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DIETCH,R. Southern California Edison Co.
RECIP.NAME RECIPIENT AFFILIATION
EISENHUT,D.G. Division of Licensing

SUBJECT: Forwards Potential Finding Rept PFR-0051 re inconsistency between FSAR & design specs. Rept has been fully processed & classified as observation w/indication of lack validity. Documentation of PFR-0017 should soon be completed by Ga Co.

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Southern California Edison Company

P. O. BOX 800

2244 WALNUT GROVE AVENUE

ROSEMEAD, CALIFORNIA 91770

ROBERT DIETCH

VICE PRESIDENT

TELEPHONE

213-572-4144

March 10, 1982

Director, Office of Nuclear Reactor Regulation
Attention: Mr. Darrell G. Eisenhut, Director
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Subject: Docket Nos. 50-361 and 50-362
San Onofre Nuclear Generating Station
Units 2 and 3

Enclosed are sixty-three (63) copies of Potential Finding Report (PFR) No. PFR-0051 which has been fully processed and classified as an Observation with sufficient indication, however, that it should have been Invalid. Note the Index for this PFR, dated March 8, 1982, as part of the documentation.

I wish to point out that this PFR was addressed in our letters to you dated February 11 and 14, 1982. These letters also included preliminary evaluations on the PFR made by General Atomic.

With this transmittal, there remains only one PFR from the 58 addressed in the Interim Report which is not yet fully processed by General Atomic. This is PFR 0017, which was also addressed in our letters to you dated February 11 and 14, 1982. We expect General Atomic to complete the documentation on PFR 0017 shortly and we will transmit it to you upon receipt, to close the book on the scope of work in the Interim Report.

If you have any questions regarding this matter, please give me a call.

Very truly yours,

Robert Dietch

cc: NRC Region V, R. H. Engelken (w encl)
H. R. Fleck, ETECH (w encl)
Frank Miraglia, Chief, Licensing Branch #3 (w encl-10)

B001
S1/1

PFR NO. 2400-PFR-0051

REVISION -

POTENTIAL FINDING REPORT
SONGS 2&3 SEISMIC DESIGN VERIFICATION

A. PREPARATION BY GA INITIATOR

AFFECTED ITEMS: Seismic Category I electric motor operated valves supplied by CE.

REQUIREMENT REFERENCE DOCUMENTS:

San Onofre 2 & 3 FSAR, Appendix 3.10A, Criteria for Seismic Design of Seismic Category I Equipment

BASIC REQUIREMENT: Section 3.10 A of the FSAR states that valve/operator assemblies demonstrated to have natural frequencies greater than 33 cps and for which the elevations of the valve and operator are not known may be statically analyzed using a maximum acceleration of 5.0 g.

DESCRIPTION OF POTENTIAL FINDING: CE specifications 000-PE-~~727~~ 707 JDS and 1370-PE-705 Section 4.2.5 state that valve suppliers may demonstrate, by analysis or test, that valves have a miminum natural frequency greater than 33 cps and are capable of operating and remaining intact during and after exposure to a faulted condition of 3.0g static acceleration. These specifications do not define valve locations or elevations. It appears that the CE specifications are not consistent with the FSAR requirement of analysis for a 5.0g acceleration.

PREPARED BY: J. D. Stanley (signature) DATE: 1-21-82

REJECTION OF GA TASK LEADER COMMENTS BY: ____________ DATE: ________

REJECTION OF ORIGINAL DESIGN ORG. COMMENTS BY: (signature) DATE: 2/10/82

B. REVIEW BY GA TASK LEADER

COMMENTS

☑ AGREE PF IS VALID BY (signature) DATE 1/23/82

☐ REQUEST RE-REVIEW BY ____________ DATE ________

☐ DISAGREE BY ____________ DATE ________

☑ REVIEW OF ORIGINAL DESIGN ORGS. COMMENTS BY: (signature) DATE: 2/10/82

C. REVIEW BY ORIGINAL DESIGN ORGANIZATION

COMMENTS

C-E project specification 1370-PE-705 Rev. 4 along with C-E general specification 00000-PE-707 Rev. 1 (we assume that the reference by TPT to 000-PE-727 is a typo) specifies that the valves have to be capable of operating and remaining intact after exposure to loads due to a 3 g static acceleration. These are procurement specifications and therefore do not define the valve location and elevation within the plant.

☐ AGREE PF IS VALID

☒ DISAGREE

The Architect/Engineer organization designs and analyzes the piping systems in which the subject motor operated valves are installed. One requirement placed on such piping design is that the g loads imposed on the valves not exceed 3 g.

BY: V C Hall DATE: 1/28/82 (Cont.)

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

PSAR commitment to demonstrate 5g capability of valves was not met. However, Bechtel Design manual requires a check to assure that valves are not subjected to > 3 gs. The committee will investigate implementation of the Bechtel Design manual through PFR 041 & 043 mentioned in Impact Assessment.

BY: S L Koutz DATE: 2/10/82

E. GA PROJECT MANAGER

☐ ACCEPT

☒ REJECT The statements in the PFR are inaccurate and incomplete.

1.) There is no "(F)PSAR committment to demonstrate 5g capability of valves".

a) The scope statement for 3.10A (see attached #1) states that it contains "criteria for acceptable methods and procedures" not required methods and procedures

b) the statement quoted says "may" which indicates an acceptable method, not a requirement as would be indicated by "shall" or a recommendation indicated by should

BY: [signature] DATE: 2/25/82

(Continued on attachment)

Response to 2408-PFR-0051 (Cont.)

The A/E has reviewed and approved C-E specification 1370-PE-705 Rev. 4 by Bechtel Package No. 12301 dated 2/23/77.

Per Bechtel telecon (D. Capito - Bechtel, J. Westhoven - C-E). Every stress calculation for piping with valves must have a "valve g level" form in the calculation. That form has a method for specifically identifying C-E supplied valves. In addition, there is a Bechtel project pipe support group design manual (Bechtel Pipe Support Group Design Manual, San Onofre Units 2 & 3, Section 27.6.3.B) which states in part,

"Acceleration levels in the valve or equipment area shall be limited to the values specified by the vendor or in the applicable specification. The following are the maximum recommended allowable "G" levels for DBE that can be experienced by valves and other equipment and shall be used unless otherwise specified in individual cases.

Bechtel valves 5G XYZ direction (SRSS $= \sqrt{5^2 + 5^2 + 5^2} = 8.66g$)

C-E valves 3G combined SRSS value for G loads in XYZ direction"

IMPACT ASSESSMENT

PFR NO. 2400-PFR-0051

AFFECTED ITEM: LPSI System Electric Motor Operated Valve Supplied by CE (2HV-9322)

1. IS THERE THE POTENTIAL FOR REDUCING DESIGN MARGINS TO THE EXTENT DESIGN ALLOWABLES ARE EXCEEDED OR DESIGN REQUIREMENTS ARE NOT MET?
   No - 2HV-9322 is not subject to accelerations greater than the 3g qualification level
2. IS THERE THE POTENTIAL THAT THE ITEM MIGHT FAIL OR ENDANGER OTHER ITEMS DURING AN SSE?
   No
3. COULD THE FAILURE OF THIS ITEM DURING AN SSE CREATE A SUBSTANTIAL SAFETY HAZARD?
   Yes (2HV-9322 is a Cat. I Active Valve and a Containment Isolation Valve)
4. COULD THE PROCEDURAL VIOLATION CREATE A SUBSTANTIAL SAFETY HAZARD?
   NA
5. ARE OTHER SIMILAR DEVIATIONS LIKELY TO EXIST?
   Possibly other CE-supplied electric motor operated valves in other systems may be subject to accelerations greater than the 3g qualification level.
6. OTHER COMMENTS:
   - Although the CE-supplied electric motor operated valves are specified to a lower qualification level than indicated by criteria in FSAR Appendix 3.10 A, BPC appears to have made a systematic effort to establish that the accelerations imposed on the valves do not exceed the qualification level. (see attached note, Stanley to Opie, 2/5/82).

PREPARED BY: J. D. Stanley DATE: 2/6/82

COMMENTS:

As a result of this PFR, a review of accelerations imposed on other CE-supplied valves within the scope of this review has been performed. Two PFRs (F041 & F043) are being filed pertaining to the method of accounting for the ZPA's in the calculation of valve effective accelerations.

BY: [signature] DATE: 2/10/82 I agree with the above impact assessment.

March 8, 1982

INDEX FOR 2408-PFR-0051

1. Information by GA Initiator

   a) Top half of page 1 of the Potential Finding Report and two page hand-written memo, J. Stanley to F. Ople dated 2/10/82.

   b) Impact Assessment

      Top half of Impact Assessment Form.

2. Information by GA Task Leader

   a) Bottom half of page 1 of Potential Finding Report.

   b) Comments on Impact Assessment

      Bottom half of Impact Assessment Form

3. Comments by Original Design Organization

   Top section of page 2 of Potential Finding Report and page entitled "Response to 2408-PFR-0051 (continued)"

   Telecon communication record dated 2/10/82 of telecon occurring on 2/2/82.

4. Recommendations of Findings Review Committee

   Middle section of page 2 of the Potential Finding Report.

5. Comments by GA Project Manager

   Bottom section of page 2 of the Potential Finding Report and page initialed by G. L. Wessman dated 2/24/82 starting with the sentence, "2) The commitment of the FSAR is stated in section ..." and attachment 1 (1 page) and attachment 2 (2 pages).

This is a case where the Project Manager believes the entire PFR to be invalid for the reasons stated in his comments. The reviewer remains convinced that the PFR is valid and the Findings Review Committee agrees with the reviewer; therefore, based on our procedures we are processing this PFR as an Observation.

2900-PFR-0051/5/82
2/10/82 JDS
page 1 of 2

From : J. D. Stanley

To : F. S. Opie

Subject : 2900-PFR-0051, Seismic Qualification of Electric Motor Operated Valves Supplied by CE

After review of the CE response and additional investigation, including discussions with BPC, I believe this PFR is valid. The CE response does not really address the subject of the PFR, which is that the CE specifications for valve seismic qualifications do not agree with requirements in the SONGS 2 and 3 FSAR Appendix 3.10 A, Criteria for Seismic Design of Seismic Category I Equipment. My interpretation of Appendix 3.10 A is that the method of qualification specified by CE would require that the valves be qualified by static analysis or test to a 5g acceleration rather than the 3g

level specified by CE. The BPC valve specifications are consistent with Appendix 3.10 A.

However the CE response, confirmed by information from BPC, indicates that BPC has made a systematic effort to establish that accelerations imposed on the CE-supplied valves do not exceed the 3g level to which they have been qualified. Of the three electric motor operated valves in the LPSI system only one, 2HV-9322, was supplied by CE. Review of the BPC piping analysis indicated a resultant SRSS acceleration of 1.87g on this valve, which is well within the 3g qualification level. (Review of accelerations imposed on other CE-supplied valves [illegible] progress by the Piping Review Group.)

FROM: J.D. Stanley LOCATION: DATE: 2/2/82

TO: F. Ople LOCATION: DATE:

2408-PFR-0051

TELEPHONE COMMUNICATION RECORD 2/10/82 SDC

(PLEASE HAND LETTER LEGIBLY IN BLACK OR RED INK)

CALL INITIATED BY: K. Tong / J. Stanley AT GAC [✓] OTHER:

CALL RECEIVED BY: J. Westhoven / R. Jewell ~~AT GAC~~ [ ] OTHER: CE

OTHER PARTICIPANTS:

PROGRAM NAME	PROGRAM NUMBER
SONGS SEISMIC REVIEW	2408400

DATE: 2/2/82 TIME: 7:30 AM

SUBJECT: PFR-0051, Seismic Qualification of Valves Supplied by CE

SUMMARY: CE was told that GAC had confirmed, as stated in the CE response to PFR-0051, that BPC had included a table of valve g loadings in the piping analysis packages reviewed by GAC to date, but that review of the piping analyses was still in progress to confirm that the qualifications to 3.0 g for CE-supplied valves were not exceeded. They were asked if they knew of FSAR changes or amendments to cover qualification of CE-supplied valves to lower levels than BPC-supplied valves and required by FSAR appendix 3.10A. They said they believed Appendix 3.10A could be interpreted to allow use of the lower qualifications, since BPC knew the valve locations (even though CE and valve supplies did not) and could establish that the qualification level was not exceeded.

ACTION ITEMS:	Date Required	Person Responsible

DISTRIBUTION: Ople, Chorman, Veca, Phelps, Krase, Tong

File No.:

PFR 00 GH Weisman 2/24/82

2.) The commitment in the FSAR is stated in section 3.9.3.22 "NSSS Active ASME Code Class 2 and 3 Pump and Class 1, 2 and 3 Valves." (see attached) ATTACHMENT #2

TP 3 "HV-9342 ----, 9341 ----- have been qualified by mean ----"

TP 4 "Qualification was by testing that demonstrated ----"

TP 5 "the test report --- provided the following summary:

A 1. "Static 3g acceleration load ---"

ATTACHMENT # 1
A.H. Weisman
2/24/82
PFR 0051c

APPENDIX 3.10A

CRITERIA FOR SEISMIC QUALIFICATION OF SEISMIC CATEGORY I EQUIPMENT

3.10A.1 SCOPE

This appendix contains criteria for acceptable methods and procedures for the Seismic Qualification of Seismic Category I equipment. The vendor is responsible for assuring safe operation of the equipment and systems under the seismic conditions specified herein. The vendor shall verify that the equipment will meet the stated functional requirements for continued operation without any malfunction or loss in function during and after application of the required loadings.

A complete qualification procedure and monitoring technique shall be presented by the vendor for review prior to the actual start of qualification work. Classification of systems and equipment is the responsibility of the purchaser.

3.10A.2 DEFINITIONS

The definitions in this section establish the meaning of words in the context of their use in this appendix.

3.10A.2.1 CATEGORY I EQUIPMENT

Equipment that is essential to the safe shutdown and isolation of the reactor or whose failure or damage could result in significant release of radioactive material.

3.10A.2.2 DESIGN BASIS EARTHQUAKE (DBE)

That earthquake producing the maximum vibratory ground motion that the nuclear power generating station is designed to withstand without functional impairment of those features necessary to shut down the reactor, maintain the station in a safe condition, and prevent undue risk to the health and safety of the public.

3.10A.2.3 OPERATING BASIS EARTHQUAKE (OBE)

The Operating Basis Earthquake is taken as 1/2 the design basis earthquake.

3.10A.2.4 NATURAL FREQUENCY

The frequency(s) at which a body, while restrained or supported at specified points and distorted in a specified direction, vibrates due to: its own

Pages missing from CA copy of FSAR Vol. II, telecopied by EPC 2/5/82

PFR0051

CE

ATTACHMENT #2 [signature] 2/24/82

Operability was demonstrated under concurrent loading due to 1.5g acceleration in the most severe of the two principal horizontal axes, 1.0g acceleration in the vertical direction and applicable nozzle loads. Nozzle loads are as follows:

	Suction Nozzle	Discharge Nozzle
Axial force, lb	561	274
Resultant shearing force, lb	336	165
Resultant bending moment, in.-lb	3881	1037
Torsional moment, in.-lb	4658	1244

The conservative analysis shows that under the above postulated loading conditions the maximum shaft misalignment would be 0.0033 radians, the maximum bearing load would be 2164 pounds, and the deflection of the impeller relative to the pump casing would be 0.003 inches. The allowable shaft misalignment is 0.017 radians. The specific dynamic rating of the bearing is 15,038 pounds. The clearance of the unloaded impeller is 0.025 inches.

The postulated seismic loading could only exist, at the most, for a few seconds because it represents the peak of the varying acceleration. Since this loading would not prevent pump operation, the pump will operate during and following the seismic event.

To complete the operability demonstration, the motor was qualified in accordance with IEEE Standard 323-1971 for the auxiliary building environment.

CE VALVES

3.9.3.2.2.3 Operability Assurance Program Results for Active Valves.

3.9.3.2.2.3.1 Letdown Stop, Check Valve Isolation, Safety Injection Tank Sample, and Check Valve Leakage and Pressure Bleed Valves. These valves are pneumatically actuated to open and spring operated to close. A three-way solenoid pilot, when energized, admits air to the actuator to open the valve and, when deenergized, vents the air from the actuator so the spring can close the valve. Electrical failure of the solenoid would result in venting of the actuator and closure of the valve. Since closure of the valve is the required active safety function, and since electrical power is not used to close the valve, these valves have no safety-related "electrical" function.

The containment, safety injection, and auxiliary building environments are inconsequential from the standpoint of the metallic materials, which alone are relied upon for the safety-related function, so no environmental qualification of these valves is required.

HV-9332, 9352, 9362, 9372, 9341, 9351, 9361, 9371, 9433, 9437 and 9231, that "active" [illegible] Category I, pneumatically operated [illegible] valves, have been qualified by means of a type test of a generically similar parent valve, the letdown stop valve, TV-0221.

Qualification was by testing that demonstrated valve seat leakage was within acceptable limits before, during, and after maximum loading was applied to simulate faulted conditions. The tests also demonstrated the ability of the valve to close under maximum load and after the loads had been removed. The valve natural frequency was determined by test and analysis. Close correlation of the analytical and test natural frequencies confirmed the accuracy of the analytical methods. Final acceptance of the dynamic response of each valve was determined by computer analysis of the system model containing the valve and the associated piping.

The test report submitted by ITT, Hammel Dahl, Report No. 625, dated March 16, 1977, provided the following summary:

A. Test Program

1. Static 3g acceleration load acting on extended structure center of gravity in the direction producing maximum deformation.

2. Internal pressure of 2485 lb/in.^{2}g within the valve body.

3. End loads imposed by the attached pipe stressed to 24,000 lb/in.

4. The total stress resulting from 1, 2 and 2 was 30,000 lb/in.

5. With the above loading, the valve was actuated from the open to closed position.

6. A 10-minute seat leakage test under the maximum body stress and internal pressure.

7. A sinusoidal, 2g acceleration from 1 to 150 Hz, at less than 1 octave per minute, was applied to determine the valve natural frequencies. This frequency survey was conducted in three orthogonal directions.

B. Test Results

1. Operability

(a)	Closure time, pretest	0.5 second
	Closure time, maximum load	2 seconds
	Closure time, post test	0.5 second
(b)	Leakage rate, pretest	0.2 cm^3/minute
	Leakage rate, maximum load	0.2 cm^3/minute
	Leakage rate, post test	0.2 cm^3/minute

2. Natural Frequency

yz plane	29 Hz
xy plane	33.5 Hz
xz plane	None