TELEDYNE
ENGINEERING SERVICES

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March 4, 1983
5633-49

50-322

Mr. Harold Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20114

Subject: Independent Design Review for the Shoreham Nuclear Power Station

Dear Mr. Denton:

Please find enclosed the latest classification of items from the subject design review.

TES has received responses from LILCO to items originally classified as Findings and the results of our review of these responses is enclosed. With respect to the classification of Reaffirmation of Finding, we expect a further response from LILCO to such items prior to a final TES classification.

If you have any questions or comments, please do not hesitate to contact Mr. James P. King or the writer.

Very truly yours,

TELEDYNE ENGINEERING SERVICES

Donald F. Landers

Donald F. Landers
Senior Vice-President

DFL/lh

Enclosures

cc: J. A. Flaherty (TES)
J. P. King (TES)
J. H. Malonson (TES)
TES Document Control

B001

[X] Transmittal - Please Sign and Return Acknowledgement

[ ] Request for Information (RFI)
When Requested Assign Control Number

[ ] Receipt (TES Use Only)

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Page 1 of 1

Control No. _____

Originator D.F. LANDERS

Project No. 5633

Date MARCH 4, 1983

Client PO 363981

Transmit To: MR. H.R. DENTON
U.S. N.R.C.
7920 NORFOLK AVE
BETHESDA, MD. 20114

Transmitted Under Separate Cover To: M. MILLIGAN, LILCO

NOTE: Furnish complete identification for items transmitted (below).

QTY	TYPE	ITEM IDENT NO.	REV	DESCRIPTION - Title and Number of Sheets/Pages	RECVD
6		ICR: 5633-1			
6		ICR: 5633-5			
6		ICR: 5633-12			
6		RFI: 5633-28			

ACKNOWLEDGEMENT OF RECEIPT BY _____ TITLE _____ DATE _____

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4/81

TELEDYNE ENGINEERING SERVICES

Enclosure (1)
EP-1-017

INFORMATION REQUEST

SHOREHAM INDEPENDENT DESIGN REVIEW

CONTROLLED DOCUMENT

PROJECT: 5633
REVIEWER: L.J. DiLuna
CALC.#:
SUPT.#:
DWG. NO.:

DATE: 8-30-82
REV.:
REV.:
REV.:

TO: S & W ☒
LILCO ☐

RFI: 5633-28

PAGE 1 OF 1

DESCRIPTION:

Please provide project guidelines for when a snubber or spring hanger should be specified vs. a rigid support or restraint.

REPLY BY: PHONE ☐ TELECOPY TO FOLLOW ☐ MAIL ☐

There are no specific project guidelines addressing the above issue. It is the task of the stress analyst to identify support type and location in order to qualify the piping system for the different loading conditions in accordance with the respective code requirements.

☐ ATTACHMENTS

Paul Gerrard
SIGNATURE
DATE 10/4/82

TELEDYNE
ENGINEERING SERVICES

INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

CONTROLLED DOCUMENT

ICR NO.

5633- 1

Reference: RRF No. 5633- 138

PMR No. 5633- 138

Date: 3/4/83

Classification of Item - Reaffirmation of Finding

Leo E Barron

Reviewer Signature

James A. Flaherty

Committee Chairman Signature

D.F. Landers

Project Manager Signature

1.0 INTRODUCTION

Teledyne Engineering Services (TES) issued ICR-5633-1 on November 2, 1983 which was a Finding on the use of chart methods to qualify a 2 inch branch line. A disposition response from Long Island Lighting Co. (LILCO) and Stone and Webster (SWEC) was received by TES on January 15, 1983. This response indicated the following:

(1) The chart analysis reviewed by TES was improper.
(2) Small bore piping analysis activity was assigned to the Site Engineering Office (SEO).
(3) Revision 3 of the piping analysis, issued November 8, 1982, was invalidated since it had not been performed by SEO.
(4) The line was evaluated by SEO on June 30, 1982 and found acceptable.
(5) A more refined calculation was performed on November 5, 1982 and confirmed acceptability.

The calculations of June 30th and November 5th, along with other pertinent information, were attached to the response for TES review.

A meeting was held at SWEC in Boston on Feburary 15, 1983 to discuss outstanding items requiring additional information. As a result of that meeting TES was supplied with the nonproprietary portion of Design Guide EMTG-5-A and three Interoffice Memos/Correspondence which modified the use of, and provided guidance on, EMTG-5-A. These are SBM #6, SBM #3 and EMTG-5 I.O.M. dated July 30, 1980.

2.0 REVIEW OF SBM #6

An understanding of the utilization of EMTG-5-A can best be determined by reviewing cases of application and directives associated with its use. A summary of the TES review of SBM #6 follows:

(1) This document is reviewed with the understanding that Ⓐ is representative of the terminal end of a small bore pipe at a run pipe which this SBM is defined as being applicable to.

(2) SBM #6 provides concise instructions on the use of EMTG-5-A/EMTP.9.5.

(3) The calculation of Relative Thermal Displacements between Points A and B is appropriate.

(4) The calculation of Relative Seismic Displacements between Points A and B is not proper for the condition considered in (1) above. It is appropriate to assume that vertical seismic building displacements are in phase within a building. However, to assume that the piping seismic vertical displacement is in phase with the building vertical displacement is not proper and can be unconservative. This error can result in two situations of concern: (1) underestimation of the relative seismic displacement which results in pipe acceptance since the result is less than the 0.35 inches criteria, (2) improper evaluation of lines which do not meet the 0.35 inch displacement criteria.

3.0 REVIEW OF SBM #3

In reviewing SBM #3 the following is noted:

(1) The acceptable shake space spans are based on a maximum stress in a guided cantilever of 13,000 psi for A106, GRB and 16,000 psi for A376 and A312.

(2) This stress combined with other assumed stresses equals the allowable $S_A + S_h = 37,500$ psi. Any margin that exists would have to be in lower thermal expansion and pressure stresses.

Examples could be given to indicate a margin existed for these stresses but conversely examples could be given to indicate zero or little margin. One would expect that a guide has inherent conservatisms that would not result in marginal situations. For example, EMTG-5-A, Paragraph 5.3, specifies that hanger/support spacing for seismic inertia effects is based on 10 G's (SSE) and 6 G's (OBE) over the entire frequency spectrum. This is a conservative approach. Unfortunately this effect, seismic inertia, is not considered in the Equation (11) solution which is used to address anchor motions. Further, conservatisms in seismic inertia impose closer spacing between support and anchor points which aggravates the anchor motion problem.

(3) The author states that:

> "Eq. 11 includes stress due to anchor movements but only considering one-half the full range, while thermal expansion stress is computed using the range of thermal moments."

This statement does not appear in the ASME Code. However, a Code Interpretation, III-1-78-212, does exist which allows the use of one-half the range of moment due to seismic anchor displacements to be used in combination with the Thermal Expansion Moment Range for evaluating Eq. (10).

Industry practice, as TES understands it, is to follow this approach but to also look at the range of seismic anchor displacement alone and to use the worst case. Therefore the statement is partially acceptable since it follows the response to a specific Code Inquiry but concern exists for situations in which the seismic anchor moment range exceeds

thermal expansion moment range plus one-half the range of seismic moment.

4.0 HORIZONTAL SEISMIC BUILDING DISPLACEMENTS

There is concern that horizontal seismic building displacements are not being applied in accordance with SWEC design guidance. SBM #6 is clear in requiring the user to obtain both an X and Z seismic displacement of the building. However, in reviewing implementation it appears that only one direction of horizontal seismic building displacement is being applied. Reviewing the submittals from SWEC in response to ICR-5633-1 indicates the following:

(1) PP42 calculation for E21, ISO Numbers P1062 and P1081, Page 2 of 2, the seismic movements at Reactor Building elevation 96.6' (OBE) are listed as:

$$\Delta H \simeq 0.264"$$
$$\Delta V \simeq 0.228"$$

The ΔH listed is taken from a two-dimensional model of the building and is the horizontal displacement in one direction, North-South (Z) or East-West (X). Therefore the calculation should consider that the 0.264" is acting in both the X and Z directions and the resultant horizontal displacement should be used.

(2) The supplemental evaluation of the above piping has the same discrepancy. The seismic movements of the Reactor Building at elevation 101'-6"(OBE) are given on Page 2 of 8 as:

$$\Delta \text{ Radial} = 0.287"$$
$$\Delta \text{ Vertical} = 0.228"$$

On Page 3 of 8 the horizontal displacement of the branch connection at the run pipe (Nodes 88 and 89) considers both X and Z displacements and a resultant radial displacement, ΔR, is given as 0.373. In calculating the total seismic movement 0.373 is added to 0.287, the single direction horizontal seismic building displacement.

For this particular model there may be justification for not considering that the Z direction seismic building and pipe displacements are out of phase because of the support configuration on the run pipe and the branch pipe. However, this is not noted anywhere in either calculation. Since TES does not have any other supplemental or PP42 calculation packages to review, we must assume the potential for error exists.

Further, since detailed review of EMTG-5-A would consume excessive time and man-hours TES has performed analyses of three small bore pipes which are part of the LPCS piping under review to determine stresses due to anchor motion effects. The results are as follows:

	Stress (psi)	
TES Model No.	Thermal + ½ SAM*	2 times SAM
1	25,000	24,000
2	15,000	32,000
3	16,600	32,000

*SAM = Seismic Anchor Motion

Based on the establishment in SWEC small bore piping procedures of 13,000 psi (A106, GRB) and 16,000 psi (A376 and A312) as a limit for this condition, these results support the concern of TES with respect to the techique used for design of small bore piping.

5.0 RECOMMENDATION

It is recommended that all small bore piping attached to large pipe and the building be reviewed to determine relative anchor displacements assuming the building and the large (run) pipe seismic displacements are out of phase in all three directions, X, Y and Z. These half-range seismic displacements should then be combined with others (thermal, SRV, etc.) and compared with twice the seismic anchor displacement case and the maximum condition used. A number of worst cases should be computer analyzed to determine stress levels for comparison with the appropriate allowables and support loads determined for reevaluation of the supports.

TELEDYNE
ENGINEERING SERVICES

INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

CONTROLLED DOCUMENT
ICR NO.
5633- 5

Reference: RRF No. 5633- 2
PMR No. 5633- 2

Date: 3/4/83

Final Classification of Item: Closed

Reviewer Signature

Committee Chairman Signature

D.F. Landers

Project Manager Signature

1.0 SUMMARY

During the initial field survey to determine actual plant configuration on June 14, 1982, all supports were checked. The spring can on support 1E21-PSSH-043 did not have a nameplate installed making verification of as-built information impossible. On September 3, 1982 a subsequent field survey indicated the nameplate was still missing. Since SWEC Specification SH1-68 requires each spring to have a nameplate a violation existed and ICR-5633-5 was issued as a Finding on November 2, 1982.

The SWEC response indicates the following:

(1) Support originally inspected and accepted by SWEC Field Quality Control on February 10, 1981.

(2) The FQC Inspection Report indicates the nameplate was present and stamped correctly.

(3) The support was turned over to LILCO start-up in March of 1981.

(4) Between March 1981 and June 14, 1982 (date of TES field survey) the nameplate was removed.

(5) Issue 10 of 1E21-PSSH-043 dated July 20, 1982 resulted in a Phase III rework request E21-205 dated August 20, 1982. Issue 10 was a modification to the support and the Phase III rework was not generated for replacement of the nameplate only.

(6) The support modification was completed and signed off by FQC on October 5, 1982.

(7) The subsequent field survey by TES on September 3, 1982 was prior to actual modification of the support.

TES inspected this support again on February 16, 1983 and found that the nameplate was in place and the modifications required by Issue 10 of 1E21-PSSH-043 were accomplished. The FQC inspection report of October 5, 1982 was also reviewed and found to be acceptable.

A concern still existed at TES that this nameplate would not have been replaced if Issue 10 of the support had not been issued resulting in support modification. During a meeting at SWEC on February 15, 1983, SWEC Procedure STP No. 811 "BOP Systems-Thermal Expansion Testing" was reviewed. This procedure requires that all spring hangers be inspected as part of the thermal expansion testing program and hot and cold settings be checked for compliance with design documentation.

Since the specific support of concern has been corrected by the normal construction process and since adequate procedures (STP No. 811) exist to detect this type of problem for spring hangers prior to plant start-up, this item should be Closed.

TELEDYNE
ENGINEERING SERVICES

INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

CONTROLLED DOCUMENT

ICR NO.
5633- 12

Reference: RRF No. 5633-133
PMR No. 5633-133

Date: 3/4/83

Final Classification of Item: Closed

Reviewer Signature

J. A. Flaherty
Committee Chairman Signature

D. F. Landers
Project Manager Signature

1.0 SUMMARY

During the review of pressure switch PS012B the single leg stand which supports PS012B was also reviewed. Since this stand is within 5 feet of a pump base a Vibra Check baseplate is used. SWEC Specification SHI-343, which governs the installation of these stands and baseplates, stated on Page 1-36, "Vibra Check shall not be used in an area where the maximum allowable radiation dose rate is above 100 MREM/HR." According to Table 3.11.2-1 in the FSAR the radiation level for the Core Spray System, while operating, is 2,000 MREM/HR. This was determined to be a direct violation of SHI-343; therefore Finding ICR-5633-12 was issued November 30, 1982.

SWEC, in their response stated that the "maximum allowable radiation dose rate" refers to the dose rate during normal plant operation. Since the Core Spray System only operates during a plant accident condition the 2,000 MREM/HR dose rate would not apply. Radiation levels during normal plant operation are shown on the figures in Section 12.3.1 of the FSAR. These figures show radiation levels to be less than 5 MREM/HR in the area in which this baseplate is located.

Since SHI-343 does not clearly state that only normal plant operating conditions are used to determine radiation levels, SWEC has issued an E&DCR to clarify the specification. Also a survey of all safety related stands using Vibra Check baseplates was performed by SWEC and all were found to be in compliance.

Since the specification has been clarified and all safety related Vibra Check baseplates were found in compliance this item should be Closed.