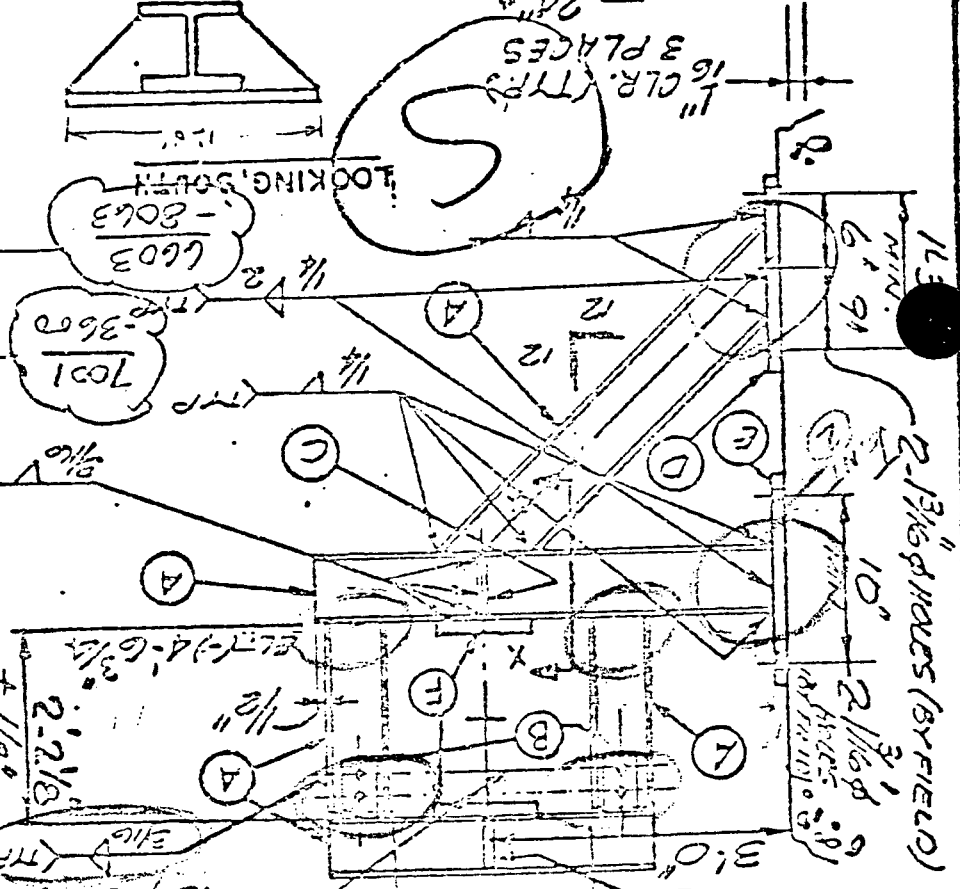
REF.

X-X 1000

2217  
= 9-12 (-)



DESIGN	(LBS)	0826	0826	0826
	F +	-	-	-
	IFT-LBS	-	-	-
	A.	-	-	-
	X	X	X	Z
Pipe O.C.C.T	DUAL CL	STRESS	MAX. TEMP	300 F
TYPE	2			



**LOCATION PLAN**

Handwritten notes at the top: AREA NO 3002

Labels and Dimensions:

- K (in a circle)
- 2922.75'
- B.F.C.
- A7
- 422
- 22132'
- 30 (in a circle)
- N (North arrow pointing right)

NO.	REC'D	NO.
5	5	12 x 13
6	2	12 3/8 x 2 1/2 x 0.060"
C	4	3/8" STIFF PL
D	1	10 1/4 x 13 x 2.2"
1	1	12 1/4 x 13 x 1.59"
2	2	FE 1/2 x 12 x 11.0"
4	4	MS-8-HC-LCSF-175
		ISSUED TO: [ ]
		DOWN TO: [ ]
		BY FIELD
		ST KILLING
56	2	CURVED PLATE 6 x 10 7/8. 55
		ATTACHMENT USE AS ME SUBJECT
		2408-1-PER F092
		5/8 BWS
		ATTACHMENT F200F

SIGNATURE CC DATE 3/6/00

CHECKED CP DATE 3/10/00

PROJECT SMISS UNITS 243

JOB NO. 10027-003

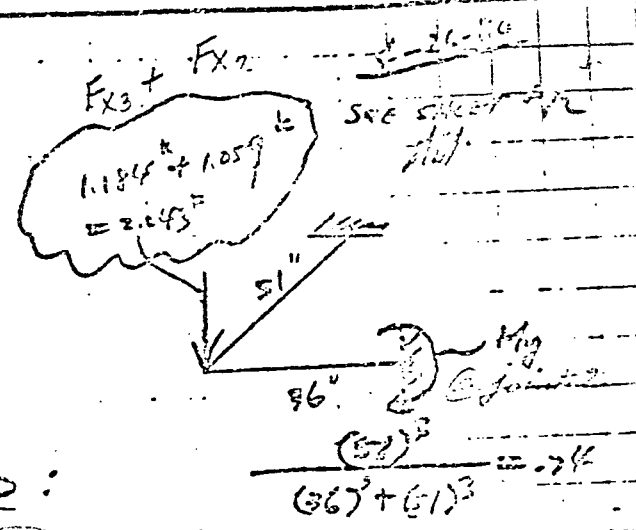
SUBJECT SS-SI-004-H-013

SHEET 10 OF 20 SHEETS

MEMBER (A) (W 4x13)

AT JOINT #2

MOMENT  $M_x = 53.750$   $\checkmark$   
 SHEAR  $V = 6.007$   $\checkmark$   
 AXIAL  $F = 12.240$   $\checkmark$

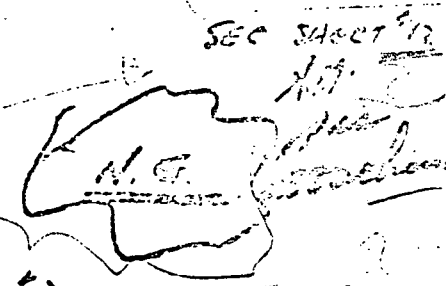


MOMENT DUE TO FRICTION LOAD :

$$M_y = 2.243 \times 7.4 \times 36 = 59.7 \text{ k-in}$$

$$\Rightarrow f_{bx} = \frac{53.750}{5.45} = 9.86 \text{ ksi}$$

$$f_{by} = \frac{59.7}{1.85} = 32.2 \text{ ksi}$$



Check combined - Attachment 1 of 2

WELD OF (A) TO (A) (AT EL. (-) 4'-6 3/4")

new load = 7000#

$$M_x = 10.5 \times 4.34 \times \frac{7000}{12,500} = 95.9 \text{ k-in}$$

$$V = 4.262$$

$$S_{wx} = 4.06 (4.16) + \frac{2}{3} = 18.22$$

$$f_b = \frac{95.9 \times (\frac{7000}{12,500})}{18.22} = 2.26 \text{ ksi}$$

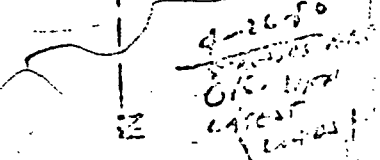
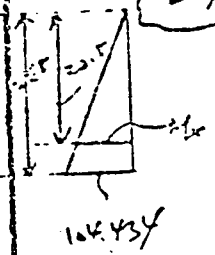
IGNORE  $f_v$   $W = \frac{5.26}{1.935} = 2.72$

MEMBER (B) (1/2" x 2 1/2" x 6")

$$M_x = 2.14 \times 2 \times \frac{7000}{12,500} = 18.72 \text{ k-in}$$

$$V = 5.162$$

$$\Rightarrow f_{bx} = \frac{18.72}{(3.0) \times (1/2)} = 12.48 \text{ ksi}$$



# CALCULATION SHEET

ATTACHMENT K4 of 5  
 2-8-PFR F092  
 CALC. NO. 10017-003  
 DATE 3/17/00  
 CHECKED GP  
 DATE 3/17/00  
 JOB NO. 10017-003  
 SHEET 11 OF 32 SHEETS

TITLE CC  
 DATE 3/6/00  
 PROJECT SONGS UNITS 2 & 3  
 SUB SR-SI-004-H-013

WELD OF (B) TO (A)

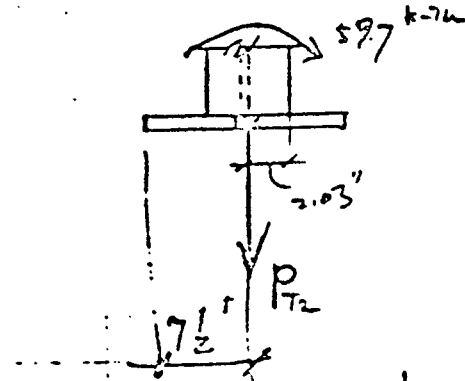
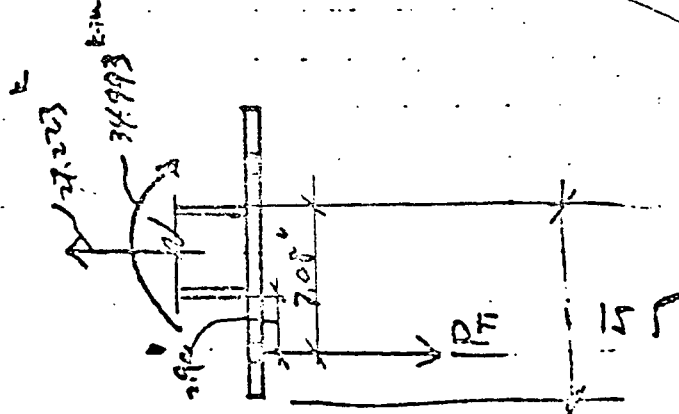
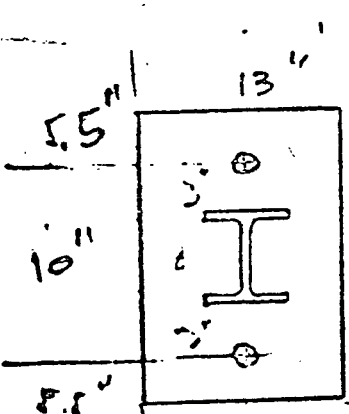
$$S_w = \frac{(W_k)^2}{3} = 2.08$$

$$f_b = \frac{1492}{2.08} = 717 \text{ psi}$$

$$W = 717 / 1885 = .483 > \frac{7}{16} = .4375 \text{ N.G.}$$

4-16-86  
 0.27" USING  
 LATEST CODES ?

MEMBER (C) (12" x 13 x 1-7")



$$P_1 = \frac{34,993}{18.5} + \frac{27,223}{2} = 15,071 \text{ lbs (smaller)}$$

$$P_2 = \frac{72.0}{7.182} = 10.03 \text{ kips}$$

$$M_2 = 19.05 \text{ ft-kips} = 59.55 \text{ (smaller)}$$

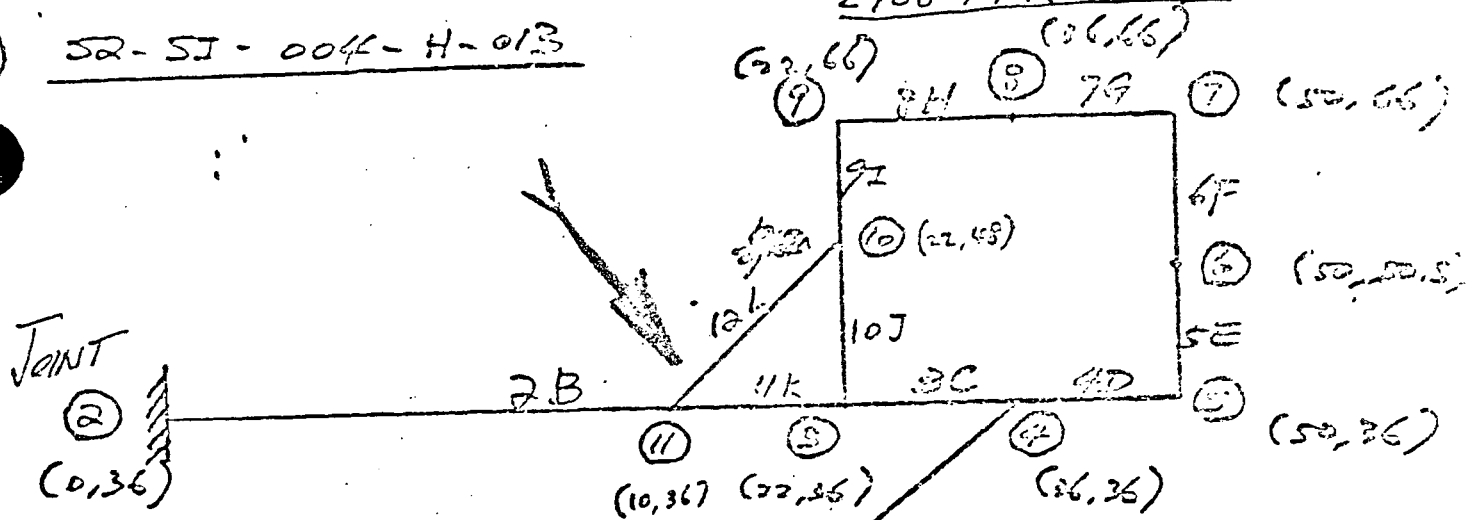
$$P_{THICKNESS} = \sqrt{\frac{6 \times 5155}{25619} (1.5)} = 1.07 \text{ inches}$$

BACK BOLTS (1" dia)

25619 (1.5)  
 (OK for new loads) it 7% OK

Check combined T & S stress on bolts

$$T = 22,101 \text{ lbs}$$

② SR-SI-0044-H-013

REF. MATERIAL ONLY

SHEET 12 OF 17CALC # P450-144-211JOINT  
①  
(0,0)1) AGHL

I = 11.3 , A = 3.82

2) BCDEFIJK

I = 13.9 , A = 6.42

LOADING COMB. :

1) { # 4  
# 6→  
→↓  
↓  
2°  
2°2) { # 8  
# 6→  
→↑  
↓  
2°  
2°

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

PFR NO. 2408-PFR-F094

REVISION \_\_\_\_\_

PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Charging inlet nozzle on the cold leg.

REQUIREMENT REFERENCE DOCUMENTS: Specification No. 1370-PE-140 "Project Specification for Reactor Coolant Pipe and Fittings for San Onofre Unit No. 2" Nuclear Power Systems, Combustion Engineering, Inc.

BASIC REQUIREMENT:

That the loads be correctly applied to the charging inlet nozzle.

DESCRIPTION OF POTENTIAL FINDING:

The charging inlet nozzle stress analysis (CE Doc. No. CENC-1365, dated March 1979) was performed using the nozzle loading (forces and moments) given in sheets A315 and A325. These loads were taken directly from the design specification (1370-PE-140) and applied to the charging inlet nozzle. The loads were not rotated into the local coordinate system of the charging inlet nozzle.

PREPARED BY: J. L. Pickering DATE: 3/4/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY [Signature] DATE 3/4/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_ DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_ DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

PFR NO. 2408-PFR-F025

REVISION \_\_\_\_\_

SEPARATION BY GA INITIATOR

AFFECTED ITEMS:

Charging inlet nozzle on the cold leg.

REQUIREMENT REFERENCE DOCUMENTS:

N/A

BASIC REQUIREMENT:

The stress analysis be complete and well documented

DESCRIPTION OF POTENTIAL FINDING: The majority of the peak stress intensity range values for the different cuts in the charging inlet nozzle listed in sheets A356-358 (CE Doc. No. CENC-1365, dated March 1979) can be developed from the peak stress values listed on sheets A346-351. However, the calculation on cut A<sub>1</sub> (sheet A354) cannot be reproduced for the primary plus-secondary stress intensity "SI + S2" values. A usage factor of 1.7 (versus the published 0.7779 value) is developed when using the peak stress intensity values listed for cut "A, inside" (sheet A346). There is no justification given in the CE document on how the "S<sub>1</sub>" stress intensity values for cut A<sub>1</sub> were developed.

PREPARED BY: J. L. Pickering

DATE: 3/4/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY [Signature]

DATE 3/4/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

### A. PREPARATION BY GA INITIATOR

see attached

PREPARED BY: C. F. Dahme C. F. Dahme DATE: 3-8-82

REJECTION OF GATASK LEADER COMMENTS BY: H. J. D. A. C. DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

8. REVIEW BY GA TASK LEADER

### COMMENTS

☒ AGREE PF IS VALID

BY 1/5/00

DATE 5/6/68

REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_



Description of Potential Finding

On sheet 4 of 30 (RS-201 of Ref. 1 ) the geometry and the corresponding material properties are presented for the nozzle. Three different materials are listed. On sheet 17 of 30 (RS-201 of Ref. 1) the locations for specific points of analysis are given. Cut No. 1 is of particular interest because it lies in the material that has the lowest stress allowables of the three material types mentioned above. Now when the maximum stresses for normal operating conditions were checked with the allowables (Sh 23 of 30), the appropriate material was used for Cut No. 1. But when the check was made for the faulted conditions at Cut No. 1 (Sht 21 of 35, RS-205 of Ref 1), a comparison of stresses was made using the wrong material stress allowables. This is also the case on sheet 23 of 35 (RS-205 of Ref. 1). A larger stress allowable was used instead of the appropriate allowable for Cut No. 1.

# POTENTIAL FINDING REPORT SONGS 2&3 SEISMIC DESIGN VERIFICATION

### A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Pipe Support 167, 203, 826, 152, 200, 52, 116, 178, 93, 77, 466, 146  
PFR No. F068 and Bechtel's comment.

REQUIREMENT REFERENCE DOCUMENTS:

PIPM Section 14.6 Checking and Review, Last Paragraph

**BASIC REQUIREMENT:** "Prior to system startup, pipe-routing changes and pipe-support interface modifications will be documented on updated isometrics, and a final stress-analysis calculation will be completed, including detailed, independent check"

DESCRIPTION OF POTENTIAL FINDING:

Bechtel's comment to PFR F066 states that "Calculation P-450-1.44 and P-450-1.50 are currently under revision". This violates the requirement that calculations will be complete prior to startup. A similar concern is noted in PFR 014A for specific piping analyses.

PREPARED BY: 1244 Napkins DATE: 3-4-82  
REJECTION OF TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: CURAC DATE: \_\_\_\_\_

**B. REVIEW BY GA TASK LEADER**

**COMMENTS**

☒ AGREE PF IS VALID

BY J. D. [Signature] DATE 5/9/82

**REQUEST RE-REVIEW**

BY \_\_\_\_\_ DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_ DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

PFR NO. 2408-PFR-F098

REVISION \_\_\_\_\_

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: The hydraulic snubber attached to the reactor coolant pump motor (pump 1A)

REQUIREMENT REFERENCE DOCUMENTS:

1. General Specification for Reactor Coolant Component Hydraulic Snubbers Spec. No. 00000-PE-504.
2. Project Specification for a Reactor Coolant Pump Motor Hydraulic Snubber for SCE SONGS 2/3 Spec No. 1370-PE-515, Rev. 2.
3. Section III of the Code, Subsection NF 3112.2(b).

BASIC REQUIREMENT:

Reactor coolant pump supports are classified as Seismic Category I, (ASAR Table 3.2-1, Sheet 4 of 73), and as such must remain functional during and after a BBE event. Reference 3 above states that effects of earthquakes shall be considered in the design of component supports.

DESCRIPTION OF POTENTIAL FINDING: Reference 1 and 2 specifications do not require that the snubber perform its intended design function while under the influence of seismic acceleration. Spec gives all loadings and responses required to achieve its design function, and specifies that it be functionally tested. But the spec does not require the snubber to be seismically accelerated while the design function is being performed. It is possible that seismic loads applied to the snubber in directions other than axially could result in a function which might render the design function ineffective.

PREPARED BY: P. R. D. Shups

DATE: 3-3-82

REJECTION OF SA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

DESIGN REVIEW BY ORGANIZATION FOR  
VALIDITY AND ACCURACY

☒ AGREE PF IS VALID

BY Bopler

DATE 3/4/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

PFR NO. 2408-PFR-F099

REVISION \_\_\_\_\_

PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Reactor Coolant Pumps

REQUIREMENT REFERENCE DOCUMENTS:

San Onofre 2 and 3 FSAR, Section 3.7, Seismic Design

BASIC REQUIREMENT: Design loadings on reactor coolant pumps must include maximum DBE loadings in order to assure integrity of reactor coolant pressure boundary during and following DBE.

DESCRIPTION OF POTENTIAL FINDING: DBE "Lower Support" Fy loads listed in CE Project Specification 1370-PE-480, Rev. 5, Table 19, 20, 23 and 24 are less than both "calculated maximum" and "specified for design" pump hangers Fy loads listed in FSAR Table 3.7-23, sheets 9 and 10. (Per Byron Jackson report TCF-1025-STH the loads listed in the CE Project Specification were used for design.) It appears that the DBE Fy loads used for pump design are less than required.

PREPARED BY: J. D. Stanley DATE: 3/4/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY FSople D

DATE 3/5/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

PFR NO. 2408-PFR -F 101

REVISION \_\_\_\_\_

PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Low Pressure Safety Injection Pump 8x20WDF

REQUIREMENT REFERENCE DOCUMENTS: Project Specification for Safeguard Pumps for Southern California Edison Company San Onofre Units 2 and 3, Specification No. 1370-PE-410, Rev. 7, Nuclear Power Systems Combustion Engineering, In. Section 4.2.7.2.

BASIC REQUIREMENT: 4.2.7.2 The lowest natural frequency vibration of the pump assembly and its components that are necessary for pump operability shall be greater than 33 cps. The Seller shall demonstrate this by analysis.

DESCRIPTION OF POTENTIAL FINDING: The independent modal analysis performed by TPT of the LPSI pump support mount with a rigid model of the LPSI pump indicates a fundamental frequency of 24 Hz. This differs substantially from the 112 Hz originally calculated by BPC\*. Due to the flexibility of the support mount and the possible coupling motion with the pump assembly, the resulting lower natural frequency (less than 33 Hz) is not consistent with the CE-prepared pump specification requirements.

S.E.B. Structural Design-Equipment Supports, File No. C-259, Calc No. C-259-2.03.14.

PREPARED BY: Fu Kong Tsung DATE: 3-5-82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER COMMENTS

☒ AGREE PF IS VALID

BY FSoper

DATE 3/9/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

PFR NO. 2408-PFR-F 102

REVISION \_\_\_\_\_

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Reactor Coolant Pump Supports.  
Stress Analysis of Pump Clevises

REQUIREMENT REFERENCE DOCUMENTS: Ref. 1: CE Calc. No. S-PEC-178, San Onofre No. 2 - Structural Analysis of the Reactor Coolant Pump Supports.  
Ref. 2: Byron Jackson Drawing No. 2F-1565H, Outline Vertical Reactor Coolant Pump.  
Ref. 3: Byron Jackson Report TCF-1025-STR. Vol. 5 Revision 0. Pump Support Skirt Analysis for Southern California Edison San Onofre Station, Units 2 and 3.

BASIC REQUIREMENT:

Analysis should be correct or conservative, and based on consistent assumptions.

DESCRIPTION OF POTENTIAL FINDING: As part of the review of SONGS reactor coolant pump supports (CE Calc No. S-PEC-178, Ref. 1) a check was made of the vertical and horizontal clevises on the pump assembly (Byron Jackson Drawing No. 2F-1565H, Ref. 2). The stress calculations of these clevises are documented in Appendix B of Byron Jackson Report TCF-1025-STR, Ref. 3. Some items of these calculations appear to be in error on the unconservative side as outlined on Attachments 1, 2, & 3.

PREPARED BY: P. Koeford DATE: 3-5-82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY Joseph

DATE 3/8/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

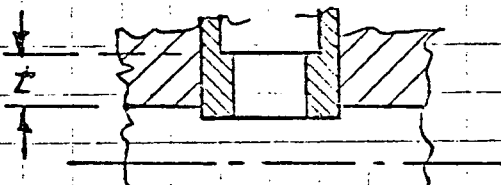
CALCULATIONS FOR REACTOR COOLANT PUMP VERTICAL CLEVIS			
EQUIP. NO.	PROJ. NO.	CALC. NO.	PAGE 1 OF 3
PREPARED BY <i>Byron Jackson</i>	DATE 05 MARCH, -82	REF. DOCUMENTS:	
REVIEWED BY	DATE		
APPROVED BY	DATE		

2408 - PFR - F102 ATTACHMENT 1

### REVIEW ITEMS

BYRON JACKSON REPORT TCF-1025-STR, APPENDIX 3 (REF. 3):

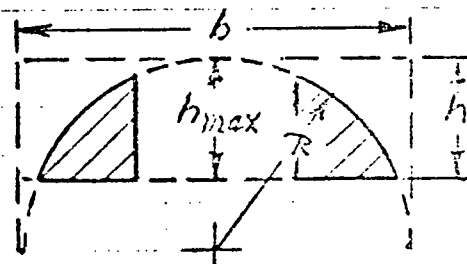
- 1) USING DIMENSIONS OF THE SKETCH IN REF. 3 IT APPEARS THAT THE AREA TENSION IS BASED ON THE ASSUMPTION OF AN EFFECTIVE  $t = 1.208"$  AS INDICATED:



THE ACTUAL TENSION AREA IS AS SHOWN SHADED UNDER ITEM 3) BELOW. IT IS NOT CLEAR, IF THE  $L \times t$  VALUE USED IS CONSERVATIVE.

- 2) THE AREA SHEAR ( $41.12 \text{ in}^2/\text{TONGUE}$ ) CALCULATED IN REF. 3 APPEARS TO BE TOO LARGE. A CONVENTIONAL SHEAR AREA CALCULATION YIELDS  $24.54 \text{ in}^2/\text{TONGUE}$ . IF FOR CONSISTENCY AN EFFECTIVE  $t$  OF  $1.208"$  IS USED, THE CALCULATION WILL YIELD A SHEAR AREA OF  $4.52 \text{ in}^2/\text{TONGUE}$ . SEE ATTACHMENT 3.

- 3) QUANTITIES  $A_1$  AND  $I_1$  ARE UNCONSERVATIVELY BASED ON A RECTANGULAR SECTION  $h \times b = 4.14" \times 12.980"$ . THE ACTUAL SECTION IS A CIRCULAR SEGMENT WITH  $R = 6.49"$  AND  $h_{\text{max}} = 4.14"$  LESS THE  $5.252"$  CENTER HOLE FOR THE BUSHING.



## CALCULATIONS FOR REACTOR COOLANT PUMP CLEVIS

EQUIP. NO.	PROJ. NO.	CALC. NO.	PAGE 2 OF 3
PREPARED BY <i>Wesley H. Hufsch</i>	DATE <i>05 MARCH 82</i>	REF. DOCUMENTS:	
REVIEWED BY	DATE		
APPROVED BY	DATE		

2408 - PFR - F102 ATTACHMENT 2

REVIEW ITEMS, CONT'D.

- 4) APPENDIX B OF REF. 3 SHOWS NO ANALYSIS OF THE THREADED PORTION OF THE STEM. A CROSS SECTION AT THIS POINT MAY HAVE MIN. TENSION AREA OF THE CLEVIS.
- 5) DIMENSION 10"R ON THE HORIZONTAL CLEVIS SKETCH IN REF. 3 IS TRUE ONLY FOR THE PUMP SKIRT CLEVIS. THE DRIVER MOUNT CLEVIS RADIUS IS  $7\frac{1}{2}$ " ACCORDING TO DWG. 2F-1565 H (REF. 2). THIS CLEVIS HAS APPARENTLY NOT BEEN ANALYZED.
- 6) THE WORD "VERTICAL" IN THE SENTENCE "MAXIMUM LOADING FROM ALL VERTICAL COLUMNS" UNDER HEADING "C) LOADING" SHOULD BE AMENDED TO READ "HORIZONTAL".
- 7) THE FAULTED COND. LOADING OF 2412 KIPS IN REF. 3 DEVIATES FROM THE MAX. HORIZONTAL COLUMN DESIGN LOADS IN REF. 1, PG. 15: 2495 KIPS TENSION, 2604 KIPS COMPR.



## CALCULATIONS FOR REACTOR COOLANT PUMP VERTICAL CLEVIS

EQUIP. NO.

PROJ. NO.

CALC. NO.

PAGE 3 OF 3

PREPARED BY

DATE 05 MAR 78

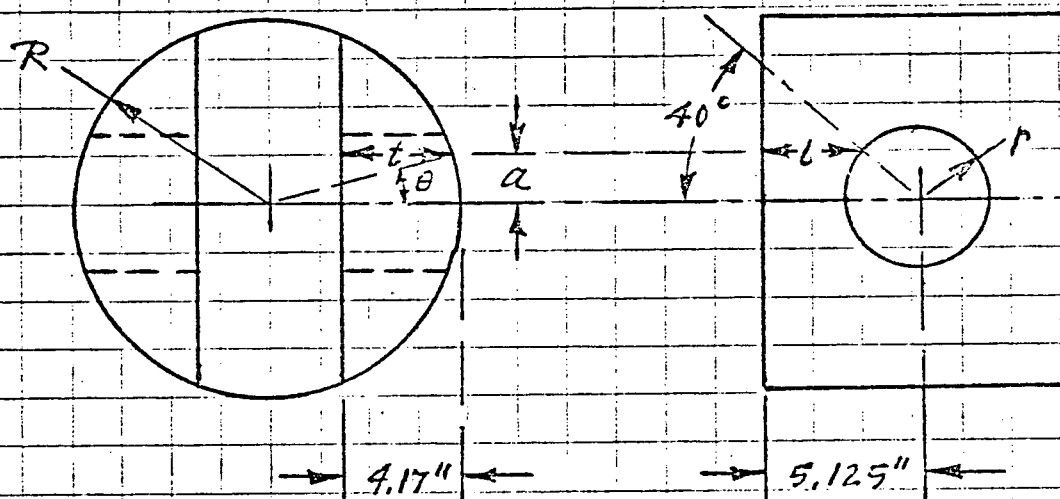
REF. DOCUMENTS:

REVIEWED BY

DATE

APPROVED BY

DATE

2408-PFR-F102 ATTACHMENT 3CALCULATION OF SHEAR AREA (A)

$$R = 6.49''$$

$$r = 2.626''$$

$$a = r \sin 40^\circ = (2.626)(.643) = 1.688''$$

$$L = 5.125 - r \cos 40^\circ = 5.125 - (2.626)(.766) = 3.113''$$

$$\sin \theta = \frac{a}{R} = \frac{1.688}{6.49} = .260$$

$$\theta = 15.08^\circ$$

$$t = R \cos \theta - [R - 4.17] = 6.49 \cos 15.08^\circ - 6.49 + 4.17 = 3.944''$$

$$A = 2Lt = (2)(3.113)(3.944) = \underline{24.57 \text{ IN}^2 / \text{TONGUE}}$$

FOR AN EFFECTIVE  $t$  OF 1.208":

$$A = 2Lt = (2)(3.113)(1.208) = \underline{7.52 \text{ IN}^2 / \text{TONGUE}}$$

# POTENTIAL FINDING REPORT

## SONGS 2&3 SEISMIC DESIGN VERIFICATION

REVISION \_\_\_\_\_

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Containment Structure Seismic Analysis

REQUIREMENT REFERENCE DOCUMENTS:

Not Applicable

## BASIC REQUIREMENT:

The basemat should have reasonable amplification when the building is on soil.

## DESCRIPTION OF POTENTIAL FINDING:

The acceleration response values obtained from a simplified MODSAP model are in general agreement with those obtained by SMIS model at all levels except the basemat elevation where the response computed by MODSAP is about 30% higher. (see attachment for details).

PREPARED BY: T.H. Lee/R.W. ThompsonDATE: 3/8/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALID

BY \_\_\_\_\_

DATE 3/8/82☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

DESCRIPTION OF POTENTIAL FINDING:

## References

1. FSAR, Table 3.7-8
2. Final In-structure Response Spectra For The Containment and Interior Structure, C-257-3.01, Figures D-1 thru D-5.
3. SMIS Finite Element Model For Time-History Analysis of Containment With NSSS Equipment, Figures A-4 and A-5
4. FSAR Figure 3.7A-6, 3.7-2, 3.7A-64.

As part of the review of the containment structure seismic analysis, output from a simplified two-dimensional dynamic model using the MODSAP computer code has been compared with corresponding SMIS model output. The natural frequencies, mode shapes and damping factors for the first five lower modes are in accord with the those of SMIS model given in References 1 and 2. It is believed that this MODSAP model is dynamically equivalent to the SMIS model shown in Ref.3 except that the agreement in modal participation factors has not yet been established because the two models use different normalization factors for mode shapes. The initiators have compared the results for the case parallel to hot leg. The maximum acceleration response values (ZPA) at various levels of the model under DBE input of 0.67g are given as follows:

SMIS Model Node Number (Ref.3)	Description	Maximum Acceleration(ZPA) in unit of g	
		MODSAP	SMIS
23	Exterior Shell 177'-6"	2.28	2.00
27	Steam Gen. Snubber Support	1.12	1.00
1	Reactor Vessel Column Suppt (basemat level)	0.98	0.75

(From Ref.4)

The above comparison shows that agreement is reasonable at all elevations except the basemat level where the SMIS value shows smaller amplification. In clarifying the concern associated with the base response, BPC's explanations should address the following:

- a. Integration method and time step used by SMIS to determine the time-history input for generating in-structure response spectra.
- b. numerical values of mode shapes and their normalization factors.
- c. procedures for computing participation factors.
- d. numerical values of participation factors and generalized masses.
- e. number of modes considered in integration of modal equations.
- f. procedures and method of handling damping in direct integration.
- g. other modeling features and solution techniques which may influence base response.

INITIATORS

BY: T. H. Lee/ R. W. Thompson DATE: March 5, 1982

PFR NO. 2408-PFR-F 107REVISION                     POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATIONPREPARATION BY GA INITIATOR

AFFECTED ITEMS: OCWS Auxiliary Intake Structure, Section F

## REQUIREMENT REFERENCE DOCUMENTS:

DC-339, San Onofre 2 and 3 FSAR, NUREG/CR-0098

BASIC REQUIREMENT: Combination of seismic load components should be in accordance with FSAR procedures or it should be justified if other method is used.

## DESCRIPTION OF POTENTIAL FINDING:

There is no justification for computing the vertical seismic load as shown in pages F06 - F08 of DC399. Horizontal and vertical load components should be combined in accordance with FSAR, Section 3.7.2. If the approach used in pages F09 to F14 is used, 100% of the effects of the motion in the principal horizontal direction should be combined with 40% of the effects in the perpendicular horizontal direction and 40% of the effects in the vertical direction, as described in NUREG CR-0098.

PREPARED BY: M. Kopley M. Kopley DATE: 3-8-82REJECTION OF GA TASK LEADER COMMENTS BY:                      DATE:                     REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY:                      DATE:                     B. REVIEW BY GA TASK LEADER

## COMMENTS

☒ AGREE PF IS VALIDBY *[Signature]*DATE 3/8/82☐ REQUEST RE-REVIEWBY                     DATE                     ☐ DISAGREEBY                     DATE                     ☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY:                      DATE:

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATIONA. SEPARATION BY GA INITIATOR

AFFECTED ITEMS: Reactor Vessel Support Columns.

REQUIREMENT REFERENCE DOCUMENTS: Ref.1 : Project Specification for a Reactor Vessel Assembly for San Onofre Units No. 2 & 3 CE Specification No. 01370-PE-110.  
Ref. 2: Reactor Coolant System Supports Design Loads, CE Dwg. No. E-1270-320-001, Rev. 9.

BASIC REQUIREMENT: The loads specified in the project specification must be greater than or equal to the actual calculated loads.

DESCRIPTION OF POTENTIAL FINDING: (See attachment)

PREPARED BY: C. Dahms *R. J. Dahms* DATE: *3-8-82*

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PF IS VALIDBY *[Signature]*DATE *3/8/82*☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_ DATE: \_\_\_\_\_

## Description of Potential Finding:

When comparing the faulted loads listed in the project specification (Ref. 1) with those tabulated in "Reactor Coolant System Supports Design Loads" (Ref. 2), no correlation could be made. However, a direct correlation could be made for normal operation and DBE loads. It was understood that this table (Ref. 2) was the latest listing of the actual calculated loads. When comparing maximum load cases, it was found that the calculated load (Ref. 2) exceeds the specification (Ref. 1).

## Example:

	Project Specification (Ref. 1)		Load Table (Ref. 2) Loca + Norm Op. + OBE
	Unruptured	Ruptured	
Axial Load (F <sub>b</sub> )	-3771.0 <sup>K</sup> (Case III)	-3388 <sup>K</sup> (Case IV)	-4436 <sup>K</sup> (Guillotine Rupture M-M)

POTENTIAL FINDING REPORT  
SONGS 2&3 SEISMIC DESIGN VERIFICATION

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS:

SCE Trend Reports of Conditions adverse to Quality.

REQUIREMENT REFERENCE DOCUMENTS:

PSAR - Attachment 1, SCE Quality Assurance Program Plan  
Amendment 20, Sec. 16, "Corrective Action", Para. 16.2.7

BASIC REQUIREMENT:

"A cognizant quality assurance engineer shall determine the existence of significant adverse trends in nonconformances and report them to the SCE chief quality assurance engineer. The chief quality assurance engineer may refer these trends to the Engineering Review Process to determine the need for corrective actions."

DESCRIPTION OF POTENTIAL FINDING:

No evidence of reporting of significant adverse trend which existed in the area of Document Control for 1972-1980 (see PFR F0054).

PREPARED BY: J. E. Brown

DATE: 3/8/82

REJECTION OF GA TASK LEADER COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_

B. REVIEW BY GA TASK LEADER

COMMENTS

☒ AGREE PFR IS VALID

BY J. Brown

DATE 3/8/82

☐ REQUEST RE-REVIEW

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ DISAGREE

BY \_\_\_\_\_

DATE \_\_\_\_\_

☐ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: \_\_\_\_\_

DATE: \_\_\_\_\_