TELEDYNE
ENGINEERING SERVICES

130 SECOND AVENUE

WALTHAM, MASSACHUSETTS 02254

(617) 890-3350 TWX (710) 324-7580

March 11, 1983
5633-51

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 Additional Concern, 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

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PDR ADOCK 05000322
A PDR

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

[ ] Receipt (TES Use Only)

**TELEDYNE ENGINEERING SERVICES**

Page 1 of 1

Control No. _____

Originator D. F. Landers

Project No. 5633

Date 3/11/83

Client PO 363981

Transmit To: H. R. Denton
USNRC
7920 Norfolk Ave.
Bethesda, MD 20112

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 | REC'D |
|---|---|---|---|---|---|
| 6 | | ICR 5633-2 | | | |
| 6 | | ICR 5633-9 | | | |
| 6 | | ICR 5633-13 | | | |
| 6 | | ICR 5633-14 | | | |
| 6 | | ICR 5633-15 | | | |
| 6 | | ICR 5633-17 | | | |
| 6 | | ICR 5633-18 | | | |
| 6 | | ICR 5633-20 | | | |
| 6 | | ICR 5633-21 | | | |
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ACKNOWLEDGEMENT OF RECEIPT BY _____ TITLE _____ DATE _____

DISPOSITION FOR PREVIOUS REVISIONS
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4/81

TELEDYNE
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INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

CONTROLLED DOCUMENT
ICR NO.
5633- 21

Reference: RRF No. 5633- 40, Rev. 1
PMR No. 5633- 40, Rev. 1

Date: 3/10/83

Classification of Item: Additional Concern

Gary A. Blanchet
Reviewer Signature

James A. Flaherty
Committee Chairman Signature

D.F. Landers
Project Manager Signature

## 1.0 INTRODUCTION

TES issued ICR-5633-21 on January 6, 1983 which was a Finding against the SWEC design process with respect to data extraction and comparison to allowable values for the dynamic qualification of motor operated valves. A disposition response from LILCO and SWEC was received by TES on February 17, 1983. This response indicate the following:

(1) The TES Finding had an erroneous valve identification.

(2) The updating of SWEC SQRT (Equipment Dynamic Qualification) documentation is a continuous process to reflect revisions to AX's (SWEC pipe stress analysis packages).

(3) SWEC SQRT documentation typically addresses a group of similar valves for which the largest bounding acceleration values are considered.

(4) SWEC does not transform global coordinate system accelerations into the valve's local coordinate system.

(5) The Shoreham basis for combining peak values of uncorrelated dynamic event is SRSS rather than absolute sum method.

(6) A summary status of each valve indicated in the TES Finding.

Discussion of the SWEC and LILCO disposition response is presented in an examination of each of the above items in the following sections.

## 2.0 CONCURRENCE WITH DISPOSITION RESPONSE

TES concurs with disposition response items 1, 2, 3 and 5. A review of each of these disposition response statements follows:

(1) TES acknowledges SWEC's correction made to proper valve identification. It is indeed IE41*MOV-031, not IE21*MOV-031B, that is represented by Nodes 88 and 89 in AX-11A.

(2) TES agrees that there is a time consideration with respect to the updating of the SQRT documentation to reflect revisions to the AX packages.

(3) TES agrees with SWEC's design process of enveloping maximum accelerations for a group of similar valves.

(5) TES also concurs with the Shoreham basis for combining peak values of uncorrelated dynamic event by SRSS rather than absolute sum.

## 3.0 NONCONCURRENCE WITH DISPOSITION RESPONSE

TES is in disagreement with disposition response items 6 and 4. A review of each of these disposition response statements follows:

(6) The disposition response summary status in IE41*MOV-031 indicates that the SWEC calculated acceleration of (10.4 g) exceeds the test qualification level of (10.0 g) and that a more refined SWEC analysis is ongoing to address this high acceleration level. It is the concern of TES that the (10.4 g) calculated acceleration level is not the most severe condition and is not justifiably used in comparison to the (10.0 g) allowable. This concern is examined in greater detail in the review of item 4.

(4) Review of SWEC SQRT 88AD forms indicate that dynamic qualification of the valve operator is performed by single axis testing. Thus, allowable acceleration values reported in the valves local coordinate system are the result of three independent tests. Since seismic vibratory motion seen by the valve is a simultaneous combination of three directions, calculated individual components of acceleration must be considered when acting in combination. Since individual local coordinate system allowables are known, it is appropriate to consider the interaction of global accelerations resolved upon the local axes when making the dynamic evaluation of the valve body and operator. Therefore, field orientation is critical to the acceptability of each valve. For valves field orientated normal to the global coordinate system, the SWEC method of comparison of the largest individual component of global acceleration vs. each of the three local coordinate system allowables is appropriate. Valves field orientated skewed to the global coordinate system should be examined on an individual basis since the determination of applied accelerations applied along the local valve coordinate system axes are dependent upon (1) the magnitude of the individual global accelerations, and (2) the angle at which the valve is orientated.

## 4.0 RECOMMENDATION

It is recommended that all motor operated valves be reviewed to determine worst case applied accelerations per the preceding guidelines. This new data should be reported in revised SQRT documentation for comparison to vendor tested allowables.

To expedite the analysis, an SRSS of the two horizontal global components of acceleration vs. each of the two horizontal local components individually is conservative.

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INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

CONTROLLED DOCUMENT

ICR NO.
5633- 20

Reference: RRF No. 5633- 35
PMR No. 5633- 35

Date: 3/10/83

Final Classification of Item: Closed

Leo E Barron
Reviewer Signature

J. A. Flaherty
Committee Chairman Signature

D.F. Landers
Project Manager Signature

## 1.0 SUMMARY

During the initial review of pipe stress package AX-10D-2 the TES reviewer generated RRF 5633-35, Rev. 1. This RRF indicated that the worksketch and NUPIPE computer run R1649W22 (May 27, 1982) had modeled a tie-back (PSA 5205) from 3" line (3WR-26-151-2) Node 67 to 3/4" line (3/4 WR-119-301-2-1) Node 327.

However, this tie-back was not shown on the as-built isometric IC-66 and, from information gathered during the TES initial field walk-down of June 14 to 18, 1982, it was determined that the small bore tie-back PSA-5205 was not installed. On September 3, 1982 a subsequent field survey indicated the support was still missing.

As a result of RRF 5633-35, Rev. 1, a Finding, ICR No. 5C33-20 was issued on January 11, 1983.

The LILCO/SWEC response to ICR No. 5633-20 indicates the following:

(1) The apparent discrepancy involved a design change that was in the process at the time of the TES field walk-downs.

(2) The SWEC analyst determined the need for the tie-back by evaluating the NUPIPE output R1649W22 (May 27, 1982)

(3) On June 8, 1982 the need for the tie-back was transmitted to the SWEC pipe support design personnel by interoffice correspondence PCA No. 50.

(4) On June 9, 1982 the SWEC pipe support design personnel acknowledged that the tie-back would be installed; and this was subsequently included in E&DCR F-39716, by which the design is issued to construction for installation.

(5) Installation was completed November 30, 1982. SWEC Field Quality Control verified completion of the installation on December 15, 1982.

Revisions of the SWEC large bore isometric IC-66 and applicable small bore isometric P-1034-1 were received by TES on February 17, 1983.

TES reviewers acknowledged the installation of the tieback during a field survey on February 16, 1983.

Based on the above additional information supplied by SWEC and the TES field survey of February 16, 1983, TES reviewer is satisfied with the SWEC response to ICR No. 5633-20 and therefore this item can be closed.

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INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

CONTROLLED DOCUMENT

ICR NO.
5633- 18

Reference: RRF No. 5633- 65, Rev. 1
PMR No. 5633- 65, Rev. 1

Date: 3/10/83

Classification of Item: Additional Concern

L. J. Di Luna
Reviewer Signature

J. A. Flaherty
Committee Chairman Signature

D. F. Landers
Project Manager Signature

## 1.0 INTRODUCTION

TES issued ICR No. 5633-18 on December 8, 1982 which was a Finding on the improper combination of loads in that the time-history load was not included as part of the "Upset" design load. A response was received from LILCO and SWEC on February 2, 1983. This response indicated that although the time-history load was not included in the Normal/Upset design load summary, a conservative "umbrella" load combination was used, and resulting stresses were compared to the normal condition (lowest) allowables. TES agrees with this response for the particular support in question, IE21-PSR-020-4. As a result of this response, TES performed a review of the method of load combination for each support, with particular attention to how the time-history loads were considered.

## 2.0 REVIEW OF "TIME-HISTORY" LOAD COMBINATIONS

In reviewing the method of load combination, it was noted that two time-history cases are reported: one case being Normal, Upset and Faulted (NU/F) and the other Faulted (F). Depending on the particular piping stress model, these are denoted as Case 16 (F) - "Injection Flow Pump Start," and Case 17 (NU/F) - Rapid Pump Start/Stop, or Case 34 (NU/F) - "Core Spray Pump Start-Up" and Case 35 (F) - "Core Spray Pump Start-Up". Out of approximately 21 rigid supports and snubbers, nine supports had N/U design loads calculated incorrectly in that the N/U "time-history" load was not included. These are PSR-009, PSST-017, PSR-020, PSST-063, PSR-002, PSR-004, PSR-049, PSR-001 and PSR-050. In addition, four anchors: PSA-023, PSA-024, PSA-059 and PSA-007 also had incorrectly calculated N/U design loads. This represents all of the anchors which TES received to review. The "umbrella load combination" procedure was not used in each of these calculations. In some cases, Normal, Upset, Emergency and Faulted load combinations were used with their respective allowables. The magnitude of the missing time-history

loads were relatively small in most cases so that the support designs would probably still be adequate. Also, the fact that the time-history loads are combined by SRSS with SRV and OBE loads diminishes their impact on the total load.

## 3.0 RECOMMENDATION

TES found that more than 50% of the snubbers, rigid supports and anchors reviewed did not consider time-history loads properly in the N/U design load combination. In some cases, the "umbrella load" procedure was not used, so specific loads and allowables were used in evaluating the support. It is noted that the magnitude of the missing loads are such that the adequacy of the supports will probably not be effected. However, this high percentage of supports with incorrectly-calculated loads warrants further attention. It appears that support analysts were not adequately instructed in loads calculation procedures. TES recommends that all piping systems with time-history load cases be reviewed to determined if the loads were correctly considered in the support calculations.

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INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

CONTROLLED DOCUMENT

ICR NO.
5633- 17

Reference: RRF No. 5633-51,52,56
PMR No. 5633-51,52,56

Date: 3/4/83

Final Classification of Item: Closed

L. J. DiLuna
Reviewer Signature

J. A. Flaherty
Committee Chairman Signature

D. F. Landers
Project Manager Signature

## 1.0 SUMMARY

This item was classified as a Finding because of concern for the lack of control of the interface between revisions to drawings and associated analyses which verify acceptance of the drawing revisions. Three RRFs and PMRs were generated addressing this issue and ICR-5633-17 was issued December 8, 1982.

The SWEC response to this ICR stated that it is not uncommon to find a drawing of a later or earlier revision than the corresponding calculation. However, according to SWEC, the current drawing revision will always be supported by the current calculation revision. This was the case for the three pipe supports in question, although SWEC admittedly sent TES the wrong drawing revision for PSSH-003.

In TES's opinion, this response did not adequately address the issue, since it was not clear how the changes required by a calculation were insured to be incorporated in a future revision of the drawing. For example, if a calculation showed the need to increase a weld size, and the drawing was subsequently revised, what means exists within the design process to insure that the weld is changed, and nothing else is changed, that is not addressed in the current calculation revision, that may effect the design adequacy.

In a meeting at SWEC in Boston on February 15, 1983, the Shoreham pipe support design process was discussed - in particular, the requirements of SWEC EAP 5.4, Page 17 (Attachment 1), shows a sample title block with the corresponding required signatures. The titles (DS, DC, RE, LE, PE) are defined for the EMD organization in the attached chart (Attachment 2). Thus, it is noted that those responsible for the calculations must sign the drawing. The calculations may not be updated to reflect the latest issue of a drawing.

This signature requirement provides documentation that the necessary review and interfaces exist in this portion of the Design Process. ICR-5633-17 should be Closed based on the above.

# ALTERNATE TITLE BLOCK
(A,B,C SIZE DRAWINGS)

NOTE 2 - THE FOLLOWING APPROVERS SHALL INITIAL THE DRAWING IN THE BLOCKS AS DESIGNATED BELOW THE PROJECT ENGINEER SHALL ALSO DATE THE "DATE" BLOCK.

RESPONSIBLE SUPERVISOR (DESIGN) (DS)
ORIGINATING GROUP (PARA 4.4.3b)

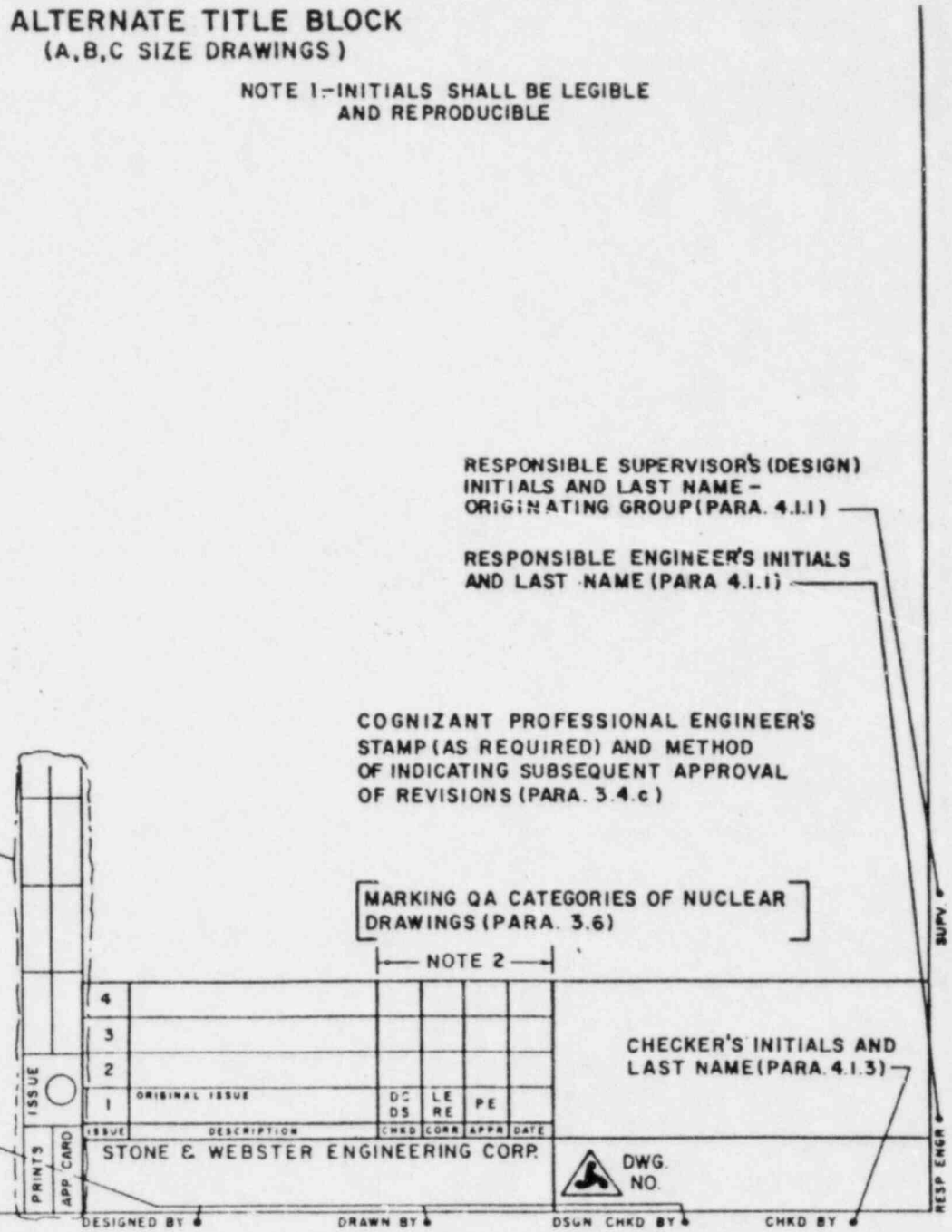
DESIGN COORDINATOR (PROJECT) (DC)
(PARA 4.4.4)

RESPONSIBLE ENGINEER (RE)
(PARA 4.5.5b)

RESPONSIBLE LEAD ENGINEER (LE)
(PARA 4.5.6b)

PROJECT ENGINEER (PE)
(PARA 4.5.7)

NOTE 1 - INITIALS SHALL BE LEGIBLE AND REPRODUCIBLE

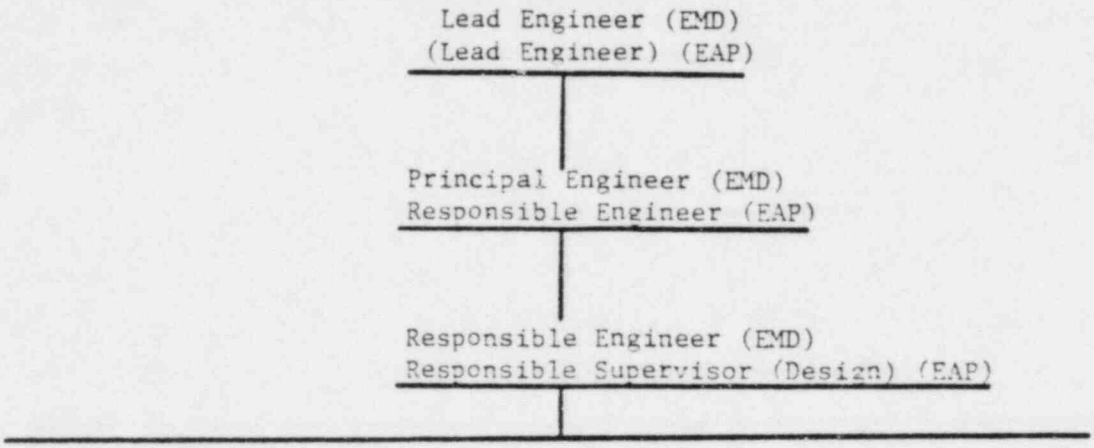



Attachment 1

SHOREHAM NUCLEAR POWER STATION

LONG ISLAND LIGHTING COMPANY

Correlation Between Shoreham Project EMD Organization and EAP 5.4 Organization




Engineers - Performs more complicated pipe support analysis, provide technical direction

Designers - Perform normal pipe support design and calculations, check drawings

Drafters - Prepare pipe support drawings

Attachment 2

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INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

**CONTROLLED DOCUMENT**

ICR NO.
5633- 15

Reference: RRF No. 5633- 6
PMR No. 5633- 6

Date: 3/10/83

Final Classification of Item: Closed

Reviewer Signature

J. A. Flaherty
Committee Chairman Signature

D.F. Landers
Project Manager Signature

## 1.0 SUMMARY

During the initial field survey to determine actual plant configuration on June 14, 1982 all valves were checked and the nameplate data for each valve recorded. At this time some of the information on the nameplate fo· valve MOV-31B seems to have been ground off. When these numbers were checked against the manufacturer's data report form, Spec. SH1-88AD, Rev. 1, and SWEC's Line Designation Table, none of the numbers, for the design conditions of the valve, were in agreement. Since there was no correlation between these numbers this item could impact the adequacy of the design process, therefore Finding ICR No. 5633-15 was issued on December 8, 1982.

The LILCO/SWEC response indicates the following:

(1) There is no information missing from the nameplate. The original purchase specification dated July 17, 1973 listed the valve operating condition as 25 psi at 225$^{o}$F, which agrees with the information on the nameplate. SWEC has since revised this spec. The original spec was reviewed during a visit to the plant site on February 16, 1983.

(2) The original specification SH1-88AD contained only operating conditions and not design conditions. Since the design conditions were unavailable the operating conditions were put on the nameplate. However, the vendor used the ANSI B16.5 valve pressure ratings to fill out the manufacturers data form. In iew of these apparent discrepancies, in 1979 SWEC reviewed all ASME III Class 1, 2 and 3 motor operated gate and globe valves to update the design conditions and specifications.

(3) Letters were sent to the valve vendors, Velan and Anchor Darling, requesting that they confirm the acceptability of

changes and to supply new nameplates. These letters were received with the response for review.

(4) In 1981 and 1983 SWEC again performed reconciliations of the Line Designation Table and the valve specifications.

(5) On November 4 and 6, 1981, SWEC issued E&DCRs P-3714A and P-3778 to Velan and Anchor Darling for new nameplates. These E&DCRs were received with the response for review.

(6) The values in the Line Designation Table marked "For Piping Only" do not reflect the design condition for the valves. This is because the design conditions for piping may be exceeded for short durations as allowed in ASME III NC-3612-3 but the design condition for the valves may not be exceeded. Therefore design conditions in the Line Designation Table marked "For Piping Only" will not agree with the valve spec.

(7) New nameplates have not yet been installed on the valves.

Since the problem of documentation reconciliation has already been identified and corrective action is currently underway, this item should be closed.

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INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

CONTROLLED DOCUMENT

ICR NO.
5633- 14

Reference: RRF No. 5633- 123
PMR No. 5633- 123

Date: 3/10/83

Final Classification of Item: Closed

Reviewer Signature

Committee Chairman Signature

D. F. Landers

Project Manager Signature

## 1.0 SUMMARY

During the initial review there was concern with the fact that SWEC NUPIPE analysis was done using all carbon steel pipe up to the Reactor Pressure Vessel nozzle. SWEC Drawing 11600.02-FP-10C-8 showed a short segment of stainless steel pipe existed at the nozzle. Furthermore a TES field inspection indicated that the nozzle was a material other than carbon steel.

In an attempt to clarify this concern TES wrote Request for Information RFI 5633-56 for nozzle details.

SWEC response to RFI 5633-56 did not alleviate TES' concerns so TES generated ICR No. 5633-14 as a Finding.

The SWEC disposition response to ICR No. 5633-14 provided an E&DCR that had been omitted from SWEC's response to RFI 5633-56. This additional documentation satisfied the reviewer that the installed piping and piping drawings were in agreement.

The disposition response, although responding to the concerns of ICR No. 5633-14, raised another question about the incorporation of E&DCRs to their affected drawings. TES was concerned that E&DCRs were not being incorporated into the FP drawings in a timely manner. This subject was discussed at a February 15, 1983 interface meeting at SWEC. SWEC personnel described the process for revisions to drawings per E&DCRs based on Engineering Assurance Procedure 6.3, including the change in the process per Project Procedure No. 38, whereby (FP) piping drawings are no longer updated and are essentially replaced by (IC) as-built isometrics. At this meeting TES requested that this process description be included in an addendum to the LILCO response to TES ICR No. 5633-14. This supplemental response to ICR No. 5633-14 was received by TES on February 25, 1983.

Since the additional TES concern involved why the particular FP piping drawing had not been revised per the E&DCR and that the meeting notes and supplemental response from LILCO described herein present detailed documentation to the change in the SWEC process in this matter, TES is satisfied and this item can be Closed.

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ENGINEERING SERVICES

INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

CONTROLLED DOCUMENT

ICR NO.
5633- 13

Reference: RRF No. 5633- 162
PMR No. 5633- 162

Date: 3/4/83

Final Classification of Item: Closed

Reviewer Signature

James A. Flaherty
Committee Chairman Signature

D.F. Landers
Project Manager Signature

## 1.0 SUMMARY

The calculations for support IE21-PSR069-2, which is a small bore support attached to the shield wall, contained a procedure governing the field design of lightly loaded attachments to the primary shield wall. This procedure states to "... initiate design at SEO and forward a copy of E&DCR to Boston Office." In the calculations for supports IE21-PSR-5057 and IE21-PSR-5144 there was no mention of any E&DCR. RFI No. 5633-37 was written to request these E&DCRs. In the response to the RFI SWEC responded that no unique E&DCRs exist. Since this was in violation of the procedure and there appeared to be no controls on attachments to the shield wall, this item was classified as a Finding in ICR no. 5633-13.

In their response to this Finding, SWEC stated "The procedure is not an officially sanctioned project procedure nor does it come within the procedural system of SWEC." Because of this SWEC is removing all references to this procedure from the calculations.

Additionally, the SWEC response to the RFI and subsequent discussions at a meeting with LILCO and SWEC on February 15, 1983 further clarified this situation. There was concern on TES' part with the effect of small bore support loads on the shield wall. The procedure attached to the original calculations covered this by requiring generation of an E&DCR and subsequent review by the Boston office. Deletion of that procedure raised this concern.

SWEC indicated that a study had been done in 1980 to address this situation. Essentially, small bore supports, by their design, can only transmit a given maximum load. Since large bore supports and pipe whip restraints are also attached to the shield wall they control the design capacity. For example, the load from these supports is 4,000 to 6,000 times that of small bore supports.

TES was still concerned with local effects on the shield wall and the difference in load cited above would not be appropriate unless large bore supports were also located on panels between stiffeners. A review was performed and some large bore supports are located between stiffeners. For example, support IE21-PSSH036 is not located on stiffeners and the load on the shield wall from this support is 9,500 lbs and a normal small bore support applies approximately 250 lbs. The concern of TES with respect to local effect on the shield wall is satisfied.

Also of concern was the design of the small bore support. The calculation packages for PSR 5057 and PSR 5144 show the supports as standard supports, which consist of a baseplate and bolts with back-to-back angles cantilevered off the plate. The actual support is a 3 x 3 tube welded to the shield wall but no unique drawing was generated. E&DCR F-24523 covers the substitution of the tube for the back-to-back angles. This E&DCR contains standard substitution for which no drawing has to be generated. E&DCR F-16785A covers the deletion of the baseplate and welding to an embedded plate instead.

Since all items have been clarified TES is satisfied this item should be closed.

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INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

CONTROLLED DOCUMENT

ICR NO.
5633- 9

Reference: RRF No. 5633- 164
PMR No. 5633- 164

Date: 3/10/83

Final Classification of Item: Closed

Reviewer Signature

J. A. Flaherty
Committee Chairman Signature

D. F. Landers
Project Manager Signature

## 1.0 SUMMARY

During the initial review of pipe support calculations for the Core Spray System, an apparent inconsistency in the methods for calculating friction forces was noted. At this time only two design documents governing the calculation of friction forces on supports were available. Specification No. SHI-68, Rev. 2, specification for the design and fabrication of nuclear power plant piping support and pipe stress, pipe support, and duct support criteria document for the Shoreham Nuclear Power Station (DCD). The procedures in the DCD supercede the procedures in Spec. No. SHI-68 which raise the initial concern of why the procedure for calculating friction forces was changed. Also of concern was what forces were used in calculating friction forces. The DCD states "the average value of the frictional force shall be taken as 0.3 times the normal force," but does not explain what loads the normal force is composed of.

Seven supports were reviewed which contained calculations of friction forces. In these calculations two different methods were used for calculating the normal force. For supports IE21-PSR018, IE21-PSR057 and IE21-PSR065 only the deadweight and thermal loads were used to calculate the normal force. Supports IE21-PSR002, IE21-PSR020, IE21-PSR025 and IE21-PSR067 used deadweight, thermal and seismic loads in calculating the normal foce. Since the spec did not specify whether seismic loads were included in the normal force, the discrepancy was a possible violation of the spec and was issued as a Finding on November 30, 1982.

SWEC in their response to this Finding, ICR No. 5633-9, referenced Engineering Division Memorandum No. EMD-80-3 which is titled "Friction Forces for the Design of Pipe Support Guides and Restraints." This document was also made available to TES for review at a meeting on March 15, 1982 at SWEC offices.

The friction criteria in the DCD was taken from EMD 80-3 and this replaced Spec. SHI-68 to provide a more exact method for calculating frictional forces and to be more representative of industrial practice. Spec. SHI-68 is more conservative then EMD 80-3 in both coefficient of friction and definition of normal force. Therefore previous calculations need not be redone and when revisions are made to the calculations the new procedures may be utilized. EMD 80-3 defines what is included in the normal force as "friction forces are only considered significant for signed loads; friction forces from cyclic loads may be neglected." Signed loads are defined as loads acting in one direction such as deadweight and thermal or a dynamic load which does not change sign for a significant portion of its duration, such as a safety relief valve discharge. Based on the information from EMD 80-3, all the support calculations meet the design criteria and those that include all seismic loads or have a higher friction coefficient are conservative.

This procedure agrees with methods currently used in the nuclear industry for pipe support design and is acceptable to TES.

Since EMD 80-3 clarifies the definition of normal force and is a reference for the design criteria originally reviewed this item should be closed.

TELEDYNE
ENGINEERING SERVICES

INDEPENDENT DESIGN REVIEW

SHOREHAM NUCLEAR POWER STATION

CONTROLLED DOCUMENT

ICR NO.
5633- 2

Reference: RRF No. 5633- 79
PMR No. 5633- 79

Date: 3/11/83

Classification of Item: Additional Concern

L. J. Di Luna
Reviewer Signature

J. A. Flaherty
Committee Chairman Signature

D. F. Landers
Project Manager Signature

## 1.0 INTRODUCTION

TES issued ICR No. 5633-2 on November 2, 1982 which was a Finding on the selection and use of pads on large bore piping. A disposition response from LILCO and SWEC was received by TES on January 15, 1983. This response indicated the following:

(1) Support was vendor designed.
(2) Pad and pipe reanalyzed on January 11, 1983 and found acceptable.
(3) All Category I supports with reinforcing pads designed by vendors were reviewed by SWEC.

The calculations of January 11th along with other pertinent information were attached to the response for TES review.

A meeting was held at SWEC in Boston on February 15, 1983 to discuss outstanding items requiring additional information. As a result of that meeting TES was supplied with three additional calculation packages for the highest (pipe stress) stressed locations.

## 2.0 PIPE SUPPORT CALCULATIONS

TES has reviewed the revised support calculations 1E21-PSSH021 (Revision 5) submitted with the SWEC response, and the three additional calculation packages received after the meeting at SWEC. These are 1B21-PSSH001, 1B21-PSSH024 and 1E21-PSSH005.

In reviewing the above calculations additional concerns have been raised by the reviewer. These are:

(1) The supports are all axial type supports. However, the supports are offset and therefore a primary bending load is induced in the piping system due to this offset.

Beam offsets were not modelled into the piping analysis for any of the following Spring(s) or Rigid (R) Supports.

| | |
|---|---|
| PSSH021(S) | PSSH026(S) |
| PSR050(R) | PSSH010(S) |
| PSR064(R) | PSR011(R) |

Support 1E21-PSR-065 was modelled with an offset.

(2) Except for support 1E21-PSSH-21 calculations for pad stresses and weld stresses of pad to pipe are not included in the analysis package.

(3) The allowable stress for A36 steel welded to the pressure boundary is given on Page 17 of Calculation 1E21-PSSH-21-5 as 12,600 psi. This value is used again on Page 26 for the weld of the pad to the W6X25. However, the allowable stress of the weld to the pipe used the piping allowable (15,000 psi for SA106 Gr B) instead of the lower of the allowables which is required by B31.1 for attachments to the pressure boundary. Section III 1971 Edition with Winter 1972 Addenda (Code defined in FSAR) states in Paragraph NC-3676.9 that supports conform to the requirements of ANSI B31.1 1967 in accordance with Paragraph 121. The reviewer cannot ascertain what Code(s) and Jurisdictional boundaries have been applied in the design of the supports.

(4) For Support 1E21-PSSH005 the analyst used the fillet weld centerline as the pad edge for qualifying the pipe stresses. In addition the offset described in (1) above was not included in the calculations.

(5) The Interoffice Memos contained in 1E21-PSSH021 as Attachment Nos. 1 and 2 serve as the design basis for pad analysis. What are pad size limits (size, shape, thickness) when a trunnion is welded to a pad but not the pipe and therefore pressure is assumed zero and only carried by pipe?

(6) The attachment of pads and/or trunnions directly to elbows changes the flexibility and stress intensification. It does not appear that SWEC accounted for these changes in the analysis.

The above additional concerns apply to both SWEC and vendor designed pads and trunnions. In view of the above additional concerns, this item cannot be Closed at this time.