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United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Richard C. DeYoung, Director
Office of Inspection and Enforcement

References:
(a) Construction Permits CPPR-135 and CPPR-136, Docket Nos. 50-443 and 50-444
(b) USNRC Letter, dated April 2, 1984, "Integrated Design Inspection 50-443/83-23", R. C. DeYoung to D. N. Merrill
(c) PSNH Letter, dated May 7, 1984, "Schedule for Integrated Design Inspection Response", J. DeVincentis to R. C. DeYoung

Subject: Response to Integrated Design Inspection; 50-443/83-23

Dear Sir:

At the outset, I offer thanks to the IDI Team members for their professional and courteous demeanor, flexibility, and mobility during their comprehensive inspection of a system designed, reviewed, supplied, and constructed by numerous organizations with complex interfaces. The IDI Team arrived on the coattails of an INPO Assessment Team on November 1, 1983, and completed their inspection on December 21, 1983. During the inspection, the Team visited the offices of Yankee Atomic, United Engineers and Constructors (UE&C), Westinghouse, 10 subcontractors/vendors, and the Seabrook site and met with literally hundreds of representatives of these organizations. The results of the inspection are documented in Reference (b). Per the request of your representatives, we offered our schedule (July 1, 1984) for responding to the IDI Findings, Unresolved Items, and Observations, and hereby, fulfill that commitment.

The focal point of the inspection was the Containment Building Spray System and auxiliaries (e.g., power supplies, cooling water). The principal design, specification, and procurement organization for this system was UE&C, and as such, the majority f the Team's inspection was conducted at UE&C's offices. The bulk of the responses to Findings, Unresolved Items, and Observations contained herein were prepared by UE&C in concert with Yankee Atomic. All of the responses have been reviewed by Yankee, UE&C, and their

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respective Quality Assurance organizations to determine if generic, procedural, or programmatic implications exist and whether additional audits of design implementation in areas other than those covered by the inspection are necessary. The individual responses provide a discussion of concomitant implications as do the following discipline summaries and summary of the Quality Assurance review.

Discipline Summaries:

Mechanical Systems

The responses to Findings 2-4 through 2-7 demonstrate that all concerns raised in these Findings relative to Net Positive Suction Head (NPSH) margin have been addressed and in each case a justification for the UE&C approach has been provided. In addition, the response to Unresolved Item 2-1 shows that, when all the effects which can impact NPSH margin are added together an acceptable margin is still maintained even though an extreme measure of conservatism, beyond that which is justified in the above-mentioned responses, has been applied.

The response to Finding 2-12 provides, what we feel, is an adequate justification for the "approach velocity" interpretation. Based on this interpretation, compliance to Regulatory Guide 1.82 is demonstrated.

The response to Finding 2-18 indicates that acquisition of actual test data for confirming calculated torque margin is not a requirement and should not have been stated as such in FSAR Section 8.3.1.1.i. The FSAR will be revised to reflect this. Verification of motor/pump performance is conducted during start-up testing. This Finding has no impact on NPSH since the pump will not be declared operational until testing is successfully completed.

The response to Finding 2-8 addresses all the concerns relative to NPSH calculations for the RHR pumps and shows that adequate NPSH margin is maintained. Furthermore, the inconsistencies that existed between the RHR pump and the CBS pump calculations are eliminated by UE&C assuming responsibility and expanding their analysis to include the RHR pumps which were previously in the W scope. This is a unique situation that does not impact other plant systems. The response to Finding 2-9 shows that the concerns of this finding have essentially no impact on NPSH margin.

Finding 2-10 cites an outdated calculation. The revised calculation, which was started prior to the August 17, 1983 cut-off date and completed on August 24, 1983, takes into account all concerns identified in the Finding. It is therefore our contention that this item should not have even been identified as a Finding. Finding 2-11 addresses a deficiency in documentation of an assumption. This has essentially no impact on NPSH margin.

As further assurance that existing NPSH calculations are adequate, UE&C has applied all concerns described in the findings on Mechanical Systems to charging pumps, spent fuel pumps, and boric acid transfer pumps as

applicable. Results of this evaluation, as in the case of the CBS, RHR, and EFW pumps, shows adequate margin is maintained.

We agree with the inspection conclusions that the design cannot be considered complete until the effects of the postulated pipe breaks have been systematically examined and appropriate protection provided where needed. Our effort is essentially complete in the problem identification phase. Follow-up action to correct the problem is underway and will be accomplished in s pport of the Project Schedule.

Mechanical Components

The major areas of concern that have been identified by the IDI Team in the mechanical components area have been reviewed and are in the process of being reconciled.

The Findings imply that several items of potential technical significance were overlooked or not properly addressed; however, it must be noted that the calculations examined for the Containment Building Spray System (CBS) were in their formative stage and not deemed complete. All areas of concern, in particular, waterhammer loads, had been previously earmarked by UE&C for review and are in the process of resolution. Also, all other significant items identified by the IDI Team will be addressed during the final stress reconciliation phase.

Civil/Structural

In the civil/structural area, the major areas of concern identified by the IDI Team have been evaluated and corrective actions are being implemented. Control of live loads during operations will be established, inconsistencies of project criteria addressing the classification of the tank farm structure will be resolved, the tank farm structure is being reanalyzed to reflect changes made to structural elements, and final loads on concrete structural elements will be addressed. Other Findings, which mainly involved inconsistencies between project criteria and the design calculations, have been resolved and the appropriate calculation revised. To date, no hardware changes have been required as a result of these Findings and none are anticipated for those Findings still undergoing resolution.

Electric Power

We concur with the inspection findings regarding inconsistencies and errors between FSAR commitments, specifications, and system descriptions, etc. Similar concerns have been identified by the NRC site inspector and the INPO Assessment conducted in 1983. We constantly endeavor to update all design documents on a reasonable schedule. OL Application Amendment 53, which will incorporate our responses to NRC Requests for Additional Information into the FSAR and our commitment to more frequent Amendments should help alleviate inconsistencies.

Although we agree with the inspection findings, we have not yet identified any serious problems that have developed as a result of conflicting information.

The correct information is being used and the people responsible for the work, be it construction or engineering, know where the correct information is to be found. We have taken steps to minimize this problem and will continue to try to explore ways to have more consistency between documents.

I & C

The responses to Findings 6-12 through 6-17 have addressed all the major concerns in the Instrumentation and Control area. These cover both common mode failure of unqualified instrumentation preventing acceptable safety system performance and the possibility of unqualified non-safety equipment and improper cable separation adversely effecting Class 1E circuits.

We are in the process of analyzing the safety-related instrumentation and controls to ensure that our design practices have not resulted in IR degradation. Both associated circuits and common mode failures of unqualified equipment are being reviewed to ensure acceptable safety system performance. Any discrepancies that are found will be reviewed and appropriate action taken. We will review the safety-related purchase orders to ensure that all Class 1E components are listed and qualified.

The responses to 6-7, 6-8, and 6-14 through 6-24 address the Quality Assurance related findings by requiring QA to determine the status of Class 1E documentation for equipment received on-site. The applicable vendor surveillance check plans have been revised to include the review of Class 1E documentation status prior to release of the equipment from the vendor facility. The auditing of Class 1E vendors will emphasize equipment qualification and subvendor control.

QA Summary

A QA evaluation of the responses to the IDI Findings, Unresolved Items, and Observations was performed to verify the programmatic adequacy of the responses and to determine the need for additional corrective actions to address generic implications of the inspection results and responses.

The evaluation consisted of the following:

- Review of each response to evaluate the programmatic adequacy of the response.
- Analysis of the findings and responses to identify generic implications.
- Evaluation of generic attributes to determine corrective actions.

Two generic corrective actions were recommended as a result of this evaluation and will be implemented.

- An ongoing program will be accelerated to review design documents and update the design information contained therein to assure consistency.

- Various computerized lists (equipment list, instrument list, valve list, etc.) will be evaluated to determine the significance of the utilization of the lists for verification activities and assure that the preparation, review, approval, distribution, and control requirements are commensurate with the "safety" verification significance of the lists.

The results of the independent QA Evaluation confirm that the Findings have received a technical review and further provide assurance that generic implications have been considered and appropriate action taken.

In conclusion, our technical review of Findings, Unresolved Items, and Observations has not resulted in any significant safety concerns, and our independent QA Evaluation confirms the conclusion of the IDI Team; "In general, the problems found in the Seabrook design appeared to be confined to specific issues that did not seem to cross discipline boundaries. The overall design appeared to be adequately controlled."

Very truly yours,

WP Johnson

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FINDING 2-1: COMMENT RESOLUTIONS

The inspection team reviewed several revisions to the System Description SD-20 "Containment Building Spray System". We reviewed 15 comment resolution forms, and determined that in one case (for Revision 6) the responsible engineer did not complete the form to indicate how the comments were resolved. The team also evaluated the file for System Description SD-3, "Main and Auxiliary Steam System", Revision 1. We identified three examples where changes to Revision 1, requested by the Electrical group, were not implemented as requested.

RESPONSE:

(a) In the case of the incompleted comment form for SD-20, the comments had been incorporated in the version. The lack of completion of the form was an isolated oversight. The form has now been completed.

(b) SD-3, Revision 2, was compared to the comment copy from the Electrical Discipline. The only omission found was information on the pump manufacturer's performance curves which was in actuality a Mechanical Discipline comment which was on the draft revision before its issue for review/comment. Informtion on pump performance will be added in the next revision to SD-3.

These two errors do not indicate a generic problem.

FINDING 2-2: SYSTEM DESCRIPTION CHANGES

The team reviewed Revisions 6 and 7 of the Containment Building Spray, System Description SD-20, and identified 25 changes affecting the system design which are indicated in SD-20, Revision 7, but were not handled by the Design Change Notice process. These changes involved details on changing from the injection mode to the recirculation mode as well as revisions to design parameters, such as available and required pump net positive suction head, maximum calculated recirculation flow, spray additive tank usable volume and maximum temperature, and sump screen dimensions. In addition, the team reviewed SD-3, and identified 19 changes made from Revision 0 to Revision 1 and 12 made from Revision 1 to Revision 2 for which Design Change Notices should have been originated, but were not. The most significant changes involved addition of equipment design data as the system design evolved. Due to the significant number of cases identified where the Design Change Notices were not used when required, and since this problem applied to three different system description revisions and two different system descriptions, the team concluded that this problem is pervasive.

RESPONSE:

The function of a DCN is to provide early information about authorized design changes that affect documents issued for construction. AP-46 states that DCN's are not required for "documents or positions which have not yet been issued for construction." Furthermore, it also states that "DCN's should not be used to document editorial or commercial changes which do not affect the design." System descriptions are not issued for construction. Therefore, changes to a system description do not require issuing a DCN unless changes affect the design on documents issued for construction.

The changes incorporated in Revision 7 to SD-20 were reviewed and tabulated in the attached list. This table lists 26 changes and evaluates each as to whether or not it is a design change or editorial change and whether or not the design change was covered by a DCN. The table shows 17 editorial changes, 3 changes covered by DCN's and 4 changes incorporating results of revised calculations which had no impact on issued-for-construction documents. Only 2 of the 26 changees are "design changes" which are not covered by DCN's. One is the change from HI-3 to HI-2 containment pressure set point for spray actuation, which is addressed in Finding 2-3. The other is the deletion of the low pump suction pressure alarm which, although not documented by a DCN, had been discussed with, and concurred by, Yankee personnel.

The changes to SD-3 follow a similar pattern; most are editorial or do not initiate changes to issued-for-construction documents.

FINDING 2-2: SYSTEM DESCRIPTION CHANGES

RESPONSE (CONT'D)

Since the actual number of "design changes' lacking a DCN is only a small fraction of that identified in the finding, we disagree that the problem is "pervasive."

However, we will initiate retraining activities for all appropriate engineering/ design personnel regarding the proper use and processing of DCN's. The objective of this retraining activity will be to ensure that design modifications made to "issued for construction" design documents are implemented via the DCN process where appropriate, consistent with approved procedures.

Also, we will be reviewing existing design documents to ensure that updated design information is contained therein.

FINDING 2-2

CHANGE			PAGE NO.	NOTES
1	-	Reference Section Update	SD-20-1, 2, 3, 4, 6, 7, 8, 9	1
2	-	HI-3 to HI-2	-10, 11	2
3	-	Clarification: Switchover	-12	1
4	-	Clarification: Closure of Disc Vlvs.	-13	1
5	-	Add Ref. to ANS N18.2, 1973	-13	1
6	-	Update Flow Rates & Calc. NPSHA	SD-20A-1, A-5	3
7	-	Deleted Description of Monitor Light During Norm Plant Operations (All Dark)	A-3	1
8	-	Deleted Alarm for Suction Pressure Low	A-3	2
9	-	Deleted Caution of Pump Runout	A-4	3
10	-	Corrected Volume of Solution in SAT	D-1	3
11	-	Revise RWST & SAT Level Alarms	D-2, 3	4
12	-	Correct Description of RWST Disch. Vlv. Interlocks	D-3	5
13	-	Added Caution Against Returning HI Temp. to RWST After Refueling	D-4	1
14	-	Corrected Max. Fluid Temp. in SAT	D-5	1
15	-	Corrected Mesh Size for Sump Screen	E-1	1
16	-	Deleted Ref. to RESAR	Table SD-20-1	1
17	-	Replaced Sketch of Sump with Copy of Drawing 9763-F-101486	Figure SD-20-3	1

1 - Editorial - Does Not Affect Issued for Construction Drawings
2 - Results of Revised Calculation, DCN Should Have Been Issued
3 - Results of Revised Calculation, No Hardware Impact, No Change to Issued For Construction Drawings
4 - Covered by DCN 65/0205A
5 - Covered by DCN 65/0167A

FINDING 2-3: CONTAINMENT PRESSURE SIGNAL

Revision 7 to the containment building spray system description, states that the containment building spray system is actuated by a high-high containment pressure signal (18 psig). Table 7.3-1 in the FSAR indicates that the system is actuated by high-high-high containment pressure. Action needs to be taken to resolve the inconsistency between the system description and the FSAR.

The change to high-high in Revision 7 to SD-20 was not handled by a Design Change Notice. Failure to use a Design Change Notice was a contributing factor to the above inconsistency. Finding 2-3 is related to Finding 2-2 in that it involved an inconsistency between the system description and the FSAR which would have been identified by United Engineers had a Design Change Notice been used to support Revision 7 to SD-20.

RESPONSE:

We will be using the Westinghouse terminology of Hi-1, Hi-2, and Hi-3 for the containment pressure setpoints. Hi-1 and Hi-2 will have the same setpoint (4.3 psig). Containment spray is actuated by Hi-3 (18 psig).

These changes will be documented by a DCN. See response to Finding 2-2 for a discussion of our method for processing DCN's.

FINDING 2-4: MAXIMUM TEMPERATURE OF PUMPED FLUID

NRC Standard Review Plan 6.2.2, "Containment Heat Removal Systems", clarifies Regulatory Guide 1.1 by stating that the NPSH analysis "should be based on the assumption that the containment pressure equals the vapor pressure of the sump water." United Engineer alculation 4.3.5.11, concluded that 23.5 feet of NPSH is available at pump runout flow conditions of 3300 gpm. The pump requires an NPSH of 21 feet at 3300 gpm. This calculation makes the assumption that the sump water will be 212°F. The specification for the containment building spray pumps states that the pumped fluid can range from 40 to 280°F. United Engineers letter SBU-13320 to Yankee Atomic Electric recommended performing a thermal test. Therefore, calculation 4.3.5.11 is inconsistent with Regulatory Guide 1.1 by not assuming the maximum expected temperature of pumped fluids.

During the inspection, United Engineers performed calculation 4.3.5.10F, a new calculation of the NPSH available, which considered sump temperature up to 260°F and assumed that containment pressure equaled the vapor pressure of the sump water, as indicated by Standard Review Plan 6.2.2. The result is a calculated NPSH of 21.68 feet at the maximum calculated runout flow of 3300 gpm (based on interpolation by the team of calculated values for 3260 and 3400 gpm).

RESPONSE:

The maximum sump water design temperature is 260°F (The 280°F temperature in the pump specification is a conservative value which was chosen for pump design purposes). The maximum expected temperature has been included in the NPSH calculation. It has been found that the case assuming 212°F still governs. The response to Unresolved Item 2-1 provides further information.

In addition, the reference to UE&C letter SBU-13320 in this finding is inappropriate since it seems to suggest a deficiency in performance of a thermal transient test. In fact, the merits of this test were evaluated and it was determined that the thermal transient test previously performed on a larger pump of the same design was valid for assessing the smaller Seabrook CBS Pump. Further justification for CBS Pump operability under thermal transient conditions is provided in our response to Finding 3-22.

FINDING 2-5: SUMP WATER LEVEL

Calculation 4.3.5.11 assumes a minimum water level in the sump of -23.33 ft. The response to NRC question RAI 440.52 (6.3) states that "there are drain lines equipped with strainers which permit a flow path between the reactor cavity and refueling canals to elevations above the water level in the rest of the containment. Should the strainers on these lines become blocked, an additional volume of 5760 cubic feet of water would be trapped. The resulting reduction of water height would be 5.76 inches." This height reduction has not been factored into the above referenced NPSH calculation. This is contrary to Standard Review Plan 6.2.2.

Response:

The blockage of the strainers was not considered as a design basis due to the lack of insulation available for blockage in the vicinity and due to the vertical cone geometry of the strainer to be used. However, this improbable occurrence has been factored into the response to Unresolved Item 2-1 and results in an acceptable reduction in NPSHA margin.

It is concluded that this finding does not have generic implications since the omission of the water volume in question was based on an interpretation of potential blockage contributors and not oversight.

FINDING 2-6: SUCTION PIPE LOSS COEFFICIENT

Alden Research Laboratory performed tests on a Seabrook containment sump model to evaluate the inlet pressure head losses of the bellmouth entrance to the suction pipe for a range of pipe Reynolds numbers. Alden observed in their report of the tests that no significant changes of loss coefficient occurred within the wide range of Reynolds numbers tested. The average values of the loss coefficients for both the pipe inlets was 0.37 with 50% sump screen blockage. The value of the loss coefficient includes losses due to screens and gratings. tests also determined that the worst case loss coefficient was 0.53. United Engineers' NPSH calculations assume the average loss coefficient (0.37) as opposed to the worst case observed in the tests (0.53) without providing any justification. The team considers it prudent to have used the most conservative value to ensure pump operation during worst case conditions.

RESPONSE:

A review of Table 6 in the Alden Report shows the 0.53 loss coefficient to be an isolated data point, well off the curve of remaining data. The scatter of data observed should be attributed to experimental error rather than variations in the independent variables. This point also occurs at the extreme low end of the coolant velocity range and, thus, should not be applied at the maximum coolant velocity for design purposes. There is no evidence to suggest that the 0.53 valve for C_L should be interpreted as a valid worst case condition. In addition, a letter from Alden dated 12/15/83 stated that use of the 0.37 was "very reasonable". In any event, a 0.53 loss coefficient was applied in the response to Unresolved Item 2-1 which indicates adequate NPSHA margin.

The justification for use of the average valve for C_L is within the scope of the Alden investigation and need not be justified repeatedly elsewhere. It is , therefore, concluded that this finding does not have generic implications.

FINDING 2-7: LOSS DUE TO SWIRL

An investigation of the effect of swirl on pipe friction losses was conducted by Alden. Alden's report stated: "The effect of swirling flow on the friction loss is dependent on swirl intensity. For an average indicated swirl angle of 5 degrees, the increase in the frictional loss would be approximately 15% compared to that for non-swirling flow at the same Reynolds number." The team found no documented evidence that this effect upon NPSH available had been evaluated by United Engineers. After this was identified by the team, United Engineers performed calculation 4.3.5.41F which determined that the swirl flow effect results in the reduction of the NPSH available by 0.092 feet.

RESPONSE:

The effect of swirl on friction losses and subsequent impact on NPSH available have been considered in the initial assessment of the Alden investigation results. It was judged at that time that these effects would be negligable and the matter was closed. As a consequence of this audit, additional attention has been focused on this issue during the inspection and subsequent to the issuance of the IDI report.

The following comments are noteworthy:

The 15% increase in friction losses associated with a 5° swirl angle is an initial value at the pipe entrance. This loss is then reduced significantly due to swirl decay. The Alden swirl investigation applies an average value of 9% for increases in friction losses over the initial 40 pipe diameters.

The loss coefficient (C_L) evaluated in the Alden sump investigation accounts for all effects of swirl from the entrance to 30 pipe diameters downstream. This is so because the method for measuring losses accounts for all effects that would alter the magnitude of the pressure and, therefore, the total energy in that length of pipe. This is presented in Figure 4, ARL Report 25-81, and is further verified by Alden in a letter dated May 24, 1984.

It can be further shown, that any residual swirl propagation beyond the initial 30 pipe diameters will have negligable effect on friction losses. The calculation performed by UE&C during the inspection, which determined that the swirl effect reduced NPSH available by 0.092' (later revised to 0.13' in Unresolved Item 2-1), is in fact conservative since it also accounts for loss due to swirl in the first 30 pipe diameters.

It can, therefore, be concluded that the effects of swirl have been inherently factored into NPSH calculation through the use of the loss coefficient developed by Alden. Furthermore, since this issue is unique to the containment sumps and the effects of swirl have been accounted for without any significant effects on NPSH margin, this finding does not present any generic implications. Nevertheless, the fact that the effects of swirl were judged to be insignificant at the time that the Alden report was evaluated should have been documented in the hydraulic calculation.

SB

UNRESOLVED ITEM 2-1: CBS PUMP NPSH AVIALABLE

The potential decrease in available NPSH associated with Findings 2-4 through 2-7, inclusive, indicate that the NPSH available may be approximately 20.59 feet as opposed to a required NPSH of 21 feet (for the calculated maximum run-out flow of 3300 gpm.) This 0.41 foot NPSH deficit does not include the effects of (1) 280°F sump water indicated in the pump specification vs 260°F water on which the 20.59 feet is based, or (2) questions with respect to the adequacy of NPSH tests conducted by the pump manufacturer (See Section 2.3, Findings 2-16 and 2-18), or (3) questions with respect to the pressure drop across the sump screen caused by blockage due to insulation. (See Section 2.2, Finding 2-12) The team considers that these effects must be considered together with Findings 2-4 through 2-7 in evaluating whether there is adequate NPSH available.

RESPONSE:

As a part of the preparation for UE&C response to the concerns regarding the $NPSH_A$ for the CBS pumps, a complete review of all the basic input was conducted. The review resulted in two corrections which increased the $NPSH_A$ reported in calculation 4.3.5.10F, Rev. 2. A study which combined all of the concerns raised in Findings 2-4 through 2-7 was then completed.

The attached table is a summary of the effects on $NPSH_A$, starting with the $NPSH_A$ reported in calculation 4.3.5.10F, and making adjustments for the concerns and corrections. The table shows the revised $NPSH_A$ for both 212°F and 260°F to address the temperature concern of Finding 2-4. One can see in the table that the $NPSH_A$ exceeds the $NPSH_R$ by nearly 10% at the maximum calculated system flow rate of 3260 gpm after accounting for the concerns of Findings 2-5 through 2-7. If credit were taken for the expected reduction in $NPSH_R$ at the pumped temperature (212°F and 260°F) compared to the performance test temperature (100°F), the margin would further increase.

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(UNRESOLVED ITEM 2-1)

CBS PUMP NPSH

Pressure	V.P.	V.P.
Flow (gpm)	3,260	3,260
Temperature (°F)	212	260
A. $NPSH_A$ (ft), -Calc. 4.3.10F, Rev. 2	22.31	21.87
B. Corrections - Calc. 4.3.5.47F, Rev. 1		
a) From 4°C to pumped temperature	(+) 0.97	(+) 1.46
b) Water level based on actual mass/ volume relationships	(+) 0.07	(+) 0.21
Corrected $NPSH_A$ (ft)	23.35	23.54
C. Concerns - Calc. 4.3.5.47F, Rev. 1		
a) Canal blockage*	(-) 0.48	(-) 0.51
b) 0.53 screen loss coeff.**	(-) 0.46	(-) 0.46
c) Swirl losses ***	(-) 0.13	(-) 0.13
$NPSH_A$ (ft) with concerns	22.28	22.44
D. $NPSH_R$ (ft) @ 3,260 gpm and 100°F	20.5	20.5
Excess (ft)	1.8	1.9

*Finding 2-5
**Finding 2-6
***Finding 2-7

FINDING 2-8: RHR PUMP NPSH CALCULATION

The Alden work had been performed under a contract with Yankee Atomic. The results were apparently not made available to Westinghouse even though bellmouth loss coefficients and swirl flow affect residual heat removal pump NPSH, just as they do for the containment building spray pump. The Alden data is not reflected in Westinghouse calculation SD/SA-NAH-114. The residual heat removal pump calculation assumes a bellmouth loss coefficient of 0.5 (without explaining the basis), which is more conservative than the 0.37 assumed in the containment building spray pump calculation and approximately equal to the 0.53 worst case value determined by Alden. The residual heat removal pump calculation assumes a minimum sump water level of -23 feet, which is less conservative than the -23.33 value in the containment building spray pump calculation. The residual heat removal pump calculation does not consider entrapped water above the -26 feet level, the effect of which had been calculated by United Engineers calculation 4.3.22-F07. There is no documented evidence that the Westinghouse calculation considered the swirl flow effect identified by Alden Labs. The inconsistencies between the residual heat removal and containment building spray pumps NPSH calculations should be corrected. In that respect, Findings 2-4 and 2-7 should be evaluated for their applicability to the residual heat removal pump NPSH calculation.

RESPONSE:

The loss coefficient of 0.5 used in the Westinghouse calculation (SD/SA-NaH-114) is an extremely conservative handbook value for pipe entrance losses which is maximized by assuming a sharp-edged entrance. This value was not revised in accordance with the results of the subsequent investigation by Alden because of its conservatism. A discussion on the basis for the use of the average value of the loss coefficient from Alden is provided in the response to Finding 2-6.

UE&C Calculation 4.3.3.16F was performed to estimate the effect of Findings 2-4 through 2-7 on the NPSH for the RHR pump during the recirculation phase of post-accident operation. The available NPSH is calculated to be 21.4 ft. at 4700 gpm which can be compared with a required NPSH of 19.5 ft. at that flow rate.

Per agreement between UE&C and Westinghouse (Ref. SBU-25835), UE&C is expanding its CBS pump analysis (4.3.5.10F) to include the RHR pumps. This will eliminate any inconsistencies between the RHR and CBS pump NPSH calculations. The Westinghouse analysis (SD/SA-NAH-114) is an evaluation of RHR pump NPSH available. The results of this analysis will be superceded by the expanded UE&C analysis as suggested in the preliminary calculation 4.3.3.16F.

The RHR pumps are the only Westinghouse supplied pumps which take suction from the sump; therefore, there is no generic implications for this finding.

FINDING 2-9: RHR PUMP NPSH MARGIN

The FSAR is inconsistent with Westinghouse calculation SD/SA-NAH-114 in that FSAR Table 6.3-1 indicates that the NPSH available for the residual heat removal pumps is 20 feet, whereas the calculation indicates it is 22.3 feet. Also FSAR Table 6.3-1 is misleading by indicating that the NPSH required is 13.5 feet at 3800 gpm, which results in an NPSH margin of 6.5 feet. However, Westinghouse's calculated runout flow is 4691 gpm, in which case the NPSH required is 19.5 feet based on pump performance curves included with calculation SD/SA-NAH-114. Therefore, for the limiting design situation, the NPSH margin is actually 0.5 foot, based on the FSAR and the pump performance curves.

Response:

The equipment parameter information provided in the FSAR is intended to identify required performance characteristics rather than the results of calculations. For the Seabrook FSAR, the entry identifying the NPSH required as "13.5 feet at 3800 gpm" should read "13.5 feet at 3000 gpm" (typographical error). This statement means that the pump vendor must provide a pump which requires no more than 13.5 feet of NPSH at 3000 gpm (the actual pumps supplied require 12 feet of NPSH at 3000 gpm). The statement that NPSH available is 20 feet means that the system design/layout will ensure that at least 20 feet of NPSH will be made available to the pump at 3000 gpm. The actual system design/layout provided more than 20 feet of NPSH. Thus, the NPSH margin of 6.5 feet at 3000 gpm implied in the FSAR is conservative.

As part of the normal design process, Westinghouse conservatively calculates actual flow rates for ECC System operation and verifies that all safeguards pumps have adequate NPSH available under all operating conditions. With respect to RHR pump NPSH margin, the limiting operating condition is Post-LOCA cold leg recirculation with one RHR pump operating. Under these conditions, the pump operates at maximum runout (4691 gpm per Westinghouse calculation SD/SA-NAH-114), requires 19.5 feet of NPSH (based on pump performance curves), and has available 22.3 feet of NPSH (per calculation SD/SA-NAH-114) for a margin of 2.8 feet at 4700 gpm, the limiting design situation.

In order to avoid further confusion, we will modify the FSAR to include NPSH data at the maximum runout condition (4700 gpm).

UNRESOLVED ITEM 2-2: RHR PUMP NPSH AVAILABLE

Based on calculations by United Engineers, the team estimated that the Westinghouse calculated NPSH should be approximately 21.4 feet to account for the correct water level and the swirl flow effect. However, the team is unable to conclude that there is adequate NPSH available for the residual heat removal pumps because of the discrepancy between the FSAR and calculation, the inconsistencies with the containment building spray pump NPSH calculation, the issue of sump screen pressure drop and the potential applicability of Findings 2-4 through 2-7 to the residual heat removal pump NPSH calculation. All of these factors need to be evaluated to ensure there is adequate margin between required and available NPSH for the residual heat removal pumps.

RESPONSE:

The responses to Findings 2-4 through 2-7 addressed all concerns affecting the CBS pumps, i.e., sump temperature, entrapped water volumes, and losses due to swirl. The response to Finding 2-12 addresses concerns relative to meeting the requirements of Reg. Guide 1.82 for velocities at the sump screens. All these factors are then summed to evaluate the gross effect on NPSH available. This summary is provided in the responses to Unresolved Item 2-1 for the CBS Pumps and in Finding 2-8 for the RHR pumps. The above responses show adequate NPSH available for both sets of pumps.

The FSAR will be revised accordingly.

FINDING 2-10: EMERGENCY FEEDWATER PUMP NPSH

United Engineers calculation 737-05, d ced 2/29/74, determined that the minimum NPSH available was 27.6 feet. The team reviewed the calculation and found that the temperature of the feed water is assumed to be 60°F, whereas FSAR Table 6.8-1 indicates it can reach 100°F. The length of pipe and the specific fittings assumed in the calculation do not represent the latest design. The minimum water level in the condensate storage tank is indicated as 2.5 feet below the pump suction centerline, for purposes of calculating statiC head. There is no justification for this assumption in the calculation.

RESPONSE:

Calculation 737-05 had been recognized as an outdated calculation prior to the arrival of the IDI team. A new calculation, 737-15, was started before the cutoff date of August 17, 1983 and completed on August 24, 1983, thus superseding the old calculation. This calculation takes into account the changes in feedwater temperature, piping components, and condensate storage tank level.

Since the new calculation was initiated prior to the August 17, 1983 cut-off date, it is concluded that this finding does not have any generic implication.

FINDING 2-11: REVISED CONDENSATE STORAGE TANK LEVEL

During the inspection, United Engineers completed calculation 737-15 which superseded calculation 737-05. Calculation 737-15 changed the minimum water level in the condensate storage tank to 4.667 feet below the pump suction centerline, but did not justify the basis for the assumed water level.

RESPONSE:

Calculation 737-15 has been revised to show the basis of the assumed water level to be the distance below the invert (inside bottom of nozzle) of the lowest non-nuclear safety class nozzle at which the guaranteed 200,000 gallon reserve is satisfied. This revision has "minimal technical impact" since there is approximately a 35% NPSH margin.

FINDING 2-12: COOLANT VELOCITY AT SUMP SCREEN

The team reviewed the containment sump design with respect to its effect on NPSH available to the containment building spray pump. Regulatory Guide 1.82 to which the licensee committed without exception in the FSAR, states that, at a recommended design coolant velocity at the inner screens of 0.2 ft/sec. debris with a specific gravity of 1.05 or more will settle to the floor level before reaching the screen surface. The available surface area used in determining the design coolant velocity should be based on one-half of the free surface area of the fine inner screen to conservatively account for partial blockage.

United Engineers calculation CI-2 assumes a total pump capacity of 7800 gpm. With 50% screen blockage, the inner screen area available for flow is 49 $ft.^2$. the velocity through the 50% blocked screen was calculated as a function of these two parameters, and the result was 0.36 ft/sec. The calculation also indicates that, when the screen is not blocked, the velocity is 0.18 ft./sec. The question whether the velocity "approaching" the screen or "through" the screen should be the basis for Regulatory Guide 1.82 compliance was raised at a conference between United Engineers, Westinghouse and Yankee Atomic on September 27, 1978. The conference report (Reference 2.16) indicated that the velocity limit in Regulatory Guide 1.82 should be interpreted as "approach" velocity to the screens since the intent of limiting the velocity is to permit debris to settle our before reaching the inner screens. The conference report also indicated that tests by Alden labs would confirm that debris would not deposit on the inner screens based on an "approach" velocity of 0.2 ft./sec. The team found no evidence that these tests were ever conducted.

A United Engineers memorandum produced after the inspection dated 1/18/84, states that the calculated number for approach velocity, 0.18 ft./sec, was in error. The 0.18 number represented a flow velocity through the unblocked screen openings and not an approaching velocity. At the time of our inspection there was no documented evidence that the coolant velocity at the sump inner screen complied with the recommended velocity in Regulatory Guide 1.82, i.e., 0.2 ft./sec.

RESPONSE:

The UE&C interpretation of Reg. Guide 1.82 with respect to "coolant velocity at the screen" as related to settlement of debris is the "approach velocity to the screen" since settlement is expected to occur prior to reaching the screen. This approach velocity is calculated at a plane immediately before the screen.

It should be noted that an assessment of debris behavior in the flow steam has never been within the scope of the Alden investigation. This is the reason why a 50% blockage of screens was assumed as an initial condition in the evaluation. The statement in the conference report, relative to confirmation of interpretation, was intended to indicate that Alden will confirm the validity for interpreting the flow velocity as an approach velocity.

Assuming that 50% of the area at this location is blocked, the resulting approach velocity is 0.214 feet per second. This is considered to be in compliance with the Regulatory guide requirement (i.e., "velocity...should be approximately 0.2 ft./sec.)

UNRESOLVED ITEM 2-3: SUMP SCREEN PRESSURE DROP

In resolving Finding 2-12, if it is determined that 0.2 ft/sec design coolant velocity at the inner screen recommended by Regulatory Guide 1.82 is exceeded, then evaluations need to be made of the resultant pressure drop across the screen and the ultimate effect on NPSH for all affected pumps.

RESPONSE:

Although UE&C maintains that approach velocity is appropriate for the issue of settlement of debris (see Finding. 2-12), it is agreed that the velocity through the screen mesh throat is appropriate for the matter of pressure drop and its effect on NPSH. The Alden Lab test simulated the Seabrook geometry and established the screen loss factors for 50% blocked screens. Therefore, both the "approach velocity" and the velocity through the screen were reproduced at the appropriate locations and use of these screen loss factors in NPSH calculations properly accounts for coolant velocities at all locations.

FINDING 2-13: SUMP ENTRAINED AIR

Alden Labs testing of the containment sump found that considerable quantities of air were caught underneath the top cover of the sump while the sump was filled. Alden recommended that holes be drilled in the top cover to vent the entrained air. We found no documented evidence that United Engineers has evaluated this potential problem. Failure to evaluate all potential problems, including entrained air, affecting pumps suctioning from the sump, i.e., containment building spray and residual heat removal pumps, is inconsistent with Regulatory Guide 1.82.

(Finding 2-13 was deemed to have no further technical significance by the IDI team since action has been taken to evaluate the potential problem and implement a design change.)

RESPONSE:

The UE&C Nuclear discipline had written a memorandum to the UE&C structural discipline (MM-10765A dated 12/17/82) informing the structural discipline of the need for vent holes in the top cover of the sump. The memo, however, was misplaced.

After the entrained air problem was identified by the IDI team, another internal memorandum was written which requested that action be initiated to add 1/8 inch diameter holes on three inch centers (providing equal venting area per square foot) to the sump cover plates and walkways with the holes to be uniformly spaced to cover the entire surface area with at least 16 holes per square foot.

Subsequent to this action, an alternative to the 1/8 inch diameter hole scheme has been proposed (MM-18384A) which provides for larger 3/4 inch diameter holes with 1/8 inch mesh screen over the openings. This is presently being evaluated by engineering.

It is concluded that this is an isolated case and does not have any generic implication.

FINDING 2-14: REFUELING WATER STORAGE TANK SETPOINTS

United Engineers Calculation 4.3.5.30F, Revision 0, established the refueling water storage tank volume allowances and associated alarm setpoints for tank water levels. The setpoints provide for alarm actuation when, because of changes in the water level, certain volume allowances are approached or expended. We found examples where the calculation did not provide justification for assumptions. These assumptions are the refueling water storage tank vortexing level, working allowance, alarm separation allowance, transfer allowance, and a shutoff allowance to allow the pumps to shutoff if the transfer is not made before reaching the vortex level.

RESPONSE:

Revision 1 to Calculation 4.3.5.30F was in progress before the cutoff date of August 17, 1983, and was completed August 25, 1983 prior to the arrival of the IDI Team. All of the above deficiencies were resolved by this revision.

Since this revision was initiated prior to the August 17, 1983 cut-off date, it is concluded that this finding does not have any generic implication.

FINDING 2-15: REFUELING WATER STORAGE TANK VOLUME ALLOWANCE

Based on the equation for working allowance in calculation 4.3.5.30, Revision 0, the team calculated a water level change of 2.88 inches for the 50° temperature difference indicated in the FSAR, as opposed to the 2.4" value stated in the FSAR. The United Engineers systems engineer agreed that the FSAR was in error.

RESPONSE:

The FSAR value was an isolated error. A correction to FSAR Section 6.3.2 has been initiated by FSAR deviation Number 269 dated 11/3/83.

It is concluded that this finding does not have any generic implication.

OBSERVATION 2-1: CBS PUMP SPECIFICATION REVIEW

United Engineer's procurement specification 9763-006-238-3 originally did not specify the design temperature and pressure for the cooling water pressure boundary. Bingham-Willamette performed the hydro-test on the seal cooler at room temperature and 45 psia. Revision 6 (9/1/82) to the pump specification added paragraph 3.1.3 which states that the cooling water pressure boundary shall have a design temperature and pressure of 200° F and 150 psig respectively. The seal coolers were successfully retested at these values.

RESPONSE:

The design requirements for the seal cooler shell side (200° F and 150 psig) were made known to BWC in UE&C's letter SBU-17818 dated April 3, 1978, long before the initial hydro-test. The test was performed by the supplier, Borg-Warner a sub-vendor to Bingham-Willamette. The test results first became known to UE&C during the review of the pump QA data package. UE&C then initiated the retest and formalized the design requirements in Spec. 238-3, Rev. 6.

FINDING 2-16: CBS PUMP TEST MOTOR

United Engineers' Specification 9763-006-238-3 requires that each pump be individually tested in the as-built configuration, with any modification to test configuration to be approved by the Purchaser. Contrary to this requirement, tests on containment building spray pumps 14210479 and 14210480 were performed by using motor HM-21 (a motor used for testing at Bingham-Willamette) instead of the as-built Seabrook motor (supplied by Westinghouse, which drives the pump in actual plant operation. There is no record of this modification to the test configuration indicated in the specification having been reviewed or approved by United Engineers. Even though the motor used in the test was the same rated horsepower (600 hp) as the as-built motor, any slight difference in NPSH test data caused by switching motors is of concern due to the questions in NPSH margin raised by Findings 2-4 through 2-7 and 2-11.

RESPONSE:

The "as-built configuration" requirement in the specification refers to the as-machined impeller/casing configuration, intending that the performance test be repeated in the event that re-machining of the impeller was required.

The performance test was witnessed, and the test data sheets (which clearly show the test motor identification) were signed by the responsible UE&C system engineer. This constitutes UE&C review and approval of the test configuration. Finally, as discussed in the response to Unresolved Item 2.1, the latest NPSHA calculations show a 10% margin for the CBS pump, making differences between the test motor and the Seabrook motor less of a concern. Confirmation of the acceptability of the Seabrook motor will be obtained during the preoperational tests.

FINDING 2-17: CBS PUMP MOTOR SEISMIC QUALIFICATION

United Engineers Specification 9763-006-128-1 was used by Bingham-Willamette as the procurement specification for the 600 horsepower motor supplied by Westinghouse to drive the containment building spray pumps. Section 3.2.12 of this specification provides seismic criteria, including motor shaft deflection, motor bearing overload, stress in the motor mounting flange or support, stress in the stator end turn insulation support system, and stress in bolts used for anchoring, assembly, bearing brackets and other vital services. There is no evidence, however, of qualification for stress in the stator end turn insulation support system. The design of the motor cannot be considered complete until this qualification is performed. The team considers that this omission should have been identified by both Bingham-Willamette and United Engineers in their reviews of the seismic analysis of the motor. The failure to identify this omission should be addressed in resolving the finding.

RESPONSE:

Bingham-Willamette was asked to amend the motor seismic analysis to include the stresses in the stator end turn insulation support system (SETISS) by UE&C letter SBU-88114. They have committed to a response by June 25, 1984.

Three of the four items in 128-1 are repeated in the generic seismic specification (9763-SD-238-3, as applied to the CBS pumps). The fourth, the SETISS, was not included due to oversight. However, this is not expected to cause great technical difficulties since the stresses in the SETISS are generally greater during motor startup than during a seismic event. This can be seen in the analysis done by Reliance for the cooling tower fan motors.

A review of all safety-related motors on the Seabrook project will be initiated to identify those motors whose design includes a SETISS. We expect a very limited number of motors to be identified since this component is used only on large motor sizes. Where it is utilized, a review of the seismic adequacy of the SETISS will be addressed.

FINDING 2-18: CBS PUMP MOTOR TORQUE

FSAR Section 8.3.1.1.i (page 8.3-22) states that motor suppliers are required to verify that actual test data confirms that the torque margin is equal to or greater than that of calculated data. Foreign print 51849-02-238-3 provides calculated data on motor torque which are indicated as "not guaranteed". Westinghouse provided test data on the motor, but the test was performed at no load conditions. Neither Bingham-Willamette nor United Engineers had test data in hand for loaded conditions to verify that the torque margin is equal to or greater than the calculated data.

RESPONSE:

Test verification of calculated torque margins is not actually a requirement of the CBS pump specification 9763-006-238-3 nor the project generic motor specification 9763-006-128-1. Test data verification was requested from Bingham-Willamette in UE&C letters SBU-7564 (6/2/76), SBU-10685 (1/4/77) and SBU-15035 (11/11/77). UE&C was unsuccessful in obtaining test data at load or certification of the existence of test data which verified the calculated torque data.

Verification of acceptable motor acceleration (torque margin) under load will be obtained during preoperational testing of the safety-related containment spray pumps.

As the verification, by test, of calculated torque margins is not a requirement, FSAR Section 8.3.1.1.i will be changed accordingly (requirement deleted).

OBSERVATION 2-2: CBS PUMP MOTOR TEST DATA

In resolving Finding 2-18, consideration should be given to the relation to Finding 2-16 in that the NPSH required was established by a test not using the as-built motor and that neither Bingham-Willamette nor United Engineers has confirmation that the as-built motor will supply the required torque. A determination should be made as to why the omission of test data was not identified in quality assurance reviews by United Engineers and Bingham-Willamette.

RESPONSE:

The motor in Bingham-Willamette P.O. 238-3 must meet the requirements of Spec. 238-3 and Induction Motor Specification 128-1. The testing required by Spec. 128-1 does not include speed torque tests. B-W was requested by UE&C letter to submit speed torque test data.

Section B of the Vendor Surveillance Check Plan for P.O. 238-3 indicates verification of motor documentation required by Spec. 128-1. This surveillance point 2.f, was covered by the UE&C Vendor Surveillance Representative during the documentation review of the Site data package for the four containment spray pumps, 1-P-9A, 1-P-9B, 2-P-9A and 2-P-9B. This is documented in Shop Inspection Report No. 6, SBU-24134, dated 2/9/79. Therefore, Vendor Surveillance was performed in accordance with the purchase specification.

FINDING 2-19: JET IMPINGEMENT ANALYSIS

UE&C Procedure TP-3 discusses considerations in evaluating effects of failed pipes, and states that potential damage from developed jets must be evaluated in every case unless specific justification exists that would allow elimination of jet reaction analysis. Appendix 3C of the FSAR provides criteria for performing such evaluations. However, the team found no documented evidence that potential damage from developed jets was evaluated, nor any documented justification for not performing the work.

RESPONSE:

As part of the systematic, programmed effort being conducted by the FMEA Review Group, areas or zones within the plant in which jet impingement effects are felt to be significant are being evaluated in detail. In such situations, jet impingement study drawings or sketches are prepared which show the resulting size and type of plume emanating from the postulated failure as well as the surrounding equipment. These jet impingement study drawings had not been generated prior to the cut-off date of August, 1983. A considerable number of these had been prepared subsequent to that date and these were shown to the team reviewer as evidence that the aforementioned criteria was being complied with.

If any such evaluations require the preparation of calculations regarding jet impingement effects on essential systems or components, these calculations will be performed in accordance with the requirements of UE&C Procedure CEDP-0005.

UNRESOLVED ITEM 2-4: JET IMPINGEMENT ANALYSIS

The IDI Team considered it poor practice to conduct jet impingement analyses as well as other piping failure analyses at this late date. The design cannot be considered completed until the work has been done to locate those instances where jets might damage essential equipment and to protect the equipment as needed in accordance with the licensing commitments.

RESPONSE:

Detailed jet impingement analyses are being performed at this state in the project to supplement the investigations conducted earlier. At the lay-out stage of the project, consideration was given to the routing of high-energy piping systems relative to essential systems and components. This consideration employed, to the extent practicable, separation or enclosure as the means for minimizing interactions between postulated high-energy piping failures and essential systems and components. When such was not feasible or possible, pipe whip restraints were located to mitigate these effects. A programmed effort is currently underway, and has been since July, 1982 to systematically evaluate jet impingement and concomitant effects arising from the mechanistically-determined piping failure locations. Any protection or corrective actions needed to ensure the operability of essential systems and components is being implemented as the review of each building area or zone is completed.

FINDING 2-20: BASIS FOR ANALYSIS

The IDI team reviewed analyses performed for two zones in the PAB, 32A and 32B. The technical work had been completed, but the zone reports had not been issued because a management review was still to be accomplished. Statements were contained in these zone reports with respect to the effects of jet impingement on nearby piping. For several cases, statements were made to the effect that the jet from a pipe break will impinge upon a pipe larger than the failed pipe and therefore no adverse effect is created. The IDI team found no evidence of a technical evaluation to establish a basis for this assertion.

RESPONSE:

The position taken in the High-Energy Line Break Evaluation regarding the above jet impingement effects is felt to be less limiting with respect to target pipe integrity than the criteria provided in Appendix B of Branch Technical Position ASB 3-1. This criteria is stated as follows: "The energy level in a whipping pipe may be considered as insufficient to rupture an impacted pipe of equal or greater nominal pipe size and equal or heavier wall thickness".

In a pipe-upon-pipe impact situation, virtually all of the blowdown force acting on the severed piping section is available to accelerate this section into the target piping. In the time interval between pipe severance and impact into the target pipe, the broken piping section will accumulate energy by virtue of the blowdown force acting through a distance (i.e., the separation between the broken and target piping). At the moment of impact, the target piping must not only resist the blowdown force loading but also an equivalent mass striking it at a certain velocity.

In a jet impingement only loading condition, the target piping will sustain only a portion of the total blowdown force loading. Because of jet expansion, not all of the expanded jet area at the separation distance may be intercepted by the target piping. Further, the target piping, due to its geometry, would have a shape factor less than 1.0. This would reduce the out-of-plane effective load. Based on these considerations, it is felt that the loads induced in larger size target piping and supports by jet impingement effects would be less severe and provide a greater margin against failure than the criteria provided in BTP ASB 3-1 regarding pipe-upon-pipe impact loading cases. UE&C has utilized this as part of its screening criteria when considering the jet impingement effects on such piping.

FINDING 2-21: PIPE WHIP EVALUATIONS

The pipe break computation sheets (for Zones 32A and 32B) state that equipment (including electrical and instrumentation systems) is protected from specific line breaks by either distance or a barrier. There is no indication of the distance or the basis for how the distance was determined to be adequate. We found no documented evidence of any evaluation of pipe whip envelopes. This is contrary to United Engineers' Procedure TP-3 which states that "Documentation of these required analyses must be clear, complete, signed and dated so that an independent review can be performed".

RESPONSE:

The original plant layout considered the effects of high energy piping failures in the routing of high energy system piping. Wherever possible, high energy lines were separated from safety-related equipment by either distance or barriers. These methods were utilized without specific distance criteria since actual break locations were not know. The failure modes and effects analysis effort now being performed considers the mechanistic effects resulting from specific breaks, since the final break locations have now been identified.

The draft reports reviewed by the IDI team were preliminary work and thus cannot be considered representative of a completed zone report.

In the course of a zone review, the FMEA reviewer considers the pipe whip and jet envelopes developed at a break and performs a detailed evaluation only for that equipment that is judged to be significantly affected by the whipping pipe or jet and which is essential for the break under consideration.

After the zone reports have been completed, FSAR Appendix 3A will be reviewed and updated where necessary to reflect the outcome of the current review effort.

FINDING 2-22: CRACKS IN MODERATE ENERGY PIPING

Section 3.6(B).2.1.b of the FSAR states that through-wall leakage cracks are postulated to occur in moderate energy piping, except where the maximum stress range in Class 2 or 3 piping is less than 0.4 (1.2 Sh + Sa), and that the cracks were postulated to occur in those locations that result in the maximum effects from spraying or flooding. United Engineers' Procedure TP-3 (Reference 2.32) requires that through-wall leakage cracks be postulated in moderate energy piping, that components/systems affected by the cracks be identified and that each component/system be evaluated for flooding or jet spray. We found no documented evidence of analyses of the effects of cracks in moderate energy piping, as indicated in the FSAR and required by Procedure TP-3.

RESPONSE:

In Section 3.6(B).2.1.b of the FSAR entitled "Moderate Energy Piping", it is stated that "through-wall leakage cracks are postulated to occur in seismic Category I and non-nuclear fluid system piping located within or outside and adjacent to protective structures, with the following exceptions...". Three exceptions are then listed stating those circumstances in which through-wall leakage cracks in moderate-energy piping need not be postulated.

One of these exceptions states that failures in moderate-energy piping need not be postulated in a plant area where high-energy piping is also present and failures in such are considered, provided that a failure in a moderate energy system would not result in a more limiting condition than the failure in the high-energy system.

For many areas of the plant that are located within or adjacent to protective structures, both high and moderate-energy piping systems are present. If the environmental consequences of a high-energy piping failure are determined to be more severe than those of the most significant moderate-energy piping failure, the former consequences are identified as the governing ones for that plant area or zone and are used in the ensuing evaluation effort. UE&C has utilized this exception in performing piping failure evaluations. This exception is consistent not only with the FSAR but also with the criteria contained in Subsection B.2.d of Branch Technical Position MEB 3-1, attached to S.R.P. 3.6.2. Procedure TP-3 will be revised to reflect these exceptions.

Beyond these considerations, a separate study has been conducted regarding flooding and spray effects produced as a result of moderate-energy piping failures. The study encompassed all safety-related areas of the plant which are outside of containment . This document, entitled "Moderate Energy Line Break Study", is available for review.

FINDING 3-1: DESIGN TEMPERATURES

The review indicated that inconsistencies in the refueling water storage tank design temperature exist between various documents. Table 6.2-75 of the FSAR specifies a design temperature of 88° F; the United Engineers System Design Description SD-20 specifies a design temperature of 100° F; Westinghouse System Description NAH/NCH-284 (for the safety injection system) specifies a design temperature of 200° F, while United Engineers Specification 9763-006-246-1 specifies a design temperature of 100° F. The temperature listed in the FSAR is given as the "maximum design temperature".

RESPONSE:

The correct tank design temperature is 100°F. Changes to clarify Table 6.2-75 have been initiated. Corrections to SD-NAH/ NCH-284 were requested of Westinghouse by UE&C in letter SBU-83405. In their letter NAH-U-3042, Westinghouse declined to incorporate the comments, saying that in the case of A/E supplied equipment (as in the case with the RWST), the parameters are "order of magnitude estimates".

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FINDING 3-2: EQUIPMENT QUALIFICATION PROCEDURES

A review of the Pittsburgh-Des Moines Steel Co.'s design reports for the refueling water storage tank and the spray additive tank indicated that both of the seismic qualification analyses were based on static analyses which utilized 150% of the peak vertical acceleration. This qualification method is not consistent with the requirements of United Engineers' Specification 9763-SD-246-1, which states that only the dynamic analysis method is acceptable. Seismic requalification by the dynamic analysis method should not be required.

RESPONSE:

United Engineer's specifications 9763-SD-246-1 and 9763-SD-246-6 provide acceptable methods for the seismic qualification of Safety Class 3 field fabricated tanks. In addition, specification 9763-SD-246-6 (Section 1.1.2) also allows the seller to take exemptions to the seismic requirements. The seller is then required to submit as part of his bid package, his proposed procedures for concurrence to the specification requirements, prior to performing his analysis. This approach affords the seller the opportunity to utilize alternate methodology which UE&C has evaluated to assure acceptability. Conversely, UE&C will delineate approaches where the sellers' methods are not adequate.

The proper approval requests were submitted by PDM for the exceptions taken in the qualification of the refueling water storage tank and the spray additive tank. UE&C formally approved PDM's request to perform a static analysis on the roofs of vertical liquid storage tanks. The overall tank shell analysis was in accordance with the industry accepted TID 7024 equivalent dynamic analysis method. The seismic qualification report will properly document the methods of analysis used.

In lieu of the above, we feel that the specifications provide sufficient instructions to the sellers and do not need to be revised.

FINDING 3-3: STRESS CALCULATIONS

Review of the Bingham-Willamette siesmic design report determined that the pump casing calculations (which compute a stress of 2,741 psi against an allowable stress of 27,200 psi reported in Table 3.9(B)-13 of the FSAR) have been superseded by the pump pressure boundary calculations in the McDonald report. The FSAR and the Bingham-Willamette report should be consistent with the McDonald report.

RESPONSE:

The discrepancy in the Bingham-Willamette supplied documents has been addressed to them in the United Engineer's letter SBU-88114. Resolution by BWC is expected by July, 1984. The Seabrook FSAR will be revised accordingly upon receipt of their response.

FINDING 3-4: PRESSURE BOUNDARY REQUIREMENTS

The McDonald report does not address the seal cooler heat exchanger shell side ASME Section III, Class 3, pressure boundary requirements. Calculations demonstrating compliance with the ASME Code minimum wall thickness requirements should be prepared.

RESPONSE:

The above oversight was addressed to Bingham-Willamette in the United Engineer's letter SBU-88114. The pressure boundary requirements for the seal cooler shell side will be documented. Their response is expected by July 1984.

FINDING 3-5: DOCUMENTATION

Although paragraph 3.9 of United Engineer's Specification 9763-006-238-3 required that all seller's drawings, calculations and test reports were to be certified by a registered professional engineer to be complete and correct many of the documents submitted by Bingham-Willamette were not certified.

RESPONSE:

Drawing H-3944 and B-33844 were certified for construction by BWC engineer on 9/21/75, but lack a P.E. stamp. The pump test data logged as foreign print numbers 53302 and 53205 are signed by a BWC engineer but show no stamp.

BWC was requested by UE&C letter SBU-88114 to provide P.E. stamps for the applicable documentation. This is expected to be accomplished by July, 1984.

UNRESOLVED ITEM 3-1: EQUIPMENT PREOPERATIONAL TEST

United Engineers purchase order file indicated that the CBS-P-9B pump had sustained flood damage. The pump and motor were immersed to approximately the elevation of the shaft centerline for an unknown period of time. Flooding was due to a break in test equipment during hydrostatic testing of some mechanical equipment. Subsequent repairs to the pump and motor were evaluated by Bingham-Willamette and Westinghouse service representatives. The pump should be started as recommended in Section 5.9 of this report and monitored during preoperational testing to provide further assurance that the repairs are acceptable.

RESPONSE:

Containment Spray Pump (1-CBS-P-9B) is currently under construction jurisdiction and is being periodically monitored under the construction preventative maintenance program. Following turnover to Startup, the pump will undergo initial testing and operation to verify proper pump performance in accordance with the existing Startup Test program. The series of tests performed from initial functional tests to final preoperational test will assure that the pump will adequately perform its design function.

SB

FINDING 3-6: BOLTED JOINTS

Paragraph 3.3.11 of UE&C Specification 9763-006-248-37 requires that torquing requirements for bolted joints must not overstress the bolts.

Assurance that yoke mounting screws are not overstressed when preloading effects are included is needed to demonstrate their structural integrity under applied loads. Assurance that bolted joints will not separate under applied loads is needed to demonstrate the functional adequacy of the joint.

RESPONSE:

These valves were designed to meet the requirements of ASME Section III NC-3600 and Appendix XI, which requires that the bolt preload be greater than the design load. Overstress of bolts is avoided by meeting the allowable stress requirements of Appendix I.

In Velan report SR-6433, flange joint bolt operating stresses are calculated to be 19,746 psi including SSE loads. Gasket seating load results in stress in the bolts of 24,533 psi. Gasket seating load (tensile load in bolts) is therefore more than expected operating load. Allowable stress for bolts (SA-564) is 2S or 56,000 psi (see Table I-7.3 of ASME III).

Compliance with these requirements assures the structural adequacy of the joints. In addition, the valve has been subjected to a functional test with the extended structure subjected to a static load equal to a maximum seismic loading to demonstrate functional and structural adequacy.

Following the test, the valve was subjected to examination for evidence of structural damage (See F. P. 91357 Static Test Procedure).

Assurance of the structural adequacy of the joint bolting is considered to be implicit in the design conformance to ASME requirements. Demonstration of functional adequacy was accomplished by the functional test under preloaded conditions. For this reason, the adequacy of the bolted joints was not specifically addressed in the seismic analysis.

Since the minimum bolt preload as calculated by the requirements of Appendix XI of the Code is greater than the load generated by seismic plus operating loads, and since the bolt preload is not permitted to exceed the requirements of ASME III, the structural and functional adequacy of the joint design is assured. In addition, the static load applied during the functional test further assures functional adequacy. No additions to the stress report are considered to be warranted.

Same response for Walworth-Aloyco valves.

FINDING 3-7: DESIGN TEMPERATURES AND PRESSURES

Velan test procedure ST-7002 indicates that the design conditions for the 16 inch CBS containment isolation valves are 445 psi and 350°F. This is inconsistenet with Velan drawing P3-6040-N15, referenced in the test procedure, which shows design conditions of 300 psi and 300°F. The Velan test procedure should be revised to agree with the Velan drawing.

RESPONSE:

The data originally given to the vendor in valve release #1 listed design conditions of 445 psig and 350°F. These values were used to generate the test procedure. The valve drawing was submitted to UE&C for review and at this time, the design conditions were changed to 300 psig and 300°F by the system engineer, and this information was transmitted to the Vendor, who made the required drawing change.

This is an isolated case in which the drawing change was not backfit into the test procedure because the test procedure conditions enveloped the actual design conditions.

Since these are 300 pound rated valves, they were designed for a cold working pressure of 720 psig at 100°F, and hydrotested to 1100 psig in accordance with NC-3500 and ANSI B16.5. Design calculations were based upon design conditions of 445 psig and 350°F, which are greater than the revised current design conditions of 300 psig and 300°F and, thus, both structural adequacy and functional capability are assured. We do not believe that any changes are necessary in the documentation.

SB

FINDING 3-8: TORSIONAL RIGIDITY

The Velan Seismic Analysis Theory Report shows that the torsional rigidity of the valve, K_t, has units of lbs/in (see page 9 of the report). These units derive from the incorrect definition of K_t given on pages 23 and 24 of the report. The correct definition of torsional rigidity is the item denoted by the symbol lambda on page 23 of the report.

RESPONSE:

Velan has used the improper terminology in defining lambda and K_t. Lambda should be defined as the torsional rigidity and K_t should be defined as the effective linear spring constant at the CG due to the rotational displacement only. Although the terminology is in error, the application within the theory is correct. The vendor has been informed of this finding. A clarification will be attached to the report as follows:

"Seismic Analysis Theory Report to Velan Nuclear Valves" (App. A)

Errata: Page 23 λ = torsional rigidity

$$\phi = \frac{2d}{E_{ave}}$$

"Page 24 K_t is the effective linear spring constant at the CG due to rotational displacement only."

$$K_t = \frac{12E^2_{ave}\ EI_{xx}}{B^2\ l_1^3}$$

FINDING 3-9: VIBRATORY MODES

The combination of twisting and bending stiffness to compute a minimum stiffness K_{min} defined on page 24 of the Velan Seismic Analysis Theory Report is also in error. The torsional and bending stiffness and modes of vibration are independent quantities. This error should also be corrected on page 54 of Velan Report SR-6433.

RESPONSE:

With regard to the torsional and bending stiffness and modes of vibration, UE&C has reviewed in detail, the approach and concluded that the approach is valid in that it produces conservative results. Confirmatory calculations have been performed.

The appropriate updating will be performed to the report.

FINDING 3-10: VALVE AND VALVE ACTUATOR IMMERSION

A review of United Engineers' Specification 9763-006-248-47 for the containment sump isolation valve encapsulations shows that the encapsulation could be filled with water or steam during plant faulted conditions. Additionally, since lines 1211-2-301-16" and 1212-2-301-16" in which the valves are located are filled with water during plant normal conditions, the encapsulation vessels could contain some water during plant non-accident conditions. However neither the valves nor the valve actuator specified immersion as a possible environmental condition. Assurance that the valve and operator assembly will operate during plant faulted conditions is necessary.

RESPONSE:

This finding repeats Finding 5-13; see response to Finding 5-13.

UNRESOLVED ITEM 3-2: VALVE QUALIFICATION TEST REPORT

The Acton Environmental Testing Corporation test report on the Walworth Aloyco 8-inch containment isolation valves indicates valve resonance at 18.0 H_z and 32.5 H_z in the "left to right" direction and at 25 H_z and 34 H_z in the "front to back" direction.

A high transmissibility at 18.0 H_z caused by strong cross-coupling along the horizontal axes was also noted.

The test report indicates that valve operability under applied nozzle loads and applied seismic vibratory loads was verified, despite the frequency requirement anomaly. These test results were contrary to the requirements of Paragraph 3.1.2 of UE&C's active valve test guidelines found conditionally acceptable by the Mechanical Analysis Group (See UE&C memo MM-9156A, dated May 24, 1982), subject to review under a verification program which was being formulated by the Piping Group. Assurance that these valves are modeled in accordance with the requirements of Paragraph 5.3.5(g)-(i) of UE&C procedure DEDP-2607 is, therefore, not currently available and should be confirmed.

Response:

Even though VTG-1 required that the valve fundamental natural frequency be equal to or greater that 33 H_z, valves with operator-to-valve body natural frequencies less than 33 H_z were purchased because hardware changes were not practical. In these cases, however, engineering evaluations were performed to preliminarily assess that these conditions did not adversely affect the design of the valve and/or the associated piping system.

In these evaluations, engineering judgement was exercised and often resulted in internal memos such as MM-7546A. Detailed explanations of these evaluations were not considered necessary at that time. For example, an evaluation was performed for valves CBS-V11 and CBS-V17. In these cases, the valves are located very close to the piping penetrations in the containment. Amplification due to the piping was judged not significant. In addition, the g-values in the frequency of interest are very small (0.30g); therefore, the valve qualification and the piping system were considered to have adequate margin.

A review of valve modeling is being included in the stress reconciliation phase.

FINDING 3-11: ISOLATION VALVE CLOSURE

Calculation Set 4.3.5.17F shows that closure of the motor operated containment isolation valves in 10 seconds during containment spray pump operation could induce water hammer peak pressures of 427 psig in lines upstream of the valves. Review of United Engineers' drawing 9763-F-804881 showed that the maximum operating pressure in these lines during the injection and recirculation modes of operation is 376 psig. Both of these pressures exceed the 300 psi ASME Code design pressures of the tube side of the containment spray heat exchangers and pumps. The Code design pressure should be the maximum operating pressure. United Engineers Nuclear Group indicated that the containment building spray system description was to be modified to specify that closure of the isolation valves should not be permitted during pump operation. This is considered technically significant, and assurance that valve closure will not occur during pump operation is needed.

RESPONSE:

Assurance that the isolation valve will not be closed during pump operation will be provided in the operating procedures which will call for the pump to be shut off before the valve is closed. This provides adequate protection since there is no automatic closure signal to the valve.

Drawing 9763-F-804881 - shows the maximum pressure of 300 psig which corresponds to the relief valve set pressure.

SB

FINDING 3-12: WATERHAMMER LOADING

In review of Line 1214-2-301-8", parts A and B, input information was found to be incomplete in that no consideration was given to the effect of water-hammer loading on the containment spray rings and the piping downstream of valve 8"-CBS-VII during initial fill transients.

RESPONSE:

The analysis of record did not address the effect of waterhammer; however, waterhammer loadings were identified and reanalysis started in early 1983 (before the IDI). Although some of the events were already evaluated as not effecting the piping system (e.g., piping fill transient) other events were under investigation since the "first-cut" analysis produced excess loads.

All the systems had not yet been systematically evaluated for the effect of all transients, although the need for such an evaluation had been identified by the in-house Engineering Assurance Audits.

As part of the on-going systematic transient evaluation program, the water-hammer evaluation for this system is estimated to be completed by 8/84.

All appropriate systems will be reviewed and evaluated for transient effects as part of the review process.

SB

FINDING 3-13: NOZZLE RADIAL DISPLACEMENT

The radial thermal displacement for the outlet nozzle for heat exchanger CBS-E-16A was improperly input, and no anchor displacement data sheets were provided to document the correct nozzle thermal displacement.

RESPONSE:

UE&C agrees that this is a random error with minimum impact on stress levels.

A new analysis was performed with the correct displacements. The calculation set was updated to include the proper displacements. All stresses and nozzle loads were found to be within allowable limits. No further action is considered necessary.

SB

FINDING 3-14: DECOUPLED BRANCH LINE

Branch Line CBS-1218-301-4" was not incorporated in the analysis of Line 1214-2-301-8:; thus, the interaction between the 8" piping and teh 4" branch was not accounted for as prescribed by Section 5.1.2 of DEDP-2607.

RESPONSE:

When the preliminary analysis of Line 1214 was prepared, the design for Line 1218 was not available. An engineering judgement was made that the interaction would not significantly affect the design adequacy.

These lines have been reanalyzed and the interaction of the branch line was considered in the reanalysis. The adequacy of the design has been confirmed.

Branch line interaction is routinely considered in the stress reconciliation phase of the analysis.

FINDING 3-15: ECCENTRIC VALVE MASS

In calculation 551.00, when valves 4"-CBS-V31, 4"-CBS-V32 and 4"-CBS-V33 were modeled, no consideration was given to the mass and center of gravity of the eccentrically oriented valve operator. A note was included on the isometric drawings for these valves and valves 20"-CC-V26, 20"-CC-V27 and 20"-CC-V448 stating, "Valve operator not modeled, since it is restrained by its own pipe."

RESPONSE:

When the preliminary analysis of these lines was performed, complete information concerning the mass properties of the valves was not available. It was known, however, that the piston operators would have to be supported from the pipe. An engineering judgement was made that not modeling the operator mass would not significantly effect the results.

The valves have been remodeled using the correct properties, and the lines reanalysed. The adequacy of the design has been verified. Also, the note has been removed from the drawing, and valve operator orientation is being included in the stress reconciliation phase.

FINDING 3-16; SUPPORT DATA SHEETS

In calcualtion 550.00, there is no justification for the statement that Line 1214-2-301-8" is similar to Line 1216-2-301-8."

RESPONSE:

In the preliminary analyses of these lines, in order to provide pipe support and embedment plate data in a timely fashion, it was decided to analyze only one of the two lines because of their similarity.

Seperate pipe stress analyses were performed for each line, and the design adequacy has been confirmed.

SB

FINDING 3-17: ANCHOR ELEVATION

The elevation of anchor 1216-A-01 is shown on Drawing 801216 as 1'-0" and on Drawings 805146 PI and 805147 PI as 0'-0".

RESPONSE:

Analysis Package 1216, Part B, was based on Drawing 801216 Rev. 5. Analysis Package 1216, Part A, was based on Drawing 805147, Rev. P1. Drawing 801216 is more recent and incorporates design changes not included in Drawing 805147, Rev. P1. These changes were judged to be not significant for the Analysis Package 1216, Part A, and therefore, updating of the Drawing 805147, Rev. P1 will be done during the stress reconciliation phase.

FINDING 3-18: STANCHION STRESSES

The team reviewed calculation 1217-RG-08 for the local stresses at stanchion #1217-SG-08 of piping line 1217-1-304-4" to substantiate theat local stresses which result from a 3" trunnion, welded to and transferring loads to a 4" pipe, meet the ASME Code requirements. Section 4.4 of Welding Research Bulletin No. 107 emphasizes that the nondimensional curves used for stress calculations do not go beyond 0.5 for beta and should not be used beyond this limit. Thus the assumption used in calculation 1217-RG-08 which states that going beyond the 0.5 limit of beta will produce conservative stresses is not justified.

RESPONSE:

In the calculation of local pipe stresses at stanchion 1217-SG-08, the modified Bijlaard's curves of Welding Research Council Bulletin No. 107, extrapolated from $\beta = 0.5$ to $\beta = 0.6$ along the tangent line at $\beta = 0.5$, have been used. For this particular case the pipe mean radius to pipe thickness ratio $\gamma = 9$ and the stanchion outside radius to pipe mean radius ration $\beta = 0.718$. All the applicable curves for this case show a tendency of approaching an asymptote or going downward from $\beta = 0.5$. Reading the data at $\beta = 0.6$ instead of at $\beta = 0.718$ yields conservative stress values because it implies that a smaller stanchion is used to calculate the local pipe stresses. From the physical viewpoint the smaller stanchion results in higher local stresses than from the actual larger stanchion which distributes the load over a greater region of the pipe.

A numerical comparison of this method of extrapolation of the modified Bijlaard's curves was made with the published results of a finite element analysis presented in a paper titled "Stress Analysis and Stress Index Development for a Trunnion Pipe Support", Journal of Pressure Vessel Technology, May, 1982. This comparison confirms that the extrapolation procedure of the curves does in fact yield conservative stresses.

FINDING 3-19: SUPPORT STEEL ELEVATION

Drawing 801214, Rev. 6, shows top of steel beam W12x79 to be (-)7'-10".
Drawing 801216, Rev. 7, shows top of the same beam to be (-)8'-4".
UE&C structural drawing shows top of this beam to be (-)8'-4".

RESPONSE:

The dimension of (-)7'-10" was the result of a drafting error. A change in steel elevation was missed by the draftsman.

The drawing error has been noted and the correct dimension will be included on the drawing during the next scheduled drawing update (to revision 8).

UNRESOLVED ITEM 3-3: INTERACTION BETWEEN SUPPORT STEEL AND PIPE

United Engineers analyzed piping is normally subjected to a seismic event (operating basis or safe shutdown) by applying amplified response spectra at each of the pipe reaction and anchor points of the piping mathematical model, and generating the envelope of these spectra as the bounding seismic event. The validity of this approach rests on the important assumption that there will be no significant dynamic interaction between the supporting structure and the attached pipe. Subsection 3.7(B)2.3 of the FSAR, Procedures Used for Analytical Modeling, notes that: "Equipment having relatively small mass or high frequency are decoupled from the supporting structure, but their mass is included with the supporting system. The major equipment systems, whose stiffness, mass and frequency have significant dynamic interaction with the supporting structure, are included in the detailed model of the structure. In such cases, a detailed equipment model is coupled with the supporting structure model. As an example, the containment concrete internals are coupled with the NSSS model." The seismic analysis performed on the pipe configuration which is detailed on the piping isometrics, cited in Finding 3-19, decouples the pipe from the support steel shown on the steel framing plan. The basis for this approach is detailed in Subsection 3.7(B).3.3 of the FSAR. The United Engineers basis for the preliminary design of support steel is to select a beam size, in conjunction with a best estimate of the applied loads, which yields a fundamental frequency of not less than 20 Hz. for the beam. Support steel is subject to a final check under the beam verification program. In general, the dynamic interaction yields a fundamental frequency of not less than 20 Hz for the beam. Support steel is subject to a final check under the beam verification program. In general, the dynamic interaction yields higher responses than the uncoupled model. Therefore, the team recommends that an analytical model which couples the support steel and the attached pipe be analyzed to confirm that the default (uncoupled) seismic analysis yields sufficiently conservative support loads and pipe stresses.

RESPONSE:

A new analytical model which coupled the pipe lines, pipe supports and the supporting building steel was prepared and analyzed for the seismic loads. New pipe support loads generated by this analysis were used for the determination of stresses in the pipe supports and the supporting structural steel.

It has been determined that the pipe stress and the stresses in the pipe support, and the supporting steel are well within the allowable limits. However, the coupled analysis yielded dynamic responses higher than the original uncoupled analysis.

A review will be performed to address other similar situations where significant dynamic interaction may exist between the supporting structure, and the attached piping. A coupled analysis for these cases will be performed if deemed necessary.

FINDING 3-20: CONNECTION DESIGN

The team also noted that the effect of the torsional moments induced in the W12 x 79 support beam by the veritical and lateral seismic loads is not addressed in Calculation Set No./Support No. M/S-1214-SG-63, Rev. 3, dated 8/15/83. The W8 x 31 and W10 x 33 beams frame into the W12 x 79 support beam at the loction of the pipe support with shear connections, so that full torsional restraint cannot be assumed. The ability of the connections to adequately resist the applied torsional loads must be assured (Finding 3-20).

RESPONSE:

The connection of W8 x 31 and W10 x 33 to W12 x 79 do provide the required restraint against torsion. Connection calculations have been performed which has substantiated this fact.

A review will be performed to address other similar situations where significant moment/torsion is transmitted through the beam connections.

FINDING 3-21: CERTIFICATION OF DRAWINGS

Pullman-Higgins drawings CBS-1213-01, Rev. 9 and CBS-1213-02 do not carry P.E. stamps as required by UE&C Nuclear quality Assurance Manual, Subsection 3.2, which mandates certification of pipe erection drawings by a registered professional engineer.

RESPONSE:

The intent of Subsection 3.2 of Section 4C of the UE&C Nuclear quality Assurance Manual was to require certification of design drawings which are required for construction. no construction aid drawings are certified.

The UE&C Nuclear Quality Assurance manual, Section 4-C has been revised to delete the requirement for professional engineering certification of the construction aid drawings because construction aid drawings are not considered to be design documents.

SB

FINDING 3-22: THERMAL TRANSIENT TEST

It was noted that the as-machined (unmounted) clearances at the wear rings of the containment building spray pumps were in accordance with API Standard 610, but the as-mounted clearances were unknown. Based on the as-machined dimensions, it would appear that the clearances in these pumps are adequate to assure their operability during the specified thermal transient. However, since operability should be based on the as-mounted clearances rather than the as-machined clearances, no clearances regarding their operability under the specified thermal transient can be drawn. United Engineers should obtain the as-mounted dimensions of the containment building spray pumps, or perform a thermal transient test, in order to resolve this item.

RESPONSE:

Both the inner and outer wear rings in the containment building spray pumps are mounted using what is known as a light press fit. This type of mounting utilizes pinning and doweling to restrain the wear rings from movement. One of the results of this method of installation is that dimensional changes of the rings are minimized.

In asssessing these dimensional changes, we consulted with Bingham-Willamette to determine precisely the magnitude of these changes and to determine if this could effect pump operability. In their initial response, Bingham-Willamette indicated that these changes are insignificant when compared to the magnitude of the clearances. We are presently requesting a written response from Bingham-Willamette which will quantify these changes and conclusively show this to be the case.

Our position on this finding is that there is virtually no difference between as-machined and as-mounted clearances when addressing pump operability. The Bingham-Willamette report will serve to justify this position. It is, therefore, concluded that no further action is required.

FINDING 3-23: VESSEL WEIGHT

The team noted a discrepancy between the encapsulation weights (empty, and filled with water) calculated in the stress report and the vessel weights tabulated on a PX general arrangement drawing. The calculated vessel weights given on Page 3-1 of the referenced stress report are 5,307 lbs empty and 14,113 lbs full of water. The vessel weights listed on the PX engineering general arrangement drawing are 2,900 lbs empty and 11,700 lbs full of water. This is considered to be a random error which is not technically significant.

RESPONSE:

The above discrepancy was brought to the attention of PX engineering in UE&C letter SBU-88137 for resolution. Their response is expected by July, 1984.

This is a random oversight and, as stated in the IDI team's report, is not technically significant.

FINDING 3-24: REVERIFICATION PACKAGES

A sample of twelve reverification packages prepared by ITT Grinnell was reviewed to determine if the STRUDL computer program coding for the pipe support geometry and loads had been signed by the preparer and checker. The package for support 1201-RG-07, Rev. 7, run 1 of 2 had been signed by the preparer but not the checker. The package for support 1201-SH-1, Rev. 3, run 1 of 1 was not signed by the preparer or checker. These two examples violate Procedure QCES-2.3.3 of the ITT Grinnell Corporation Engineering Services Quality Assurance Manual, Rev. 1, dated 2/14/83. The technical accuracy of all packages prepared by ITT grinnell should be confirmed by United Engineers.

RESPONSE:

ITT Grinnell has assured Yankee Atomic Electric Company and United Engineers and Constructors that all computer input data related to the verification program has been checked. Each pipe support calculation package contains a "Design Review Report" which is essentially an engineering check list that assures all design inputs are correct. Grinnell has stated that one of the check list items "Design Input Criteria Correct" documents a check of computer input data. The "Design Review Report" is updated when a revision to the computer analysis is performed.

A review by ITT Grinnell has indicated that there are approximately one hundred and forty computer outputs that are without the proper preparer and/or checker signatures. UE&C performed a review of twenty such packages and found some discrepancies. We do not expect that these discrepancies will result in any hardware changes.

A review of all one hundred and forty packages will be made to assure the technical adequacy of the support designs.

FINDING 3-25: SPECIFICATION REVIEW

The ITT Grinnell Engineering Standards, Design Policy Procedures, and Rework Procedures that formed the technical basis for the ITT Grinnell reverification program, and which were listed in Section 3 of ITT Grinnell Technical Specification SB-001 (Reference 3.28) were not reviewed or examined by Yankee Atomic, as noted orally by ITT Grinnell technical staff. This is contrary to the requirement of Change Order No. 42 to United Engineer's Purchase Order 248-8 (filed on behalf of Yankee Atomic, the purchaser), dated June 1, 1982 (Reference 3.43) which requires that: "This technical specification shall be reviewed and accepted by Purchaser prior to work." This is also contrary to subsection 2.1.1.5 of the Yankee Atomic Quality Assurance Manual, Rev. 2, dated 3/31/78 (Reference 3.119), which requires that: "Provisions of technical documents by the vendor shall be examined." The team therefore concludes that the review conducted by Yankee Atomic was deficient, since it did not adequately address the design and analysis procedures that were to be used by ITT Grinnell to perform the reverification work for United Engineers.

RESPONSE:

The Yankee Atomic (YAEC) cognizant engineer for the pipe support reverification program, performed by ITT Grinnell, was knowledgeable of the design and analysis procedures used. In fact, he had first-hand knowledge of these documents. He was employed at ITT Grinnell before YAEC and he had worked with these documents. However, there exists no former documentation stating that he reviewed and accepted the documents listed in Section 3 of ITT Grinnell Technical Specification SB-001.

To provide formal documentation that YAEC reviewed and accepted these documents, a review was performed by YAEC. All ITT Grinnell design and analysis procedures used on the Seabrook verification program were found to be consistent with the Seabrook Project Pipe Support Design Guidelines and current industry practice.

FINDING 3-26: FRICTION FORCE DUE TO THERMAL MOVEMENT

The pipe support reverification packages prepared by ITT Grinnell for United Engineers did not consider frictional effects for thermal movements less than 1/16". Two such examples are contained in the United Engineers calculation sets for support Nos. 326-SG-01, Rev. 1, dated 5/12/83, and 179-SG-04, Rev. 3, dated 9/22/83, which include both the ITT Grinnell calculations, and the United Engineers' closeout calculations which subsequently address frictional effects not considered by ITT Grinnell. This is contrary to subsection 5.1 of ITT Grinnell Technical Specification SB-001 , which requires that friction be evaluated for all cases where thermal movement does not equal zero. This is not technically significant, as the magnitudes of the corresponding loads are low. However, United Engineers had committed to consideration of frictional force due to thermal movement in Subsection 3.9(B).3.4.a of the FSAR.

RESPONSE:

Yankee Atomic Electric Company and United Engineers and Constructors, Inc. were aware that ITT Grinnell did not consider the effect of friction on the support design when the pipe movement was equal to or less than 1/16". Document SB-001, Rev. 4, dated 12/28/82, reflects this position.

UE&C has reviewed all such supports where the pipe movement was equal to or less than 1/16" and took appropriate action, where required, to assure compliance with the design requirements.

FINDING 3-27: MOMENTS OF INERTIA

ITT Grinnell support calculation for pipe support No. 1203-RG-8, Rev. 8, dated 9/3/82, was reviewed for technical content. The calculations for the principal moments of inertia and section moduli for the 6 x 4 x 1/2" angle detailed on Page 10 of this calculation were found to be incorrect. The calculated value of the principal moment of inertia is 17.33 in., while the correct value is 20.07 in. This data was subsequently input to the STRUDL run, dated 9/7/82, which forms a part of this calculation package. This is considered to be a random error and is not believed to be technically significant, since there is not a substantial difference between the calculated and the correct moments of inertia.

RESPONSE:

The value of the principal moment of inertia for the 6 x 4 x 1/2 angle was incorrect. The calculation package has been revised and checked. The error did not impact the final support verification results.

Every calculation package performed by the engineer involved was reviewed. Only one support, 363-RG-1, was found to have a similar calculation, and was found to be correct. A random review of other packages produced only one other support with a similar calculation, 394-RG-1. This calculation was found to be correct.

Based on the above, the angle property calculation error on 1203-RG-8 is considered to be a random error.

FINDING 3-28: SUPPORT STIFFNESS

ITT Grinnell support calculation for pipe support No. 1203-RG-3, Rev. 5, dated 9/3/82 was reviewed for technical content by the team. The calculation for the support stiffness in the negative Z direction given on page 6 is inadequate and possibly incorrect, due to the use of displacement data generated by a STRUDL run which specifies an insufficient number of significant figures. The specific stiffness in the negative Z direction is the ratio of the 1000 lbs. applied as a load in the negative Z direction in the STRUDL model to the resultant displacement of 0.001 inch output by the STRUDL model. This ratio yields a stiffness in the negative Z direction of 1 x 10E6 lbs/in, which is the magnitude of the minimum stiffness allowed for this support. However, due to roundoff, the magnitude of the displacement could be as high as 0.00149 inch, which would yield a corresponding stiffness of 0.67 x 10E6 lbs/in, causing the support to fail the minimum stiffness criterion of 1 x 10E6 lbs/in. This appears to be systematic error. It is probably not technically significant, since the variation between the calculated and actual stiffnesses is not substantial, and pipe stress analysis are not sensitive to minor variations in the magnitudes of the support spring constants. However, United Engineers had committed to minimum support design stiffnesses in Subsection 3.9(B).3.4.a.1 of the FSAR.

RESPONSE:

ITT Grinnell has reviewed all (approximately 700) STRUDL outputs associated with the pipe support verification program. Eighteen cases were found to have displacement values not carried to the proper number of significant figures. Two out of the eighteen pipe supports were found to have stiffness values not meeting the minimum stiffness criteria. These two supports (1203-RG-3 and 362-SG-4) will be reviewed by UE&C. Appropriate changes will be made, if needed, to assure compliance to project design requirements.

SB

FINDING 4-1 : TANK FARM SSE LOADS

Seismic classification of tank farm structural steel is not consistent in various documents. Structural steel frame and roof system of the tank farm are not included in the FSAR Table 3.2-1, which identifies all Category I structures. FSAR Table 3.7(B)-22 identifies the tank farm area over the refueling water storage tank as a non-Category I structure designed not to collapse into Unit 1 primary auxiliary building. Section 3.1.24 of the Structural Design Criteria, SD-66, Revision 1, categorizes the Tank Farm area (concrete and steel framing) as seismic Category I. In Table 3.3-2 of SD-66, which tabulates the loads for non-Category I structures, there is an entry for the tank farm area. The calculations and drawings are all classified as Seismic Category I. The design load combinations listed in the calculation of the tank farm structural steel, Calculation Set No. WB-61, omit load combinations containing safe shutdown earthquake. This violates the Structural Design Criteria, SD-66, Table 5.4-2 which contains two load combinations with safe shutdown earthquake loads.

RESPONSE

The Tank Farm area consists of a reinforced concrete portion and a structural framing portion, each seismically classified and designed according to the regulations set forth in USNRC Regulatory Guide 1.29, Revision 3. The reinforced concrete portion including foundations, dike walls and pipe chases are structures associated with safety-related systems and are designed as Seismic Category I. The structural steel framing portion which includes steel framing, concrete roofing and metal siding, serves only to provide weather protection to the tank area and to form the rooms which house non-safety related electrical equipment. No safety-related structures, systems and components are attached to the steel framing portion. The steel framing portion is therefore designated non-Seismic Category I and is designed and constructed such that the operating basis earthquake (OBE) and safe shutdown earthquake (SSE) would not cause the steel framing portion to collapse upon any safety-related structure, system or component within or surrounding the Tank Farm area.

The original design of the main steel framing only considered the OBE load combination. Calculation Set WB-61 has been revised to include the safe shutdown earthquake (SSE) load combination. The calculation shows that OBE controls the design of the main steel members.

The appropriate revisions to the FSAR and SD-66 will be made to be consistent with this response. The estimated date of completion is 9/84.

FINDING 4-2 : LIVE LOADS

When considering load combinations which include earthquake loads, no movable live loads have been considered for most Category I floors. FSAR Section 3.8.3.3 indicates that live loads on structures inside the containment are only present during shutdown conditions. FSAR Section 3.8.4.3 utilizes the normal definition of live loads for Category I structures other than containment. Per Table 4.2-1 of the Structural Design Criteria, SD-66, Revision 1, only two floor areas of Category I structures utilize movable live loads in combination with seimic loads. This situation is noted as a generic finding applying to all Category I structures at Seabrook.

RESPONSE

Moveable uniform live loads were not combined with seismic loads in the design of Seabrook Station. No significant live loads were anticipated during plant operation. We concur with the IDI Team recommendation that the technical specifications for plant operations should place live load control limitations on the plant operators. The incorporation of this requirement into the technical specification will be completed before fuel loading.

SB

FINDING 4-3 : TANK FARM TORNADO LOADS

Per Section 3.1.24 of the Structural Design Criteria, SD-66, Revision 1, the tank farm area (concrete and main steel) is categorized as seismic Category I structure and is designed to resist all tornado effects. However, Table 3.3-2 identifies the tank farm area (Unit 1 steel framing) as non-Category I, and it is designed to resist tornado pressure, but not tornado missiles. The FSAR Table 3.3-4 indicates that the tank farm area structural steel framing over the refueling water storage tank is a non-seismic Category I structure designed to collapse in such a manner as to fall away from the primary auxiliary building due to tornado wind loading. Additionally, Section 3.3.2.3 of the FSAR and Section 4.4.2.6 of the SD-66 address the special design procedure for non-Category I structures under tornado loadings in which the roof slabs are considered expendable. The calculation for the tank farm structural steel, Calculation Set No. WB-61, indicates no design for the tornado loading for the structural steel framing. This was found to be inconsistent with Section 3.1.24 of SD-66 which indicates the steel framing is designed for tornado loads.

RESPONSE

As discussed in response to Finding 4-1, the steel enclosure is Non-Seismic Category I. This steel structure has been evaluated for tornado loads against the collapse on surrounding safety-related systems, components and structures and it has been found that there are no adverse effects. The tornado effects of the steel framing upon the systems and components located within the Tank Farm structure are not a design consideration because the loss of function of these systems and components will not affect the capability of a safe reactor shutdown. The tornado missiles generated from this structure are considered less severe than the standard missile spectrum used for the plant design.

Applicable sections of FSAR and Structural Design Criteria SD-66 will be revised to be consistent with this response by 9/84. Calculation Set WB-61 has been revised to consider the appropriate tornado load requirements.

FINDING 4-4 : CONTROLLED MANUALS

Controlled copies #38 and #46 of the United Engineers Administrative Procedures for the Seabrook Project were not properly updated. These controlled copies were missing some memorandum and administrative procedure. The omissions are violations of UE&C's Administrative Procedure No. 23 (AP-23), "Controlled Documents." This finding represented two of two samples examined as not being current. No direct effects on the design were found as a result of these items.

RESPONSE

We have reviewed Administrative Procedures copy #38 and #46 for the missing memorandum; and have verified that the manuals have been updated. This was an isolated omission due to an oversight by the filing clerk.

SB

FINDING 4-5 : DESIGN DOCUMENTS

The team located documents in the structural subject files appearing to to be what the team would consider as design documents or technical memoranda which did not appear to be controlled under the requirements of the "Correspondence Control System," United Engineers Administrative Procedure No. 2 (AP-2). This procedure states that "all technical correspondence whether it is a letter, telecopier or internal memorandum will be controlled by the Project Document Control Center." The team concluded that the internal memoranda listed in References 4.21 through 4.28 were not controlled as required.

RESPONSE

We have reviewed the referenced documents identified by the team as improperly controlled and have determined that only one document had design significance. This single case was adequately controlled and made a part of the applicable calculation.

OBSERVATION 4-1 : STRUCTURAL SUBJECT FILES

Four instances of misfiled information within the structural subject files were found by the team. Material found in Index 1.2.5 instead of 11.7.1.5, in Index 1.0.1.28 instead of 1.1.4, in Index 1.0.1.33 instead of 1.0.3.3 and in Index 1.0.1.23 instead of 1.0.1.27. This is not a finding or an unresolved item but an item which the licensee may wish to consider.

RESPONSE

Items mentioned in above observation were reviewed and put in proper order where necessary. These cases are considered to be isolated, and have no impact on the design.

SB

FINDING 4-6 : Tank Farm Building Stiffness

The mathematical model of the tank farm described in Calculation No. SBSAG-5WB does not account for the stiffening effect of the fill concrete since the base of the seismic model utilized was erroneously designated to be at the bottom of the fill concrete.

Based on the fact that the seismic model did not incorporate the stiffening effect of 15 feet of fill concrete in the north-south response direction, that only the shear stiffnesses were included in the overall computation of building stiffness, and that the flange effects for bending stiffness were neglected, the team concluded that the aggregate building stiffness was inaccurately calculated. This has the potential of shifting the fundamental frequency of the structure and consequently changing the location of peak frequencies as well as the value of acceleration in the amplified response spectra. The modeling was not consistent with the FSAR, Section 3.7(B).2.3 which states that "the elevation of the point-of-fixity of the mathematical model is .... a lowest elevation of upper surface of concrete backfill which bears directly against the structure."

RESPONSE

UE&C Technical Procedure TP-17 for ARS Verification Program, Section 3.0, requires that structural or general arrangement drawings, masses, etc. used as original input in the seismic analyses be verified against final design parameters. The purpose of this requirement is to show that reasonable and representative input data was used in the original analyses. This work for the Tank Farm area had been scheduled but not performed at the time of IDI audit. The completion of this program would have resolved the NRC concern.

Subsequent to NRC inspection, UE&C initiated a detailed analysis of the Tank Farm area, Unit 1, considering the stiffening effects of the fill concrete. The existing design will be checked against the results of the new analysis. It is estimated the whole effort will be completed by 9/84.

FINDING 4-7 : STRUCTURAL STEEL BRACING

In calculating the stiffness of the structural steel bracing, United Engineers assumed that all X-bracing was composed of angles 4"x4"x3/4". In fact, the bracing actually consists of substantially larger members as indicated in United Engineers drawings "Tank Farm and Pipe Tunnel," Drawings F-111824 and F-111835. The neglect of overall bending in the development of the stiffness of the stick model did not significantly simplify calculations, but did raise questions concerning the correct stiffnesses of the mathematical model.

RESPONSE

As discussed in response to Finding 4-6, this concern would have been resolved during ARS Verification Program in accordance with UE&C Technical Procedure TP-17.

Subsequent to NRC inspection, UE&C initiated a detailed analysis of the Tank Farm area, Unit 1, considering X-bracing as shown on the final drawings. The existing design will be checked against the results of the new analysis. It is estimated that the whole effort will be completed by 9/84.

FINDING 4-8 : CONTAINMENT INTERNALS EARTHQUAKE LOADS

Calculation No. CI-2, "Design of Screen for Recirculation Sump in Containment Building," shows that the structure was designed for the load combination of the dead load, live load and the operating basis earthquake as required by the FSAR and the Structural Design Criteria, SD-66. The calculation also states that this was the controlling load combination equation, but there was no comparative analysis or any evidence that the safe shutdown earthquake had been considered. Additionally, the effects of thermal expansion of the beams had not been taken into account as required by the criteria. Consideration of the safe shutdown earthquake loads should be evidenced in the design and that omission of this load is a violation of SD-66, Table 5.4.2, Revision 0, which requires consideration of a loading combination which includes the safe shutdown earthquake.

RESPONSE

Thermal effects were addressed in Appendix A to Calculation Set CI-2, Revision 1. Calculation Set CI-2, Revision 1, was inadvertently furnished to the IDI Team. Same calculation, Revision 2, which was subsequently furnished to the IDI Team does include data for safe shutdown (SSE) and operating basis earthquake (OBE). It is confirmed that the OBE load combination did control the design.

FINDING 4-9 : STRESSES AT CONNECTING PLATES

Examination of Detail 101486M on "Containment Steel, Recirculation Sump Screen Details", UE&C's Drawing F-101486, revealed that the structural channel member was eccentrically connected to the bent plate. This was inconsistent with the analysis, in Calculation No. CI-2, which did not consider the effects of any eccentricity. The shop drawings were verified to have same eccentric connections and the installation was consistent with these drawings. The eccentric connections will result in increased stresses at the connecting plates due to thermal conditions. This condition had not been analyzed in accordance with the American Institute of Steel Construction Specification which requires analysis of non-standard connections.

RESPONSE

Calculations to evaluate the effects of the eccentric connections shown in Detail 101486M of Drawing F-101486 have been performed, and the resulting stresses are within the code allowables. This is the only non-standard connection associated with the recirculation sump area. The structure as built is adequate. These calculations have been incorporated in Calculation Set CI-2.

SB

FINDING 4-10 : ANALYSIS OF ECCENTRICITY

It was observed that a number of steel beams framing into the steel plates embedded into the concrete in the annulus area of the containment had been modified and this resulted in eccentric connections. The modified connections are shown on UE&C's Drawing No. F-102320 and the pertinent shop drawings, Cives Corporation Drawing 6816-X163B. It was determined that the modification of the connections was not reflected in the analysis completed. The calculations were contained in Calculation No. CI-70. We determined this to not be in conformance with the American Institute of Steel Construction Specification, Section 1.15.3 and the Structural Design Criteria, SD-66, Sections 2.1.2 and 6.2.5.1 The requirements are that a connection detail which introduces eccentricities must undergo a specific detailed analysis which was not done in this instance.

RESPONSE

The typical eccentric connections of annulus steel beams framing into the steel plates embedded in the concrete are shown in Section 102326 AA on UE&C Drawing F-102326. These types of connections were developed to suit the field conditions.

A program is under way to review all similar conditions for the annulus steel. Calculations for the envelop conditions of different types of connections will be performed by 9/84. To date two typical connections have been reviewed and found to be satisfactory.

FINDING 4-11 : TORSION IN COLUMN

Another item which is related to the annulus area of containment pertains to the connection of the beams to the columns in the annulus steel. Examination of the Cives Corporation Drawing 6816-X102A dated November 11, 1982 revealed that in order to accommodate welds between connecting angles and the beams framing into columns, but not perpendicular to the columns, the axis of each beam was shifted by one inch from the centroidal axis of the support column. This resulted in an eccentricity with respect to the column, which in turn induced torsion in the column. We have found that this was not accounted for in the analysis and that it violates the Structural Design Criteria, SD-66 and Section 1.15.3 of the American Institute of Steel Construction Specification (Reference 4.3).

RESPONSE

The typical eccentric connections of the annulus steel beams framing into the columns are shown in Section 102320A on UE&C Drawing F-102320. For these types of connections, the effects of eccentric axial loads did not increase the stresses above the code allowables. The members and connections are adequate as they are. The calculation addressing these items has been included in Calculation Set No. CI-87, "Steel Calculations for Specific NRC Questions," Revision 0.

OBSERVATION 4-2 : CALCULATION SKETCHES

On Sheet 85 of 139 in Calculation CS-22 a structural steel member made from an angle shape was sketched incorrectly so that the horizontal leg was reversed from the direction utilized in the calculations. On Sheet 98 of 139 in Calculation CS-22 a structural steel member made of an angle section shown in Section AA in the calculational sketch should have been drawn with the horizontal leg reversed from the direction used in the calculations. Revised Sheets 17 and 23 of 139 in Calculation CS-22 were not included in the listing of the "Calculation Revision Control Sheet" as required by "Preparation, Documentation and Control of Calculations" United Engineers General Engineering and Design Procedure 0005 (GEDP-0005). In the above instances where the sketches were improper, the errors were corrected apparently by a knowledgeable detailer when preparing the shop drawings so that the connections were properly made. Since the team found no other clustered examples of this type of error in other sets of calculations they were judged to be isolated. This is not a finding or an unresolved item, but an item the licensee may wish to consider.

RESPONSE

Subsequent to the inspection, Calculation Set CS-22 has been revised to correct the errors. These cases are considered to be isolated, and have no impact on the design.

FINDING 4-12 : SEISMIC INPUT DATA

Seismic forces and moments as used on Sheets 30 through 35 as input to the SHELL I computer program in the calculation "Design of the Containment Shell and Dome", Calculation No. CS-15 were obtained from modified seismic analysis SBSAG-4CS3, not from SBSAG-4CS4 as indicated in the calculation. SBSAG-4CS3 has been superseded by the final seismic analysis SBSAG-4CS4. Although comparison of the SBSAG-4CS3 and SBSAG-4CS4 analyses shows that their results are very similar and that the seismic forces and moments used as input for the SHELL I computer program utilized in Calculation CS-15 seem conservative, we determined that use of the outdated data is a violation of "Calculations", United Engineers Administrative Procedure No. 22 (AP-22) Appendix A, and 10 CFR 50, Appendix B, Section III, "Design Control", dated August 1, 1980 in that the incorrect input data were utilized.

RESPONSE

Calculation Set CS-15 has been revised using final data from seismic analysis SBSAG-4CS4. It has been confirmed that only minor differences exist between the results of the two analyses (4CS4 and 4CS3), and these results are conservative.

SB

FINDING 4-13 : COMPUTER PROGRAM VERIFICATION

The containment structure (the shell and the dome) was designed using several computer programs. Some of them such as LESCAL, WILSON I and WILSON II have been documented in the FSAR Appendix 3F. There were others, however, such as SHELL I and SHELL II, which have not been included in the FSAR in Appendix 3F. This is in violation of the licensee's commitment made in Section 1.8 of the FSAR to meet Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," Section 3.8.1.4.

RESPONSE

Programs Shell I and Shell II are simple programs which were used to simplify hand calculations and perform data manipulations; they are part of the total calculation package. These programs have been verified and documented per UE&C Procedure GEDP-0044, "Documentation and Verification of Digital Computer Programs." Therefore, these programs do not need to be listed in the FSAR Appendix 3F.

FINDING 4-14 : BEAM LOADS

A structural steel beam, Mark B9, located on the Elevation 81 foot roof along Column Line 0.5 was designed for dead loads, live loads, and operating basis earthquake loads in Calculation No. WB-61, Sheet 17 of 79, checked September 28, 1978. Later, a redesign was made to add the sag rod loads to the dead loads, live loads, and operating basis earthquake loads (Sheets 9I and 9J of 79, checked November 3, 1979). The original calculation (WB-61, Sheet 17 of 79, checked on September 28, 1976) was not voided as required by "Procedure for Preparation, Documentation and Control of Structural Calculations," United Engineers General Engineering Design Procedure No. 0005 (GEDP-0005), Paragraph IID, Subsequently, another calculation was made (WB-61, Appendix A, Sheet 10 of 16, Rev. 3, checked on June 17, 1981) which added a pipe support load, but neglected the sag rod loads. Again the previous calculation was not voided. The safe shutdown earthquake pipe support load was incorrectly combined with beam operating basis earthquake loading and designed for safe shutdown earthquake allowable stresses. The neglected loads and the combining of operating basis earthquake and safe shutdown earthquake criteria for stress checks against those associated with the safe shutdown earthquake violates Structural Design Criteria, SD-66.

RESPONSE

Calculation Set WB-61 has been revised to account for all correct loads and load combinations meeting the requirements of GEDP-0005 including the voiding of old calculations as applicable. This is considered to be an isolated case. Other calculations performed by this individual design engineer have been reviewed and found to be in compliance with GEDP-0005.

SB

FINDING 4-15 : TANK FARM WALL REINFORCING DESIGN

The calculations for the tank farm reinforced concrete walls along Column Lines 4.5 and 5.0 as contained on sheets 8 and 9 of 13, United Engineers Calculation No. WB-68 did not include an adjustment of the value of the capacity reduction factor, ϕ, for combined bending and axial load. The results of the calculations indicated a requirement for reinforcing less than that which would be required utilizing the correct ϕ factor. The tendency of the designers to provide more reinforcing than actually required by design because of practical and geometrical reasons may mean that sufficient reinforcing is in fact present for the revised calculations. This appears to be a systematic error for the tank farm walls. The team recommends a review of the design of all reinforced concrete members subject to combined bending and compression.

RESPONSE

The design of the reinforced concrete members of the tank farm area subject to combined bending and compression were reviewed. Two design calculation sets, WB-68 and WB-69, were revised to account for the proper ϕ factor value. The original designs were found to be adequate.

All other design calculations involving reinforced concrete members subject to combined bending and compression will be reviewed for the proper use of ϕ factor. The estimated date of completion is 9/84.

FINDING 4-16: REFUELING WATER STORAGE TANK STIFFNESS

United Engineers had not provided sufficient instructions in Procurement Specification 9763-006-246-6 for the spray additive tank on how to execute the equivalent static analysis on the tank.

Pittsburgh-Des Moines prepared design calculations for the refueling water storage tank. In calculating the stiffness of the cylinder in which only the overall bending stiffness was considered, the shear stiffness was neglected. This is inappropriate for a thin walled tank of large diameter. Only the fundamental frequency was calculated and higher modes were neglected in violation of Section 2.3.3.1.7 of United Engineers' Specification 9763-006-246-1. A reanalysis could indicate greater design seismic loads. A reanalysis is necessary to meet the requirements of the specifications and good engineering practice.

RESPONSE:

a. The response to Finding 3-2 addresses these concerns.

b. The effect of the omission of the shear stiffness and higher modes in the analysis of the refueling water storage tank has been evaluated by considering these factors in a dynamic response analysis. (Reference UE&C calculation set 9763-SQ-00161-4-002-4.3.5.48F). The critical meridional membrane stresses for this analysis have been compared with the results previously employed, and it has been concluded that no appreciable difference exists, and stresses remain within allowable limits. While extensive research has been done in the area of the dynamic response of tanks since TID 7024 was first issued, the approach is still considered valid and has not been superceded by an alternate method. An evaluation using dynamic response analyses will be performed for other similar tanks to verify the validity of the Seller's analyses.

OBSERVATION 4-3 : SKETCH

The sketch of the mathematical model in United Engineers Calculation No. SBSAG-22PB of a stairway floor frame at approximately Elevation 3 feet was incorrectly made in locating the model with respect to Column Line D. The horizontal location of the model of the platform was incorrect when compared to United Engineers Drawing F-101558. Since the model itself was dimensioned correctly, the relative displacement of the model by 34 inches west in relation to the reference points did not affect the results of the analysis performed by the Structural Analysis Group. This was not a finding or an unresolved item, but represents an apparently isolated instance found by the team where there was an apparent lack of attention to the details. The licensee may wish to consider this information.

RESPONSE

We do not agree with the observation that there is "an apparent lack of attention to the details." The referenced sketch is the second of two companion sketches (Pages 3 and 4 of Calculation Set SBSAG-22-PB). The first sketch is a dimensioned labeled area sketch taken from Drawing F-101558. It is both neatly drawn and accurately represented in all details. This source is the basis of the second sketch which is a portrayal of the mathematical model of the stairwall. The dimensions on this second sketch define the dimensions of the elements of the model and are not used for locating the physical structure on the floor. The use of column line symbol is unnecessary for this sketch and was placed there for the purpose of orientation only. To state that it is misplaced is correct in a strict sense but is immaterial in a practical sense and has no consequence in any way for the calculations in either accuracy or use. The memorandum transmitting the results of this calculation included a sketch which is also accurately dimensioned and labeled in all details.

FINDING 4-17 : EQUIPMENT VAULT STEEL FRAMING DRAWINGS

United Engineers structural design drawings Nos. F-101558 and F-101562 were released for construction on 9/28/76 and 7/6/78 before the supporting structural design calculation, "Primary Auxiliary Building, Equipment Vault Steel Framing", Calculation No. PB-76, was completed on 12/1/83. The original design calculations could not be found and we concluded that the absence of such computations constitutes a violation of "Calculations," United Engineers Administrative Procedure No. 22 (AP-22), Section 2.3.1, which requires that calculations related to drawings released for construction or installation shall be either preliminary or final. This was judged to be an isolated finding where drawings apparently were released prior to the preparation of calculations.

RESPONSE

The original calculations for the design of the platform shown in Drawings F-101558 and F-101562 have been inadvertently misplaced. Calculation Set PB-76 completed on December 1, 1983 shows the design adequacy of the platform frame.

FINDING 4-18 : EQUIPMENT VAULT LIVE LOAD

A review of Calculation No. PB-76 revealed that when the designer considered different load combination equations involving seismic loads, the live load had been omitted. We considered this to be in violation of the FSAR in Section 3.8.4.3. The FSAR Table 3.8-16 specifies that live loads are combined with seismic loads in all instances. The team noted that the omission of live loads in load combinations with seismic loads on floor areas not covered by equipment is considered to be a violation of the Structural Design Criteria, SD-66.

RESPONSE

See Response to Finding 4-2.

OBSERVATION 4-4 : EQUIPMENT VAULT STEEL FRAMING ORIENTATION

A review of United Engineers Drawing F-101562 of the structural steel framing in the equipment vault indicated that no dimensions existed to orient the plan views in the north-south direction without the use of the reinforced concrete drawings for the same area which were not listed as reference drawings. This was not a finding or an unresolved item but is mentioned as an item the licensee may wish to consider.

RESPONSE

Dimension not shown on structural steel drawing F-101562 to orient the plan view is an isolated case of oversight on designer's part.

F-101562 has been revised to show the dimension.

SB

OBSERVATION 4-5 : INSTRUMENT RACK SUPPORT

During field inspection at the plant, we observed that one leg of the instrumentation rack MM-IR-14 in the auxiliary building equiplment vault at approximately Elevation 3 feet is resting on a 1/2 inch thick floor plate instead of the channel structural member, C10x15.3, as assumed in Calculation No. PB-76. This installed configuration formed a cantilevered plate with respect to the channel. We concluded that this is contrary to sound engineering design and recommended that a vertical stiffener plate be provided, welded to the channel and the plate, under the leg of the rack to carry the load to the channel. The reason for this recommendation is that the leg of the rack is situated at the corner of an opening in the floor plate of the platform. The opening was cut to accommodate vertically oriented electrical cables. The cut out will cause some stress concentration in addition to the bending stresses introduced by the plate cantilever. A review of the level of stresses in Calculation PB-76 in the plate platform supporting the rack indicated existing stresses were low with respect to the code allowables. Since it was judged that the additional stresses just described would not increase the total stresses so as to violate any requirements regarding existing codes or procedures we did not consider this to be a finding or an unresolved item. We believe, however, that providing a stiffener plate as described would be advisable and would improve the design where the main load carrying member was not in the direct load path.

RESPONSE

We have reviewed the stresses in the plate and in C10X15.3 and these are well below the allowable limits per AISC. Considering the impact of providing stiffeners and low level of stresses on structural members, no modification will be made.

FINDING 4-19: LINER ANCHOR TEST MACHINE CALIBRATION

In February of 1982, Professor Edwin G. Burdette was also under contract to United Engineers to conduct tests of surface-mounted plates with expansion anchors in order to determine the validity of the value of the prying factor equal to 1.2 which had been calculated by Un' ed Engineers of use in the design. The test program was conducted under Purcha . Order No. 210-9. The purchase order contained no reference to 10CFR50, Appendix B or other quality requirements for the testing program. The team determined that the test specimens were fabricated under the quality assurance program for the Seabrook Plant, however, no quality requirements existed on the control of the testing equipment. The team received calibration data for the same University of Tennessee 120,000 lb. capacity Tinuis Olsen machine used on the liner anchor tests. This calibration was completed on January 7, 1982 which is prior to the date the prying factor tests were begun.

The test report did not contain an identification of the test machine utilized so that there was no direct link of the calibration data to the data obtained in the prying factor tests. The team determined that United Engineers' Quality Assurance Procedures "Design Control", QA-3 "Control of Measurement and Test Equipment", QA-12 and "Project Level Design Review and Design Verifications", General Engineering and Design Procedure (GEDP-0022), had not been completely followed.

RESPONSE:

Subsequent to the IDI Audit, Professor Edwin G. Burdette, provided UE&C the following calibration data pertaining to the prying factor testing:

1. Tinius OLSEN Universal Testing Machine was calibrated on June 10, 1980, January 7, 1982, and June 21, 1983.

2. The calibration results varied less than 1%. This indicates the accuracy of the machine was insignificantly affected during this period.

The calibration data provided, covers the time period when the prying factor test where performed.

Professor Burdette also confirmed that the tests were performed on the subject calibrated machine.

FINDING 4-20 : SPACING OF HORIZONTAL STIRRUPS

While reviewing Bethlehem Drawing No. 017RM31 and comparing it with the corresponding United Engineers design drawing, Drawing F-101402, it was observed that the spacing of the horizontal stirrups which on the design drawing was 16" whereas on the detailed shop drawing the spacing was 8". The total amount of the reinforcing steel remained unchanged in spite of the change in spacing. The design drawing had not been updated to reflect the change in spacing. We found that this is a violation of "Document Control - Foreign Print System," United Engineers' Administrative Procedure No. 29 (AP-29), Section 8.6.2, Rev. 7, dated April 12, 1983. In all of the drawings reviewed this was the only case where a discrepancy between the design and shop drawing was found. This finding had no generic implications and was judged to be an isolated instance of lack of consistency and failure to maintain up to date documents.

RESPONSE

The spacing of horizontal stirrups as shown on UE&C Drawing F-101402 was different from that detailed on Bethlehem Drawing No. 017RM31 because the stirrups were grouped differently which resulted in different spacings. However, the total amount of shear reinforcing steel remained unchanged in spite of the change in spacing. There is no impact on the design.

Subsequent to the inspection, UE&C Drawing F-101402 has been revised (Revision 14) so that the engineering and shop drawings are consistent.

OBSERVATION 4-6 : AS-BUILT DOCUMENTS

According to UE&Cs Administrative Procedure No. 39 (AP-39), "As-Built Documents," reinforcing steel changes do not require as-built information and incorporation into UE&C's drawings. We were informed that as-built information is required only in those cases where the amount of steel is different than that stated on the design drawings. Relocation of reinforcing steel within specified limits is permitted under this concept.

We expressed our opinion that the procedure does not restrict the discrepancy between the design and as-built conditions in any way and such a deviation could consist of providing reinforcing bars of smaller cross-sectional area, omission of reinforcement in some area altogether or some other change that might impact the design. We do agree that there are many field situations where a change in placing of reinforcing steel may be tolerated and even sometimes necessary. We believe, however, that the procedure, Administrative Procedure No. 39 should be revised in order to avoid gross deviations from the design requirements. Such deviations could result in an inferior or inadequate structure. This was not a finding or an unresolved item, but is mentioned as an item the licensee may wish to consider.

RESPONSE

AP-39 does not require the recording of "As Built" of the reinforcing steel because of other means and programs that are implemented to control such deviations between the as designed and "As Built" conditions as noted below:

a) Deviations between design drawing and vendor drawing are checked during the review of vendor drawings.

b) QC program during the installation of the reinforcing steel prevents items such as smaller size rebar being used in place of specified size or omission of rebar in some area altogether by QA check off review of these items.

c) AP-38 program addresses areas where rebars are damaged or cut and provides justification for such design related deviations.

d) All other deviations from the as designed conditions are controlled and recorded by Engineering Change Authorization (ECA) and other similar documents. The procedure for handling all such documents is addressed in Administrative Procedure No. AP-15.

SB

OBSERVATION 4-7 : TANK FARM STRUCTURAL STEEL

The design of the structural steel beams for the tank farm area as provided in Calculation No. WB-61 was based upon using the uniform snow load which is considered a permanent live load. The team determined that the design procedure used was applied in accordance with the UE&C's "Guidelines for Beam Verification". The team, after reviewing the guidelines concluded they were adequate and were being properly implemented based on the current United Engineers criteria. The tank farm structural steel has not been addressed by the beam verification program as yet; however, it is scheduled for completion. The team recommends that this be done subsequent to any reanalysis or the seismic loads as described in Sections 4.1 and 4.2 and addressed in Findings 4-1 and 4-7. This is not a finding or an unresolved item, but an item which the licensee may wish to consider.

RESPONSE

The design of the tank farm structural steel will be addressed for the final loads subsequent to the reanalyses for the seismic loads in response to Findings 4-1, 4-6 and 4-7.

OBSERVATION 4-8 : CONCRETE STRUCTURES FINAL LOADS

No specific overall program currently exists to assess the final loads resulting on concrete structures which would encompass pipe supports, equipment, cable trays, and other systems. This is not a finding or an unresolved item, but an item the licensee may wish to address.

RESPONSE

Original design load assumptions for concrete structural elements will be reviewed for final significant support and equipment loads.

SB

FINDING 4-21 : SITE APPROVED CHANGE

UE&C's Administrative Procedure No. 38 (AP-38), "Cutting Reinforcing Steel in Permanent Concrete Structures," establishes responsibilities of organizations for approval of cutting reinforcing steel during drilling into permanent plant concrete structures so that the process is controlled and the effect on the design is controlled. These procedures were found to be adequate. The team did establish that the Site Approved Change (SAC) has been discontinued, yet Revision 1 of AP-38, dated July 31, 1981, has not been updated to reflect this fact and erroneously requires use of the Site Approved Change instead of the current Engineering Change Authorization (ECA) or Request for Information (RFI).

RESPONSE

UE&C's Administrative Procedure (AP) No. 38, "Cutting Reinforcing Steel in Permanent Concrete Structures", Revision 1, July 31, 1981, mentioned Site Approved Change (SAC) to be used for approval of reinforcing steel cutting within the limits of reserve reinforcing steel given on the reserve capacity forms. In July, 1981 AP-15, "Changes to Project Documents, Engineering Change Authorization (ECA) and Request for Information (RFI)" included SAC for making minor changes to the project documents. Since then AP-15 was revised authorizing design changes by ECAs only, and rebar cutting approval was given only on the basis of ECAs prior to issue to contractors. AP-38 has been revised in order to be consistent with the latest AP-15.

SB

UNRESOLVED ITEM 5-1: MAIN TRANSFORMER EFFECT ON VOLTAGE REGULATION

The voltage regulation calculation neglects generator step-up tranformer impedance.

RESPONSE:

The generator step-up (GSU) transformer has an impedance of 10% on a 1230 MVA base. This impedance is insignificant compared to other transformer impedances (unit auxiliary transformers and unit substation transformers) so that the actual resultant voltage drop is a very small percentage of the total voltage drop. For this reason, the GSU transformer impedance had been neglected in this study based on the engineering judgment that the reduction of the voltage at different buses will be insignificant.

Subsequently, a study has been made incorporating the GSU impedance to determine the voltage drop across the GSU transformer, which is 0.33%, and to obtain a quantitative measure of the reduction in bus voltages. The incorporation of GSU transformer impedance in the voltage regulation study resulted in a reduction of approximately 0.4% voltage at different buses and motor terminals during full load running and motor starting conditions. Under the worst case, i.e., motor starting voltages on 480V buses, the desired voltage requirements are met.

Also, inclusion of GSU impedance will have little impact on the 120V ac buses. The reduction in voltage due to GSU transformer impedance has no significant effect in the voltage regulation study except the fan motor 2-SW-FN-51B terminal voltage becomes 79.73% of rated motor voltage during starting. The required voltage during starting is 80%. This minor deficiency in voltage will not have any effect in starting the fan; it might increase the acceleration time slightly which is not considered significant in this application. The voltage regulation study will be revised to include the GSU transformer impedance.

FINDING 5-1: MAIN TRANSFORMER EFFECT ON VOLTAGE REGULATION

"The Medium Voltage Protective Relay Coordination and Miscellaneous Relay Calculation", number 9763-3-ED-00-23F does not correctly calculate the undervoltage setpoint.

RESPONSE:

We agree with the finding that the setpoint shown is not the correct one. The correct setpoint is one which will assure adequate voltage to the 4160 volt, 480 volt and 120 volt safety related buses as specified in the FSAR.

The analysis being performed to satisfy position 1 of BTP PSB-1 is the basis for correct selection of the setpoint. Initial results of this analysis indicate that the correct undervoltage relay setpoint will be 3800 volts. To account for any relay tolerances and assure a minimum relay dropout at a setpoint of 3800 volts, the relay will be set at 3840 volts $\pm$ 1%. This setting will be verified and entered into the Technical Specifications when final review of the analysis is completed.

This finding has no generic implications because this is the only application where the undervoltage relay setpoint requires a specific study to determine the minimum setpoint.

FINDING 5-2: PIPING ENCLOSURE BUILDING AMBIENT TEMPERATURE

Cable calculation does not address derating of cables at 130°F in main steam and feedwater pipe chase area.

RESPONSE:

Cable sizing calculation (9763-3-ED-00-03-F) is a generic calculation. Particular areas with specific conditions are reviewed individually. The specific areas mentioned in the finding had not been reviewed. Calculation (9763-3-ED-00-47-F) has been performed to determine the acceptability of all power cables in main steam and feedwater pipe chase area based on a 130° ambient. The calculation indicated that all power cables, as used, are acceptable. Control and Instrumentation cable in this area are not affected by this increased ambient. Low current loading of these cables provides adequate margin to allow for any ambient variations. Temperatures in all other plant areas were reviewed and no similar discrepancies were found.

FINDING 5-3: BATTERY SIZING DATA

Cell capacity data used in the battery sizing calculation was based on data furnished by the manufacturer for a different size cell than actually supplied.

RESPONSE:

We agree with the finding. This error was caused by the incorrect assumption that the cell capacity factor expressed in "amperes per positive plate" was constant for all cell sizes of a given cell type. This assumption is true only for discharge times greater than one-half hour as shown in the manufacturer's (GNB, Inc.) test curve TC107011B which was included in the Battery Instruction Manual (FP32364-06). The difference in cell capacity was not pursued because the actual discharge period which determined the required cell size was two hours for all four safety related batteries. Actual cell capacity data for the required cell size was obtained from the Manufacturer (VU-38743 and VU-39004) and the calculation revised to incorporate this data. The revised data for discharge times less than one-half hour had no effect on the required battery size.

FINDING 5-4: BATTERY SIZE MARGIN

No explicit design margin was shown on the load profile or battery positive plate calculation contrary to the response to FSAR Request for Additional Informatuion Number 430.30 which stated that a design margin in excess of 15% was applied to the sizing calculation.

RESPONSE:

RAI 430.30 described how the Seabrook battery sizing methods met the recommended practices for battery sizing given in IEEE Standard 485-1978. The 15% design margin given in the RAI was included in the sizing calculation for purchase of the batteries to have spare capacity for future load additions and does not reflect the actual spare capacity available over the battery life.

Revision 3 of the calculation was used to purchase the batteries and explicitly showed the design margin of 15%. The IDI reviewer was walked through the purchasing documents, including the specification (9763.006-137-1, Rev. 2) and vendor proposal which clearly showed that the required design margin was included.

Revision 5 of the calculation showed the present loading of the battery which included various changes in the dc system, i.e., load additions since the batteries were purchased. These changes, for example, larger inverters, resulted in a larger load profile and therefore some of the 15% spare capacity for future loads were used.

Revision 5 concluded that the batteries had sufficient capacity to supply the new load profile and listed the remaining spare capacity.

The FSAR will not be revised because it is still a correct description of how the battery sizing methods met the recommended practices of IEEE 485-1978 (the 15% design margin was for future load additions after battery purchase). The calculation will not be revised since it is still a correct representation of the present battery including load additions since battery purchase and spare capacity.

FINDING 5-5: MOTOR BEARING AND LUBE OIL TEMPERATURE

Inconsistencies were observed in (1) containment spray pump motor bearing temperature values in motor outline drawing (FP-51022-04) and containment spray pump instruction manual FP52764 and (2) containment spray pump motor lube oil temperature values in containment spray pump instruction manual and notes of conference between Westinghouse and United Engineers' letter SBU-78480). Verification is required that the allowable motor bearing and lube oil temperatures are not exceeded during post-accident operation of the containment spray pump.

RESPONSE:

The 95° C limit for bearing temperature stated in the motor outline drawing is the limit for normal operation, while the 90° C limit for bearing temperature stated in the containment spray pump instruction manual is for initial start-up of the pump during the post-installation testing. The set limit for bearing temperature of the subject pump motor is lower for initial start-up compared to normal operation, because there may be a rapid rate of rise of bearing temperature during initial start-up due to mechanical problems.

The 71° C limit for the lube oil temperature stated in the containment spray pump instruction manual applies to the pump bearing oil (viscosity rating 150 SSU @ 100° F) and not the motor bearing oil recommended viscosity rating 200 SSU @ 100° F which has the 85-90° limit discussed in the notes of conference between Westinghouse and UE&C.

Documents will be clarified by adding notes or other explanations.

Bingham-Willamette was requested via United Engineers' letter SBU-88114 to confirm that the motor will perform satisfactorily at the maximum ambient temperature of 148° F, as shown in the specification

SB

FINDING 5-6: DIESEL GENERATOR TRIPS

Diesel generator circuit breaker protective trips which are not bypassed during an accident condition are inconsistently identified in SD-74, SD-76, FSAR Section 8.3, and Diesel Generator Specification No. 9763-006-201-1.

RESPONSE:

The inconsistencies between documents is not considered to be a breakdown in following Administrative Procedure AP-41, Identification and Control of FSAR Deviations. The differences between protective trip descriptions was due to not having system descriptions and the diesel generator specification timely updated to reflect current as-built conditions and the interpretation that the one trip not listed in the FSAR was an operational and not a protective trip.

The referenced diesel generator specification and system descriptions have been updated for consistency. FSAR sections have been clarified.

FINDING 5-7: DESIGN CHANGE NOTICE

DCN 03/0303B did not include SD-74 and Spec. 145-2 as affected documents.

RESPONSE:

We have reviewed the subject DCN and find that SD-74 and Specification 145-2 were not required to be listed as affected documents for the following reasons: System description is a conceptual document and may not include each specific design detail, such as the content of DCN 03/0303B. Therefore, its inclusion as an affected document is not considered mandatory.

Regarding Specification 145-2, the subject of this DCN was a refinement on the residual voltage bus transfer. Conceptual description of this transfer scheme has been included in the specification since the initial issue. Whether the content of the subject DCN had an affect on the description of the transfer scheme is a matter of interpretation. Our interpretation was that there was no effect and therefore, theis specification was not listed as an affected document. Since the discussion of this finding with the IDI reviewer, we have made a slight modification to the specification on Rev. 7 dated 3/9/84 based on the content of the subject DCN to more clearly describe the transfer scheme.

SB

FINDING 5-8: CLASS 1E EQUIPMENT LIST DATA

The class 1E Equipment List (Drawing 9763-M-505300) has been issued without the review and approvals required by UE&C Quality Assurance Procedure QA-3, Section IV.E.3.

RESPONSE:

We agree that the Class 1E Equipment List (Drawing 9763-M-505300) has in the past not been signed off, reviewed and approved in accordance with UE&C Quality Assurance Procedure QA-3, Section IV.E.3.

The Class 1E Equipment List is a computerized data base that is updated on an "as required" basis. The inputs to the data base are supplied by the various engineering disciplines (e.g., Nuclear, Instrumentation and Control, etc.) to the qualification group (QTF) who are responsible for preparing the computer input form and initiating the generation of the various computer output "sorts" that are considered to be the Class 1E Equipment List. The issued "sorts" were then transmitted to all disciplines for their review and comment. The comments and additional updated information were included in the next revision of the Class 1E Equipment List.

To bring the 1E List into compliance with QA Procedure QA-3, the latest issue of UE&C Drawing 9763-M-505300 "Class 1E Equipment List Sort No. 1 (System)" Revision 11, dated 1/30/84 has been reviewed and issued in accordance with the requirements of QA-3, Section IV.E.3. This review has been documented by the use of project "Documentation Review Route Sheets", copies of which have been placed in the files. In addition, a cover sheet with appropriate signatures, nuclear safety-related designation, and professional engineer's stamp has been added to the 1E List. All future issues of the 1E List will be controlled in this manner.

The Class 1E Equipment List Sort No. 1 (System) is presently undergoing a complete check by each of the action disciplines to update it for recent design changes and to correct any deficiencies or inconsistencies. Upon completion of this check, the computer data base will be updated and a revised Sort No. 1 (Drawing No. 9763-M-505300) will be circulated for interdiscipline review in accordance with Procedure QA-3. Upon completion of this review and resolution of comments, the 1E List will be issued for construction.

The review methodology previously utilized has had no impact on the design process as the 1E List is used primarily for listing that equipment which has been previously determined to require environmental qualification. As equipment qualification is an ongoing process, each 1E List update is reviewed to ascertain whether equipment has been added or whether equipment manufacturer, model number or location has changed. To assure that changes to the 1E List have no impact on the equipment qualification, a review of the previously approved qualification programs will be performed utilizing the updated 1E List. All equipment on the Class 1E Equipment List will be qualified for its plant specific loation or a modification or replacement will be implemented.

SB

OBSERVATION 5.1 SERVICE ENVIRONMENT CHART REFERENCES

The Service Environment Chart (Drawing 9763-F-300219) incorrectly identified references to the "Report on High Energy Line Break" and the "Post-Accident Dose Engineering Manual."

RESPONSE:

We agree that Revision 13 to the Service Environment Chart (Drawing 9763-F-300219) contained references to report numbers and report titles which did not appear on the actual reports. In September 1982, it was determined that the "Report on High Energy Line Break" which contained a calculation entitled "Analysis of High Energy Line Breaks Outside Containment" should be assigned a report number in conformance with UE&C General Engineering and Design Procedure (GEDP) 0006. The report number 9763-006-S-N-2 was assigned with the understanding that this number would be added on the next issue of the report as the report had been issued on April 15, 1982. The report number and the title on the calculation were then added to the Service Environment Chart (Note 19) on Revision 10 dated 9/14/82. In a similar fashion, a document which was an extraction from the "Post-Accident Dose Engineering Manual" was assigned a report number with the intent of adding this number to the next issue of the report as the report had been issued on June 1, 1982. The report number and a title were then added to the Service Environment Chart (Note 18) on Revision 10 dated 9/14/82. The inaccurate reference numbers and titles had no impact on design as only the one issue of the documents existed.

To preclude further confusion, we have revised the Service Environment Chart (Rev. No. 14, dated 3/19/84) to correct the references and titles. Further discussion of this revision is contained in our Response to Finding 5-9.

SB

FINDING 5-9: ENVIRONMENTAL DATA DOCUMENT CONTROL

The "Extractions-Post Accident Dose Engineering Manual" did not appear to be controlled in accordance with Quality Assurance Procedure QA-3.

RESPONSE:

We agree that the "Extractions-Post Accident Dose Engineering Manual", issued June 1, 1982, was not initially assigned a controlled report number nor were there the sign-offs of the report required by UE&C General Engineering and Design Procedure (GEDP) 0006.

The "Extractions" were originally issued on June 1, 1982 to provide a summary of information presented in the "Post Accident Dose Engineering Manual", dated April 28, 1982. In September 1982, the "Extractions" were assigned a Report No. 9763-006-S-N-3. This report number was to have been added to the document at its next revision.

On September 10, 1982, Calc. Set No. 4.4.14.70F, "Total Integrated Dose Tables", was issued. The calculation was revised on August 29, 1983. This calculation is a duplication of the information contained in the "Extractions-Post Accident Dose Engineering Manual." As the Calc. Set has been prepared, reviewed, signed and controlled in accordance with Seabrook Project Administative Procedure (AP)-22, it was determined that this document would be utilized in lieu of the "Extractions" as the basis for the Service Environmental Chart (Drawing 9763-F-300219). The Service Environmental Chart was issued Rev. No. 14 on 3/19/84 to correct Note 18 to refer to Calc. Set No. 4.4.14.70 "Total Integrated Dose Tables", Rev. 1, dated 8/29/83.

FINDING 5-10: SWITCHGEAR SEISMIC ANCHORING

The test assembly anchorage requirements are not defined in the seismic report for the 5kV switchgear. Mounting details of the test specimen was not provided, and the qualification report on file was not revised to reflect IEEE 344 requirements.

RESPONSE:

Brown Boveri provided a seismic qualification report for the 5 kV switchgear to United Engineers & Constructors for review. Between the time the switchgear was purchased and the qualification report was submitted to United Engineers & Constructors, the proposed mounting details were modified to suit field conditions. To incorporate this difference in mounting, the United Engineers & Constructors' detail was transmitted to Brown Boveri (SBU-55917). Brown Boveri reviewed the United Engineers & Constructors' detail and determined additional engineering would be required to maintain applicability of the seismic qualification report. The need for this activity was concurred with by United Engineers & Constructors and Brown Boveri subsequently provided their concurrence (VU-37858) that the mounting detail was acceptable; however, the technical justification was not forwarded.

Pursuant to the IDI Audit, United Engineers & Constructors has requested Brown Boveri to furnish technical reasoning for their concurrence (SBU-85981). We will review the response for acceptability, and file the response with the qualification report.

A program will be initiated to review changes and modification to equipment with respect to the adequacy of the technical justification on file.

SB

FINDING 5-11: QUALIFICATION DOCUMENTATION

Actual wiring used in switchgear is Vulkene, whereas qualification report states Vulkene Supreme.

RESPONSE:

This is an error in the vendor document.

The qualification report has been revised to reflect that both Vulkene and Vulkene Supreme control wiring has been used in the construction of the switchgear.

Because of possible generic implications, other qualification reports will be spot checked for similar discrepancies.

FINDING 5-12: ENVIRONMENTAL CONDITIONS

The Service Environment Chart and Class 1E Equipment List show that the maximum service temperature in the pipe penetration area is 148°F; United Engineers' specifi cation 9763-006-248-47, states that the maximum external ambient temperature for the encapsulation vessel is 140° F. Review of building cooling calculations confirmed the 148°F Service Environment Chart temperature value. The team, therefore, concluded that the 140° F temperature stated in Section 2.4 of the specification was incorrect. We consider this an isolated error.

RESPONSE:

We believe that the 140°F entry in the specification was an undetected typographical error. We have verified that the environmental qualifications of the electrical feed throughs are not affected by this inconsistency in ambient temperatures; therefore Specification 9763-006-248-47 has been revised on 4/26/84 to correct this error.

We consider this an isolated error and, thus, no further action is contemplated.

FINDING 5-13: QUALIFICATION OF FEEDTHROUGH & VALVE ACTUATOR

The equipment in the valve encapsulation, the penetrations and the limitorque actuators must be qualified for submergence.

RESPONSE:

Conax Electrical Penetrations: Further investigation with the manufacturer (Conax) indicates that the electrical penetrations are qualified for submergence.

Valve Actuators: The valve actuators are not qualified for submergence; the following analysis indicates that lack of submergence qualification will not jeopardize the operation of the containment spray and residual heat removal systems:

There are two mechanisms that could result in water being present in the valve encapsulation vessel: 1) slow leakage through the valve packing and 2) a break in the suction pipe or sleeve pipe which could flood the vessel during or after a LOCA.

Leakage Through Packing: The resulting flooding from a slow leak of this nature would occur over a long period. Instrumentation will be installed to detect such an event. If any water is present, the valve and piping will be inspected and repaired.

Break in the Suction Pipe or Sleeve: We have postulated an active failure during the injection phase of a LOCA and a passive failure during the recirculation phase of a LOCA. According to 10CFR50 Appendix A, this meets the definition of a single failure. The flooding concern is the result of a passive failure and is postulated to occur only during the recirculation phase of containment cooldown. The CBS system and RHR system do not go into the recirculation phase until the suction valves in the encapsulation vessel are opened. At this time, the valve actuators have served their purpose and are no longer required for accident mitigation.

Because of the unique nature of this finding, there are no generic implications.

FINDING 5-14: MOTOR CONTROL CENTER RADIATION ENVIRONMENT

The motor control center qualification report shows a total radiation of 876 rads. UE&C's procurement specification shows 2.5 millirads per hour for a 40 year life (total 876 rads). FSAR Figure 3.11(B)-1 shows a total radiation of 1000 rads for the 40-year life.

RESPONSE:

This discrepancy is a result of an oversight. The radiation dose value given in the specification was not properly checked with the value given in the FSAR Fig. 3.11 (B)-1.

The motor control center manufacturer has informed us that the equipment has been qualified to higher radiation levels that satisfy the requirement of 1000 rads. The qualification report will be updated to reflect this change. The UE&C procurement specification has also been revised (Rev. 9, 2/17/84) to reflect the change in total radiation to 1000 rads.

Radiation levels on other electrical specifications will be checked against the values shown in the FSAR Fig. 3.11(B)-1 and, where necessary, corrections will be made.

FINDING 5-15: MOTOR CONTROL CENTER SEISMIC QUALIFICATION

The test specimen in the seismic qualification report shows: a) top mounted pull box ("top hat") 9 inches high, b) ground bus 1/4 inch thick by 1 inch wide and c) an HJ3M125, 400 amp frame circuit breaker. The plant equipment has: a) "top hat" 12 inches high, b) ground bus 1/4 inch thick by 2 inches wide and c) a JL3M125, 400 amp frame circuit breaker. Section 8.5 of IEEE Std. 344 requires a comparison be made between the purchased equipment and the test specimen.

RESPONSE:

Review of seismic qualification documents focuses on three major items:

- o Technical review of the analysis/qualification procedures used.
- o Conformance of vendor documentation with the governing specification requirements.
- o Clarification of items which are, or may effect, the qualification of the equipment.

The seismic qualification report did not contain the comparison (as per IEEE Std. 344. Section 8.5) between certain supplied components and the test sample. The types of differences were minor in nature. Since then, the manufacturer has revised the seismic qualification report to include such a comparison which does not alter any previous conclusions. We give below a brief summary of the comparison for the specific items outlined in the finding.

1) Pull box mounted on the plant equipment is 12 inches high versus 9 inches high for the test specimen. Each vertical section (20" wide) weighs approximately 830 lbs, including the weight of the pull box. The difference in weights between 9" high and 12" high pull boxes is approximately 6-12 lbs., or 0.8%.

2) Ground bus for plant equipment is 1/4" x 2" versus 1/4" x 1" for the test specimen. The difference in weights between 1/4" x 1" and 1/4" x 2" ground bus is approximately 1-1/2 lbs. for each vertical section. The difference is 0.2% when compared to the total weight of the vertical section of approximately 830 lbs. Further, the center of gravity of the ground bus is only 4-1/2 inches above the floor.

3) Frame JL type circuit breakers are used in the plant equipment which were not included in the test specimen. Type HJ frame breaker, seismically tested (R-STS-26) and type JL frame breaker are seismically identical. They have the same dimensions, weights and trip mechanisms.

A program will be initiated to review changes and modifications to equipment with respect to the adequacy of the technical justification on file.

FINDING 5-16: WELD SIZE

The American Welding Society Standard specifies the fillet weld for welding plates 1/4 inch or less should be the same size as the plate thickness. The vendor supplied welding specification included in the seismic qualification report specifies a 1/4 inch fillet weld. Vendor supplied correspondence (UE&C VU-10803, 6/6/78) states that MCC mounting sills are ASTM/A569 7 gauge formed steel (0.1875 inch equals 7 guage). A 1/4 inch (0.25 inch) weld would not conform to AWS D1.1.

RESPONSE:

This deficiency was caused by an oversight on the vendor's part. We consider this to be minor in nature. UE&C, during their analysis, has specified a correct weld size meeting AWS D.1.1-81. The vendor seismic qualification document will be revised to show correct weld size. We consider this to be an isolated instance with no generic implication.

FINDING 5-17: WELD CONFIGURATION

Motor control centers are anchored to floor sills using a 3/16 inch by 2 inch long weld in accordance with UE&C's instructions. Vendor's weld detail shows a 1/4 inch by 3 inch long weld. No justification, analyses or vendor concurrence has been supplied for the difference.

RESPONSE:

We agree that no justification or analyses exists in the UE&C files to support the difference, however, the vendor's concurrence was obtained to use the UE&C mounting method (VU-31193, 6/16/82). We have requested the vendor to document this concurrence, with justification, in a revision to the seismic report (SBU-84437), similar to what we have stated in response to Finding 5-10.

A program, which will consider anchorage details, will be initiated to review changes and modifications to equipment with respect to the adequacy of the technical justification on file.

SB

FINDING 5-18: WELD DRAWING

The seismic qualification report #SC-275, Attachment C, has a drawing with the same initials for "checking" and "approving". This is contrary to the vendor's quality assurance procedure, Section 3.3.10 (Rev. 5.58).

RESPONSE:

The vendor has replaced this drawing with a drawing having three different initials, "drawn by", "checked by" and "approved by".

We do not believe that this is a generic problem with vendor's documentation. We consider the above finding an isolated case. No further action is contemplated.

FINDING 5-19: NRC INFORMATION NOTICES & BULLETINS

A review of United Engineers handling of Information Notice 80-11 indicated that the subject deficient ASCO solenoid valve reported to have problems in high humidity/high temperature environments was not listed in the United Engineers Deficient Products List. Consequently, no determination was made if the subject ASCO valves were used in the Seabrook project. Also, the review of the handling of Information Notice No. 80-21 indicated that the subject friction type clamps reported deficient for anchoring Class 1E equipment were not listed in the United Engieers Deficient Products List, and were not evaluated for its usage with safety related equipment. Field inspection confirmed that these friction type clamps were used to anchor safety related horizontal cable trays to tray supports. Both items are violations of UE&C's Administrative Procedure AP-49.

RESPONSE:

We agree that Information Notice 80-11 has not been incorporated in the Deficient Products List. It will, however, be incorporated in the future update of AP-49.

United Engineers in their letter to Yankee Atomic Electric (SBU-44863, dated May 15, 1981) regarding Information Notice 80-11 pointed out that: a) the Seabrook fire protection system did not use any of the equipment identified in the Viking recall notice and b) other UE&C purchase orders were reviewed to ensure that any ASCO Solenoid valves specified Viton material.

Relative to the matter of electrical failure of solenoids under high temperature and high humidity conditions, EG&G Idaho, in their attachment to the information notice, briefly discussed such failures without identifying any specific vendors or equipment. United Engineers reviews all solenoids intended for Class 1E application by catalog number and accepts only those solenoid valves that are supported by qualification documentation. ASCO qualification reports submitted for specific valves are reviewed against the required environmental parameters applicable to the specific valve locations. If the ASCO testing envelopes the specific requirements, the valve is considered qualified; if not, the valve is replaced or an application-specific analysis is performed.

According the finding regarding Information Notice 80-21, "friction type clamps were used to anchor safety-related horizontal cable trays to tray supports". As was emphasized to the IDI reviewer by United Engineers, the particular anchorages observed were not being used in a friction clamping mode. Instead, they were employed only as horizontal guides for the cable trays, and only resist loads in the plane of the support. The loads which develop in the out-of-plane direction are resisted by separate axial bracing systems. It is therefore, our opinion that the application of this clamp is not in conflict with the guidance found in the information notice. Since the AP-49 Deficient Products List is intended only to identify vendor specific equipment, components, parts and materials, the generic design concerns relating to anchorage and support of safety-related equipment is not considered applicable to this list.

FINDING 5-19: NRC INFORMATION NOTICES & BULLETINS

RESPONSE:
(Continued)

We have reviewed the AP-49 Deficient Products List against the 1E documentation received to date and have updated the list to incorporate additional products considered applicable to this list. We, again, wish to stress that candidates for this list are vendor-specific components, parts and materials intended for use in safety-related applications, not generic design issues which are evaluated for application to Seabrook Station and action taken where required.

SP

FINDING 6-1: COMPUTER SPECIFICATIONS

Public Service of New Hampshire has design responsibility for the main plant computer system, and has prepared and issued a computer procurement specification 146-01. The preparation, issue, and revision of this specification have not been accomplished using typical engineering design control practices such as those described in United Engineers GEDP-0015. For example, the document does not contain signatures indicating the preparer, reviewer, or approver. Nevertheless, this finding is considered by the team to be minor since Yankee Atomic has indicated that Public Service of New Hampshire letters transmitting computer specification revisions are prepared by the responsible group manager and are signed by the project manager, and the technical caliber of the specification was considered by the team to be excellent.

RESPONSE:

The Main Plant Computer System (MPCS) is non-safety-related and therefore is not required to be under the QA program described in FSAR Chapter 17.

The MPCS is the primary product of the PSNH computer group in the Nuclear Projects Department. This group is responsible for the total MPCS from configuration to programming. They worked closely together and had informal but effective controls on their activities.

Formal documentation of the reviews associated with the MPCS specification is not required nor is it considered necessary.

FINDING 6-2: FOREIGN PRINT CONTROL

On November 12, 1981, Westinghouse submitted the E16A environmental and E16B seismic test report portions of WCAP-8687, Supplement 2, Revision 1, to United Engineers. However, this material was not logged into the foreign print document control system in accordance with United Engineers Procedure AP-29 until discovered during the inspection on December 5, 1983. This is considered by the team to be an isolated occurrence.

RESPONSE:

Westinghouse Equipment Qualification Test Reports, WCAP-8687, Supplement 2, (Volume 3) which includes the environmental qualification test report E16A, Rev. 1, and seismic test report E16B, Rev. 1, for the Solid State Protection Cabinets has been logged into the foreign print document control system UE&C's foreign print number for WCAP-8687, Supplement 2, (Volume 3) is F.P. 56475, Issue-01.

FINDING 6-3: INSTRUMENT POWER SOURCE

Two errors were noted in the Containment Building Spray System Standard Instrument Schedule (SIS) for the power assignment by separation group. In both instances, however, the UE&C loop diagram and logic diagram showed the correct separation group power source for these items. These two minor errors were confined to the SIS computer listing.

RESPONSE:

The Standard Instrument Schedule and Standard Equipment List are considered as reference and information drawings, in accordance with Administrative Procedure No. 4, "Control of UE&C Issued Drawings". These drawings are not used for any safety-related function. They are used as a guide for finding additional information and/or appropriate Project documents. The statement "For Information Only", will be added above the title block and on each sheet of these documents. Our administrative procedures do not require review and approval of reference/information drawings.

These drawings will be updated and corrected as time and personnel become available.

SE

FINDING 6-4: STANDARD EQUIPMENT LIST

A number of Safety Class and Seismic Category clarification errors (Table 6.1) were found in the Standard Equipment List (SEL).

RESPONSE:

See response to Finding 6-3.

SB

FINDING 6-5: VENDOR DESIGN CONTROL PROCEDURES

Westinghouse has purchased both Group A (harsh environment) and Group B (mild environment) transmitters from Tobar, Inc. as well as Group B transmitters from ITT Barton with special Group A material and process control requirements on the in-containment sensor. United Engineers has purchased Group B devices from ITT Barton. Tobar, Inc. (formerly Westinghouse Veritrak) has delivered the Group B Refueling Water Storage Tank level transmitters and in the Containment Building Spray System, and is currently supplying Group A transmitters qualified to harsh environmental conditions for use in the Nuclear Steam Supply system. Prior to the June, 1983 formation of the Tobar organization, Veritrak used Engineering Design Procedures (EDPs) to control the instrumentation engineering design process. Westinghouse confirmed that Veritrak EDPs were still in effect at Tobar during a QA audit on June 22-23, 1983. However, during the Seabrook IDI visit on November 28-29, 1983, Tobar Product Integrity manuals had replaced the Veritrak EDPs for engineering design control and the organizational structure had been significantly changed relative to that shown Westinhouse during their QA audit. Tobar PI-1, Section 2.2, requires that controlled copy holders be provided changes; however, action had not been taken to inform Westinghouse of these design control procedure changes at the time of the inspection.

The Tobar Product Integrity manuals alter the independence of engineering activities relative to the QA organization by having numerous Engineering Design Practice policies listed under the responsibility of the QA organization. Tobar's president confirmed that this was his intent, as greater operating controls on the independence and freedom of engineering were desired compared to the practice under Veritrak. As described in Section 6.2.4 of the IDI report, one particular example that could have safety significance by impacting the qualification basis of Group A harsh environment transmitters was found in that, Tobar Operations had not consulted with engineering on vendor requested test exceptions to a Tobar procurement specification.

RESPONSE:

Westinghouse has conducted audits of Tobar throughout the transition process. These audits have resulted in findings and subsequent corrective actions. This finding is one of a small group of the Westinghouse audit findings related to events following the sale of Westinghouse Combustion Control Division of its Veritrak facility and the formation of Tobar, Inc. We consider that this finding is an isolated event and the conditions which gave rise to it have been corrected.

In the process of the formation of Tobar there was a significant reduction of the workforce. The management staff at Tobar considered different organizational structures in the several months following the formation of Tobar in order to effect a more equitable distribtion of the workload. The organizational structure shown to the NRC IDI team during their visit in November, 1983 was an interim structure as were the engineering design control procedures related to that structure.

SB

FINDING 6-5: VENDOR DESIGN CONTROL PROCEDURES

RESPONSE:
(Continued)

Through audit follow-up visits and communications with Tobar in January, March and May, 1984, Westinghouse has maintained its awareness of the status of implementing the latest organizational structure proposed by Tobar in January, 1984. Westinghouse has reviewed this organizational structure and its related QA and engineering design control procedures and are satisfied that they adequately meet requirements and are satisfied that all work done for Westinghouse has been subject to adequate control through the transition process.

UNRESOLVED ITEM 6-1: 10 CFR Part 21

A number of ITT Barton bills of material lists for seismic category I and electrical Class 1E components were inspected, and in no case was the control level "21" choice selected where the requirements of 10CFR Part 21 apply. ITT Barton stated that they address 10CFR21 situations on a case-bycase basis between the President and the Director of Quality Assurance. Neither Westinghouse nor United Engineers' procurement documentation provided to ITT Barton identified the particular safety functions required of individual instruments. Use of the "21" control level for commponent parts by subcontractors should be re-examined by the licensee, Yankee Atomic, United Engineers and ITT Barton.

RESPONSE:

According to ITT Barton, "The document described in this finding has been erroneously referred to as a 'Bill of Material'. The documents reviewed during the NRC audit were actually Baseline Documents. The Baseline Document is used to support Barton's generic qualification and defines drawing revisions and levels of control.

The intent of the Baseline is to identify levels of control, which include requirements for identification of suppliers of components, to whom the requirements of 10CFR Part 21 need be applied. At present, BIC Engineering has identified that none of the suppliers of components purchased for use in our products need have the provisions of 10CFR Part 21 applied.

The third sentence of Unresolved Item 6-1 is not correct. ITT Barton did not state that 10CFR Part 21 situations are handled on a case-by-case basis between the President and the Director of Quality Assurance. The ITT Barton policy (see Standard Practice GE12-1) is intended solely to address reporting of defects to the NRC and/or customers. ITT Barton does not attempt to identify applications of safety related instruments. In each case of 10CFR Part 21 notification made by ITT Barton, ALL Barton customers have been notified."

FINDING 6-6: NUCLEAR SAFETY RELATED LEGEND

United Engineers' Procedures GEDP-0013 and AP-28 require that the "nuclear safety related" legend be included on documents that depict equipment performing safety-related functions. During the inspection, individual sheets in a series of United Engineers block diagrams were found to be inconsistent in that some sheets depicting safety-related equipment did contain this legend whereas others did not.

RESPONSE:

UE&C was aware of this deficiency prior to the IDI Audit. UE&C's master drawing file was marked up to include a "Nuclear Safety Related" legend in future revisions of the drawings. UE&C has revised and issued the block diagrams (Rev. 2) to incorporate the "Nuclear Safety Related" legend. UE&C will conduct an audit to verify the compliance to Procedure GEDP-0013 and AP-28 for the "Nuclear Safety Related" legend. This audit will be completed by September 28, 1984.

SB

OBSERVATION 6-1: DRAWING SAFETY CLASSIFICATION

Westinghouse has not applied IEEE Std. 494-1974 to implement the identification legend requirement of IEEE Std. 279-1971, Section 4.22. The Westinghouse containment pressure transmitter drawing identifies the device as "Safety Class 1E," however, its associated sensor and instrument piping drawing provides no indication of its safety classification. Considering the importance of this ITT Barton supplied sensor and the recently imposed requirement for a silicon oil fluid medium, this Westinghouse practice is not prudent.

RESPONSE:

The drawing in question (containment pressure sensor drawing) is a subdrawing of the main transmitter drawing. This main drawing identifies the transmitter as 1E. The sensor drawing is a generic drawing used with 1E and non-1E systems. It is, therefore, Westinghouse's practice to use the main transmitter drawing to identify whether the system is 1E or not.

Westinghouse feels that this method provides for a clear indication of the 1E status of documents, thus we plan no further actions with regard to this observation.

OBSERVATION 6-2: VENDOR DESIGN CONTROL PROCEDURES

As suppliers to the nuclear industry, component vendors su h as Tobar and ITT Barton are required to meet nuclear industry quality assurance requirements as specified in procurement documents. Frequently, these include design review and design verification. However, knowledge of the application end-use of their products by these vendors is quite limmited. For example, both Tobar and ITT Barton indicated that they have committed to the performance of design reviews in their design control procedures; however, the extend and depth of these reviews is not oriented to the end-use application of these products nor do these component vendors have sufficient internal staff resources to perform application design reviews. Rather, these vendors concentrate on limited scope design reviews involving a single issue at a particular point in time, such as material selection, component performance, testing, procurement delivery expediting, or manufacturing processes. Problem identification and timely resolution of component or part level problems are the focus rather than global system application considerations. However, ITT Barton does use a detailed risk analysis procedure for certain non-nuclear applications involving toxic, explosion, and other similar hazards.

RESPONSE:

The transmitter suppliers, ITT Barton and Tobar are required to provide a qualified transmitter, however, the transmitter is only required to meet the requirements provided in the Design Spec. The suppliers are only responsible to design the transmitter according to this design spec. The purchaser is responsible to assure that the requirements in the design spec. are correct for the application and for the review and verification of the application of the transmitter. The supplier, therefore has no need to conduct a design review per application.

We have documentation to demonstrate that the application of these transmitters has been verified in accordance with our design control commitment.

FINDING 6-7: QUALIFICATION TEST REPORT

United Engineers Specification 252-16, used to procure both Class 1E and non-Class 1E differential pressure switches from ITT Barton, has been subject to considerable revision of seismic and environmental parameters during the past few years. Class 1E differential pressure switches procured by United Engineers specification 252-16 have been delivered by ITT Barton and accepted by United Engineers Field QA without an approved qualification test report and without identification in the United Engineers non-conformance reports of the absence of an IEEE Std. 323-1974 environmental qualification test report. This violates the United Engineers vendor surveillance check plan requiring review of the environmental qualification test report as well as the seismic qualification test report provided with the Site Data Package or preparation of a completely descriptive non-conformance report.

RESPONSE:

Vendor Surveillance Shop Inspection Reports , 11, 12, 16 and 18 (SBUs-57416, 63558, 66052, 75994, and 76479, respectively) had indicated that there was no approved IEEE-323 environmental qualification test report, but failed to include it on the conditional Quality Shipment Releases (QSRs) 6962, 6721, 3605, 3614, 15802 and 15805. The remarks section of these conditional QSRs only stated that release was contingent upon ITT Barton's submittal of an approved seismic report to be included in the site data package for Class 1E items. Upon receipt at Seabrook, Field QA only issued non-conformance reports for lack of an approved seismic report. This was an error of omission.

Field QA has issued a non-conformance report (NCR 74/2722) for all the Class 1E differential pressure switches and indicators included on the above QSRs.

Site Data Packages for Class 1E equipment will be reviewed by Field QA to assure that the data packages contain an approved IEEE-323 qualification report or, if not, the items were conditionally released and are identified on a nonconformance report.

In addition, personnel will be instructed on the requirements for IEEE 323 qualification documentation.

FINDING 6-8: QUALIFICATION TEST CONDITIONS

For several years, ITT Barton has not agreed to meet certain environmental and seismic requirements of the United Engineers' specification involving both Class 1E and non-Class 1E devices. A design qualification test plan proposed by ITT Barton has been accepted by United Engineers with technical comments that still require resolution between ITT Barton and United Engineers. Issues involving inconsistencies in temperature values (320 versus 375 degrees F) and plant specific seismic values for Class 1E devices and radiation exposure (3 versue 20 megarads) for non-Class 1E devices had not been resolved at the time of the inspection. Nevertheless, ITT Barton advised the IDI team that an environmental and seismic qualification test report, based on this not-fully-resolved test plan, was submitted to United Engineers on 12/23/83 and United Engineers subsequently indicated that the seismic test results are indeed satisfactory.

RESPONSE:

UE&C Spec. 252-16S has been revised to reflect the Seabrook environment and to resolve information inconsistency (Ref. SBU86057, dated March 16, 1984). There are no major seismic problems (Ref. MM202979A, March 30, 1984). Discussions (Ref. SBU-88138, dated May 15, 1984) are under way with the vendor to resolve outstanding issues.

FINDING 6-9: PRESSURE RECORDER LOCATION

United Engineers marked up the Containment Pressure Control Functional Block Diagram to reflect the relocation of the Train B containment pressure recorder and pressure indicator from zone GR to Zone BF. However, United Engineers did not mark up this drawing to reflect the addition to Train A of containment pressure recorder SI-PR-937 required by this modification. This omission is considered to be minor.

RESPONSE:

Although the process control block diagram (Dwg. 9763-C-509022, Rev. 1) was not marked up to reflect the addition of containment pressure recorder (SI-PR-937) on MCB Section BF, as required by DCN 650195A, the SI containment pressure control loop diagram, Dwg. 9763-M-506802, issue 5, and all other drawings associated with the referenced recorder modification work were revised in accordance with DCN 650195A. UE&C has revised the process control block diagram by adding the subject pressure recorder (9763-C-509022, Rev. 2, dated 1/13/84).

This is deemed an isolated case.

FINDING 6-10: PRESSURE SENSING LINE FLUID

The Barton Model 752-1 containment pressure transmitters and the Barton Model 351 bellows Sensor and its associated piping inside containment are required to meet Revision 1 of a Westinghouse specification sheet that permits either silicon oil or water as the transmitter internal bellows process fluid, and specifies air as the sensor input process fluid. Note 5 of Westinghouse Drawing 8765D52, Revision 2, states that the instrument line is to be filled with water. United Engineers indicated on two separate occasions during the inspection that this revision is the current drawing applicable to Seabrook Unit 1. Subsequently, Westinghouse indicated that Revision 3 had been issued on 9-1-82 and transmitted to United Engineers via letter NAH-U-2766 on 5-17-83 to change the process fluid from water to Dow Corning 702 silicon oil. Application of the revised drawing to Seabrook Unit 1 had not been accomplished two years after this fluid medium problem was first identified by Westinghouse.

RESPONSE:

The transmittal of Drawing 8765D52, Rev. 3, was not a critical action item for Seabrook since the Seabrook transmitters were not scheduled to be installed in the near future. Therefore, work on the Seabrook transmitters was deferred due to higher priority action items. The cognizant shop order holder maintained awareness of the need for revised drawing transmittal. The revised drawings were transmitted when permitted by resources and schedule.

UE&C Project outstanding correspondence is tracked by "Client/Vendor Correspondence Reporting System (Report No. 6)". Westinghouse letter NAH-U-2766 was outstanding correspondence requiring UE&C's approval prior to August, 1983. The above correspondence response was delayed by UE&C due to a heavy backlog of work load. However, the formal approval of Westinghouse drawing 8765D52 (F.P. 56199) was given via SBU-82110, on December 19, 1983.

FINDING 6-11: RELAY CONTACTS

Review of the Westinghouse-United Engineers interface uncovered three instances of errors not detected or resolved in the design review.

RESPONSE:

We agree that three minor drafting errors existed in either the Westinghouse or United Engineers schematic drawings. The actual field wiring and termination drawings made by United Engineers to implement these circuits were correct.

The two drafting errors on the Westinghouse drawing were brought to Westinghouse's attention by letter SBU-86907. The one drafting error on the United Engineers circuit (9763-M-310900, Sheet D39a) was corrected on Revision 4 of that sheet.

These minor errors observed by the IDI team were random and did not represent a breakdown in the design control.

Therefore, no additional audits of other schematics were deemed necessary.

FINDING 6-12: EAH SYSTEM FAILURE

Both containment enclosure emergency filter-fan trains can be rendered inoperable by the common mode failure of non-safety-related current-to-pneumatic converters EAH-PDY-5781-2 and EAH-PDY-5787-2 which modulate the fan vortex inlet dampers.

RESPONSE:

An examination of the system performance indicates that the fan vortex inlet damper can remain in the full open position, thus producing the maximum possible negative pressure within the containment enclosure and associated areas. The inlet damper control will be disconnected to ensure that the dampers are always in their "fail-open" position.

See our response to Finding 6-14 for a discussion of our review of safety-related instrumentation and controls.

OBSERVATION 6-3: FAN INLET DAMPERS

Containment enclosure exhaust fan inlet dampers DP-29A, 29B: a) Mechanical stops should have been provided to prevent full closure of the dampers, or b) accident signal to de-energize the Class 1E solenoids to position vortex inlet dampers in full open position.

Response

See response to Finding 6-12.

SB

FINDING 6-13: RHR SYSTEM FAILURE

In summary, we found that the Emergency Core Cooling function of both Residual Heat Removal trains can be rendered inoperable due to the valves (for temperature control) not being in their proper position. Additionally, the Residual Heat Removal System can be rendered inoperable or seriously degraded during normal or emergency plant cooldown by common mode failure of non-safety-related current-to-pneumatic converters due to environmental or seismic effects. This situation can cause the heat exchanger outlet valves to close and/or heat exchanger bypass valves to open, rather than positioning the valves to their fail-safe position, as required for accident mitigation. The United Engineers control system design violates IEEE Std. 279-1971 and General Design Criteria 20, 21,22, 23 and 24.

RESPONSE:

The RHR system is a dual purpose system, as stated in FSAR Section 6.3.3.7.

The ECCS function is fully automated and single failure proof and is only required in modes 1,2 and 3 (Technical Specification 3.3.2 and 3.5.2). Below 350°F, the stable reactivity condition of the reactor and the limited core cooling requirements do not necessitate that the single failure criteria be met (Bases 3/4.5.2 and 3/4.5.3).

We will ensure that RH-HCV-606 and 607 are open and RH-FCV-618 and 619 are closed when in modes 1,2 and 3 by including these valves and their control switches (RH-CS-606, 607, 618 and 619) in the surveillance procedures that meet the system lineup surveillance requirements of Technical Specification 4.5.2.b.

Since the RHR valves and control switches are periodically verified to be in the proper position for the ECCS function, and since the control switches and solenoid valves are Class 1E, there is no single failure that will cause the valves for both trains to be repositioned to the incorrect position. IEEE Standard 279-1971 and General Design Criteria 20, 21, 22, 23 and 24 do not apply, as there is no protective action required of these valves.

The additional concerns about the RHR system being rendered inoperable during a cooldown without an accident were addressed in our response to RAI 420.52 where we showed that there is sufficient time for operator action to restore cooling with a complete loss of RHR flow. The postulated failure of the current-to-pneumatic converters (loss of heat sink) is enveloped by our response to RAI 420.52 as the operation action (moving RH-CS-606, 607, 618, 619 to the correct position) is from the control room.

SB

FINDING 6-14: PCCW SYSTEM FAILURE

The design of the PCCW system violates position C.4 of Regulatory Guide 1.75, Revision 2, in that the loads on the associated circuits are unqualified and an analysis has not been conducted to address the potential degrading effects of the unqualified components to ensure that Class 1E circuits are not degraded below acceptable levels.

RESPONSE:

The Seabrook associated circuit philosophy is in compliance with requirements of IEEE Std. 384-1974, Section 4.5. This section provides three alternatives and requires that the design shall comply with one of these.

For Seabrook we chose alternative (1) which states that the associated circuits " shall be uniquely identified as such and shall remain with or be separated the same as those Class 1E circuits with which they are associated."

Regulatory Guide 1.75, Revision 2, Section C.4, endorses this approach.

The finding states that "United Engineers did not conduct an analysis of the potential degrading effects of the circuits connected to non-safety related components to ensure that safety related circuits are not degraded below acceptable levels." We like to point out that the performance of an analysis is the requirement of alternative (3) of Section 4.5 of IEEE Std. 384-1974. Since Seabrook has chosen alternative (1), we do not see any violation as stated in the finding.

The finding described a scenario which appeared to show a degradation of Class 1E circuits because of unqualified components. Although this is not required by regulations as described above, we have performed an analysis to show that these Class 1E circuits are not degraded below an acceptable level.

The finding postulated a failure of a non-qualified current-to-pneumatic converter provided in an instrument loop. The IDI team postulated that this failure could potentially cause excessive current and consequential hot shorts between selector switch terminals. It was alleged that such failures could cause inadvertent operation of safety related components placing them in their undesirable positions.

We analyzed the failure mechanisms postulated in this finding. Our review indicated that the maximum output from the instrument loop electronics is 40 volts dc at open circuit, and 150 milliamperes with a short across the electronics terminals. The GE SBM control switches are rated for 600 volts and the instrument cables are rated for 300 volts. The instrument cables used in Seabrook design are #16 AWG which can carry up to 10 amperes. Because of limited voltage and current levels available during faults, no degradation of cables and hence no detrimental interaction between associated circuits and Class 1E circuits is possible.

FINDING 6-14: PCCW SYSTEM FAILURE

RESPONSE:
(Continued)

In general, instrument loops whether class 1E or not are powered from a transducer or a low voltage power supply. By nature of its design, this type of device limits the available fault current to a magnitude below that which can cause degradation of the instrument cable and hence prevents any detrimental interaction between class 1E and associated instrumentation circuits.

In order to address possible generic implications of this finding, we intend to further review safety-related instrumentation and controls to substantiate that the Seabrook design philosophy and the design measures already in place prevent detrimental interactions such as the ones postulated in the finding. We like to emphasize that this review is over and above the requirement of the applicable sections of IEEE Std. 384-1974 and Regulatory Guide 1.75.

FINDING-6-15: TEMPERATURE CONTROL CIRCUIT ISOLATION

Loop B temperature control instrumentation (TYY-2271-2) circuit for the PCCW heat exchangers is located within cabinet CP-152B, which contains both Train B safety-related instrumentation card frames and one non-safety-related instrumentation card frame. United Engineers Specification 174-2 requires that whenever an interface occurs between a Class 1E instrument loop and a non-Class 1E component, a Class 1E isolation device shall be provided to ensure that malfunction of the non-Class 1E component will not affect the proper operation of the Class 1E instrument loop. The temperature control Loop B data sheet supplied by United Engineers to Westinghouse did not specify isolation cards for the non-safety-related TTY-2271-2 temperature control loop circuitry. Westinghouse panel wiring diagrams do not show use of safety related isolation devices to isolate the non-safety-related circuit TTY-2271-2, or its associated card frame from the safety-related card frames within CP-152B.

United Engineers has not performed the analysis of non-safety-related circuits within cabinet CP-152B to demonstrate that safety-related circuits would not be degraded under accident conditions.

RESPONSE:

We have analyzed the associated circuits external to CP-152B and have determined that failures of non-qualified components will not degrade the internal circuits. Output isolators are provided that will prevent external faults from affecting the internal circuits. External inputs are from thermocouples or loop powered transmitters that have no failure mode that will degrade the internal circuits.

Regulatory Position C.4.5 of Regulatory Guide 1.75 is met within CP-152B as all components are identical to similar components used in Class 1E circuits.

Therefore, we have determined that isolators are not required between the Class 1E and associated circuits in CP-152B, and will not be provided.

See our response to Finding 6-14 for further discussion of associated circuits.

FINDING 6-16 EQUIPMENT STATUS INDICATION

This finding plus related Findings 6-19, 6-20 and Unresolved Item 6-3 discuss deficiencies in the qualification of ETC 39TB series terminal blocks Master Specialties Co. (MSC) series 90K indicating switches and NAMCO valve position switches which are used in Class 1E circuits within the Main Control Board.

Finding 6-16 postulates loss of emergency core cooling valve position and pump status indication and containment isolation status indication based on failure of the ETC terminal blocks, the MSC switches and the NAMCO position switches in a seismic event.

Finding 6-19 reports that neither the ETC 39TB terminal blocks nor the MSC 90K switches were included in the seismic testing of the Main Control Board, Section E, conducted by Wylie Labs and documented in Test Report 45657-1. Further, the finding states that the MSC 90K switches were procured by York Electro-Panel (YEP) to Class 1E requirements, but seismic qualification documentation has not been obtained by YEP.

Finding 6-20 reports that the ETC terminal blocks were not procured by York to Class 1E requirements, and that seismic qualification documentation has not been obtained.

Unresolved Item 6-3 summarizes the team's concern for possible common mode failures due to lack of qualification or critical electrical components of which the ETC 39TB series terminal blocks ar an example.

RESPONSE:

All components addressed in Findings 6-16, 6-19 and 6-20 and Unresolved Item 6-3 are considered Class 1E. The Seabrook design requires that all Class 1E components be qualified. The following addresses actions being taken to complete qualification of 1E components on the MCB:

1. ETC 39TB Series Terminal Blocks

   The ETC 39TB series terminal blocks are being seismically qualified to the requirements of IEEE 344-1975. Qualification is expected to be completed by December 31, 1984.

2. MSC Series 90K Switches

   MSC Nuclear Test Report 062-1224-79 covering the qualification testing of MSC series 90H switches and 90K indicators to the requirements of IEEE Stds. 323-1974 and 344-1975 was received by United Engineers in April of 1982 (VU-28544). The series 90H switch is the military version of the series 90K. Our review of the MSC Report has confirmed that the test response spectra envelopes the required response spectra specified in Specification 9763-SD170-1. However, since the 90H switch tested is not the exact switch purchased for use in the MCB, we have submitted a complete list of the MSC 90K switches that are used in Class 1E circuits within the MCB, and requested that it be appended to the test report.

FINDING 6-16 EQUIPMENT STATUS INDICATION

RESPONSE:
(Continued)

3. NAMCO Valve Position Switches

The NAMCO limit switches are being replaced as part of our program to provide Class 1E valve accessories, such as limit switches, solenoid valves, motor operators, etc. The change order (No. 107) for the qualified valve accessories was placed with Westinghouse on August 5, 1983.

To assure that all electrical components/devices used in Class 1E circuits are qualified, we will review the safety-related purchase orders to ensure that all Class 1E components are listed and properly qualified.

FINDING 6-17: CIRCUIT BREAKER FAULT CURRENT

Equipment qualification reports for safety related circuit breakers type E22 and BQ, used in control circuits, do not provide information regarding the fault current interruption performance of the breakers prior to, during or after the seismic qualification test.

RESPONSE:

Regarding the fault current interruption performance of the subject breakers prior to the seismic test, the manufacturer meets the requirements of NEMA Std. AB1, Sect. 2.3.7, Production Tests, through his own QC procedure. These production tests verify that production circuit breakers meet all design tests. Production testing includes, on a sample basis, the testing of the instantaneous trip characteristic of the circuit breaker. We see no need for further testing documentation.

In regard to the fault current interruption performance of the subject breakers during or after the seismic test, while it is true that no specific test was performed to confirm the fault current interruption capability of the E22 and BQ molded case breakers during or after a seismic event, we believe that no such test is necessary for the following reasons:

During the seismic test, the manufacturer has been monitoring critical parameters, such as contact chatter, continuity and structural integrity of the breakers and experience has shown that if something has gone wrong, it would be apparent during the seismic test. The breakers were subjected to an operational test after the seismic tests, which included an overload test, a dielectric test and opening and closing of the breakers. Furthermore, the tested breakers were dissected and examined for integrity; no abnormalities were observed. All of the above indicate that the breakers will perform as designed during a short circuit and isolate the circuit.

We like to point out that during the licensing process, a related concern was expressed by the NRC (NRR), i.e., will the protective device, such as breakers, etc. maintain its structural integrity and perform its function when subjected to a seismic event and failure of the load. We quote their evaluation from the Safety Evaluation Report, page 8-20, "Based on operating experience of protective devices that have been subjected to actual and simulated seismic conditions, it is the staff's judgement that the protective device will maintain its structural integrity and perform its function (power removal) when subject to a seismic event and failure of the load. This item is, therefore, considered resolved."

The retention of the structural integrity following seismic events has recently been verified by the Seismic Qualification Utility Group (SQUG) in an independent assessment of whether certain classes of equipment in operating nuclear power plants have demonstrated sufficient seismic ruggedness in past earthquakes so as to render the explicit seismic qualification unnecessary.

FINDING 6-17: CIRCUIT BREAKER FAULT CURRENT

RESPONSE:
(Continued)

Because these type of breakers are used in electrical penetration protection to satsify the requirements of Regulatory Guide 1.63, the fault current interruption performance of these types of breakers will be verified periodically as required by the Technical Specifications. As stated in FSAR Section 8.3.1.4.6.1(c), any generic degradation, such as set point drift, manufacturing deficiencies and material defects, will be detected and corrected generically.

Based on all of the above, we believe that enough assurance exists that the E22 and BQ breakers will perform their intended function. We are not contemplating any further testing.

UNRESOLVED ITEM 6-2: ASSOCIATED CIRCUIT DESIGNATIONS

Separation Group B circuits from computer IRTUs are powered from Separation Group A power supplies. UE&C should provide written criteria for assignment of separation groups to circuits powered from one train and connected into panels and circuits of another train. These criteria should address the criteria of IEEE Std. 279-1971, Sections 4.2, 4.6 and 4.7.

RESPONSE:

The criteria for separation are delineated in Seabrook Station FSAR Appendix 8A, "Attachment C to AEC letter dated December 14, 1973, Physical Independence of Electric Systems." Reviews have determined that circuits contained in one separation group and powered from another separation group are limited in number at Seabrook. The design criterion for these limited number of circuits is that there should be a qualified isolation or protective device between the separation groups or an analysis should be performed to assure that no detrimental interfaces exist between the separation groups. With the exception of four computer Intelligent Remote Terminal Units (IRTUs) and their two related RTD and thermocouple conversion cabinets (RTD/TC cabinets), all circuits powered from separation groups other than those to which they are assigned, have a qualified isolation or protective device between the separation groups. A discussion of the results of the analysis for the IRTUs and a review of compliance with the requirements of IEEE Std. 279-1971, Sections 4.2, 4.6 and 4.7 is presented below.

IEEE Std. 279, Section 4.2, "Single Failure Criteria" requires that "any single failure within the protection system shall not prevent proper protective action at the system level when required." The IRTUs and the RTD/TC cabinets are not part of the protection system and perform no protective action. Therefore, Section 4.2 of IEEE-279 is not applicable.

IEEE Std. 279, Section 4.6, "Channel Independence" requires that "Channels that provide signals for the same protective function shall be independent and physically separated to accomplish decoupling of the effects of unsafe environmental factors, electrical transients and physical accident consequences documented in the design basis...." Channel independence is assured by the implementation of the separation criteria delineated in FSAR Appendix 8A. Analyses of all equipment where physical separation is not fully in accordance with the criteria established in the FSAR are contained in UE&C Calc. Set No. 9763-3-ED-00-38F, "Review of Physical Separation in Equipment." Identified deviations and proposed corrective actions are also documented as part of the calculation. The calculation contains the following analyses for the IRTUs and RTD/TC cabinets:

UNRESOLVED ITEM 6-2: ASSOCIATED CIRCUIT DESIGNATIONS

RESPONSE:
(Continued)

A. IRTUs 1, 2, 4 and 6

The Separation Group B Intelligent Remote Terminal Unit (IRTU) contains Separtion Group A (Train A Associated) and Separation Group B (Train B Associated) cables.

The Separation Group A cables are for the scan synchronization circuits between the host computers and the IRTU. These circuits are pulse circuits operating at 30 volt maximum and are considered low power circuits, incapable of propagating the power required to damage other circuits. The Train A Associated power supply to the IRTU does not interface with Train B or Train B Associated power supplies, except through isolation devices or low power semiconductor devices.

The Separation Group B cables are for analog, digital, RTD, and thermocouple inputs to the IRTU, which gathers and preprocesses the information for the host computer.

The Separation Group A and Separation Group B cables and wiring are in proximity to one another inside the IRTU. The analysis below indicates that a failure involving Train A Associated circuits in an IRTU will not challenge Separation Group B circuits. Therefore, this deviation from the independence between separation groups is acceptable and no modification is required.

The following is a discussion of each type of Train B Associated input.

1. Westinghouse Digital Inputs

These inputs to the IRTU are through a Modcomp Model 1125 Isolated current Input Card which contains an optically coupled LED-photo transistor and provides up to 200 volts isolation.

In addition, all inputs to the IRTU are protected by surge suppression equipment (variators for digitals inputs and transorbs for analog inputs) located in the IRTU termination cabinet. Further, all of these circuits are very low power circuits which are protected by a variety of fuses, circuit breakers and current/voltage limiting devices. These protective measures will prevent propagation of failure from one separation group to another.

UNRESOLVED ITEM 6-2: ASSOCIATED CIRCUIT DESIGNATIONS

RESPONSE:
(Continued)

2. Other Digital Inputs

These inputs are isolated field contacts that are scanned by monitoring the voltage applied to the contacts by the IRTU. The inputs are not isolated from their Train A Associated power supply; however, they are electrically separate from other Train B and Train B Associated circuits.

Additional protection is provided as noted in the second paragraph of "1. Westinghouse Digital Inputs" above.

3. Analog Inputs

For these inputs, isolation credit can be claimed by the following design features:

a. The analog multiplexer selects only one input at a time; hence, the Train A Associated and Train B Associated inputs do not connect directly to each other.

b. There is isolation in the wide range analog input subsystem between the scanning analog to digital (A/D) conversion circuitry and the computer interface point. This isolation is in the form of an isolating transformer; hence, there is no electrical connection between the computer circuitry and the wide range analog subsystem circuitry.

c. The multiplexing A/D conversion module is powered by a Train A Associated power source. However, this module is a very low power micro-electronic semiconductor unit which is incapable of propagating the power required to damage other circuits. The power to this module comes from an internal low voltage power supply, which includes an isolating transformer. This transformer acts as a barrier between the Train A Associated power supply and the internal circuitry of the module. Additional protection is provided as noted in the second paragraph of "1. Westinghouse Digital Inputs" above.

4. Thermocouples Inputs

These inputs are similar to the analog inputs with the exception that they come from electrically separate thermocouples whose circuitry does not interface with Train B Associated power supplies.

UNRESOLVED ITEM 6-2: ASSOCIATED CIRCUIT DESIGNATIONS

RESPONSE:
(Continued)

5. RTD Inputs

These inputs are similar to the analog inputs with the exception that they come from the conversion cabinets (see Item 11 of Calculation 9763-3-ED-00-38-F) and are ultimately powered from Train A Associated power supplies.

B. RTD/TC Cabinets

The Separation Group B RTD/TC Conversion Cabinet contains a Separation Group A (Train A Associated) cable and Separation Group B (Train B Associated) cables. The Separation Group A cable is the 120V ac power supply to the cabinet. This cable enters the top of the cabinet and terminates on a terminal block near the AC control panel at the bottom of the cabinet. This cable will be installed in flexible conduit inside the panel. All other 120V ac wiring will be barriered or separated by a minimum of 6 inches from the Separation Group B wiring and cables.

The interface between the Separation Group A circuit and the Separation Group B circuit is the power supply for the Computer Products RTP 7504/20 RTD Signal Conditioning Chassis. This power supply consists of a filter, two 2 amp fuses and a 115-12.5 volt transformer. The output of this power supply feeds the individual circuit cards which contain a 10 volt dc power supply and four RTD bridge completion networks. The electrically isolated Train B associated RTDs are connected to the bridge completion network which provide a Train B Associated analog output to the Train B Associated computer termination cabinet. There is no electrical interconnection with any Train B power supplies. A failure in the Train A Associated portion of the circuit will have no impact on the Train B or Train B Associated equipment except to cause loss of indication from the non-safety-related RTDs. A failure in the Train B associated portion of the circuit will not cause damage to Train B or Train A cables due to the number of protective devices (fuses and circuit breakers) in the circuit (approximately 5) which could be expected to operate to isolate the fault. In addition, because of the inherent limiting capabilities of the inverter, the dc power supplies on the RTD cabinet card frames and the conecting cables, a failure at the RTDs would not cause sufficient short circuit current to cause damage to safety-related cables routed with the Train B Associated RTD Cables.

Therefore, although there is an interconnection between separation groups, the separation and protection incorporated in the design provides assurance that a failure in the Separation Group A or Separation Group B circuits will not prevent the safety-related circuits from performing their safety function.

UNRESOLVED ITEM 6-2: ASSOCIATED CIRCUIT DESIGNATIONS

RESPONSES:
(Continued)

The criteria in the FSAR and the analyses satisfy the independence criterion of IEEE Std. 279.

IEEE Std. 279, Section 4.7, "Control and Protection System Interaction" requires that "Any equipment that is used for both protective and control functions shall be classified as part of the protection system . . ." Additional requirements of isolation, single failure and multiple failures are also addressed. For Seabrook Station, all interfaces between protection and control systems are through devices that are part of the protection system and are either qualified Class 1E isolation/protection devices (e.g., isolators, circuit breakers, fuses) or Class 1E electrical devices (e.g., switches, relays, terminal blocks) that have voltage and current ratings comensurate with the circuit applications. Included in the control systems are inputs to the IRTUs and RTD/TC cabinets from protection system components and modules. The utilization of qualified isolation/protection devices and other Class 1E devices that are properly rated satisfy the control and protection system interaction requirements of IEEE Std. 279.

Based on the above discussions, the Seabrook Station design as delineated in FSAR Appendix 8A and supporting analyses is in compliance with the requirements of IEEE Std. 279-1971 Sections 4.2, 4.6 and 4.7.

SB

FINDING 6-18: CAPACITOR QUALIFICATION

A tantalum capacitor vendor to Tobar, Inc. took exception to the Tobar request for quotation in one qualification test area and was ambiguous in its response for another area. Rather than test 50 units for 2000 hours at elevated temperatures, Acushnet Electronics Company requested an exception so that 100 units could be tested for 1000 hours. The ambiguity concerned whether the IV 175 degrees C elevated temperature leakage tests were either waived or would indeed be performed. Tobar acceptance of the test ambiguity and the vendor requested exception was granted by the Tobar Vice President of Operations without review or concurrence by appropriate engineering personnel. This action violated the qualification design basis for harsh environment transmitters using this capacitor.

In this instance, a Tobar internal request for engineering action (REA) was not prepared to evaluate the vendor request nor was a revision notice (RN) prepared to modify the Tobar capacitor specification to match the vendor proposed tests. The effect on design had not been evaluated by Tobar; however, capacitor leakage current was determined from Westinghouse tests to be a critical performance parameter during qualification of the baseline transmitter design. On December 6, 1983, Acushnet agreed to perform the thermal tests which resolves the item of ambiguity.

RESPONSE

This finding is included in a small group of our own audit findings related to events following the sale by Westinghouse Combustion Control Division of its Veritrak facility and the formation of Tobar, Inc. We consider that this finding is an isolated event and that the conditions which gave rise to it corrected.

In the process of the formation of Tobar there was a significant reduction of the workforce and the loss of key people who had an awareness of the issues impacting design/qualification. As part of the sale agreement between Westinghouse and Tobar, Westinghouse provided, on a loan basis to Tobar, an individual with substantial expertise in the area of design/qualification. Due to the aforementioned workforce reduction, the management staff at Tobar considered different organizational structures in the several months following the formation of Tobar in order to effect a more equitable distribution of workload. In one of the organizational structures implemented for a short time at Tobar, the individual with expertise in the design/qualification area was not assigned responsibilities commensurate with his originally intended role of providing technical assistance in the control of design/qualification activities. It was during this period of time that the events resulting in

SB

FINDING 6-18: CAPACITOR QUALIFICATION

RESPONSE:
(Continued)

the subject finding occurred. Had the organizational structure at that time been one which involved the individual with expertise in the design/qualification area in the proper activities, we are confident that this finding would not have occurred. The organizational structure has since been changed to place the individual with design/qualification expertise in his originally intended role. Westinghouse audit follow up visits with Tobar have confirmed that the conditions which gave rise to this finding have been corrected. Additionally, a complete review of design/qualification related documents was accomplished by Tobar to assure that the information was indeed subjected to review and the necessary approval of Westinghouse through the Westinghouse onsite representative.

FINDING 6-19: SWITCH QUALIFICATION

Required seismic qualification documentation per IEEE Stds. 323-1974 and 344-1975 for the Master Specialties Series 90K Switches used in Class 1E circuits within the main control board had not been obtained by York Electro-Panel in accordance with United Engineers' Specification 170-1.

RESPONSE:

See response to Finding 6-16.

FINDING 6-20: TERMINAL BLOCK QUALIFICATION

York Electro-Panel did not procure the ETC Type 39TB series terminal blocks as Class 1E devices, and has not obtained seismic qualification documentation in accordance with the requirements of United Engineers' Specification 170-1.

RESPONSE:

See response to Finding 6-16.

UNRESOLVED ITEM 6-3 QUALIFICATION OF CRITICAL DEVICES

FINDING

Either a complete analysis of all the safety-related circuits terminated on the ETC terminal blocks should be performed relative to possible common mode failures or these terminal blocks should be qualified as safety-related devices.

RESPONSE:

See response to Finding 6-16.

SB

FINDING 6-21: CABLE BILL OF MATERIAL

The engineering bill of material specifying the Main Control Board control wire purchased from Rockbestos on York Electro-Panel P.O. No. 32958 is missing. Lack of the B/M is a violation of the York QA Manual relative to engineering documentation.

RESPONSE:

As documented in York letter YC-371, dated May 22, 1984, the bill of material for the Rockbestos wire was misfiled, but has now been located and correctly filed. The corrective action required of York by this finding has been completed. We, therefore, consider this finding closed.

FINDING 6-22: CABLE FLAME TEST REPORT

York procured and installed Rockbestos, Helistrand and Anaconda wiring within the main control board. United Engineers Specification 170-1 requires York to submit for United Engineers engineering review and approval wire flame test reports per IPCEA-S-19-81 and IEEE Std. 383, and qualification documention per IEEE Std 323. However, York did not submit Rockbestos, Helistrand, and Anaconda wire flame test and qualification reports to United Engineers for review and approval.

RESPONSE:

The omission of home office review for the Flame Test Report and the IEEE 323 Qualification Test Report on the vendor surveillance check plan (VSCP) was an oversight of the specification requirements. The VSCP for P.O 170-1 was revised and issued to York Electro Panel (YEP) via SBU-86561, dated March 29, 1984 to delete "Shop V/S" next to Review Required block for Flame Test Report and to add the requirement for submittal of the IEEE 323 Qualification Test Report to UE&C for review and approval. Also, Vendor Surveillance Directive No. 25, dated February 25, 1982, was reemphasized to all V/S representatives. This directive addresses verification that documents submitted by the vendor, as required by Section A of the VSCP, have been reviewed and approved by UE&C.

Specifications pertaining to Class 1E equipment were reviewed to assure IEEE 323, 383, and flame test qualification documentation, as applicable were incorporated in the VSCP. As a result of the review, there are 13 VSCPs that require revision to add document in Site Data Package or specify Home Office review.

As a result of the above mentioned revision of the VSCP for P.O. 170-1, United Engineers' home office has received flame test and qualification reports submitted by York Electro-Panel (VU-38753), covering the Class 1E wire and cable supplied by Anaconda, Helistrand and Rockbestos for use within the main control board. The reports have been submitted in accordance with the requirements for qualification documentation, as stated in Section 3.14 of United Engineers' Specification 170-1. The Anaconda, Helistrand and Rockbestos Flame Test and Qualification Reports have been received and reviewed. Our review of the reports has identified deficiencies in the documentation. Consequently, the reports have been returned to YEP with comments to be resolved.

SB

FINDING 6-23: VENDOR SURVEILLANCE CHECK PLAN

Two deficiencies were noted with respect to wire and cable used within the main control board:

a. York Electro-Panel failed to list wire specifications by manufacturer, size, or type in the Main Control Board as-built drawing package or the instruction manual. According to the Team's Finding, United Engineers was unaware of the wiring used in the Main Control Board.

b. The Flame Test and Qualification Reports for the Main Control Board wire and cable were not submitted for UE&C Home Office review in violation of the VSCP for P.O. 170-1 and QA Procedure QA-7-2.

RESPONSE:

a. The York Electro-Panel (YEP) as-built drawing package did not include complete wire specifications. YEP general wiring detail drawing E-5505 has been revised to indicate MCB wire and cable by manufacturer, type and size.

Previously, YEP had submitted the wire specification as part of of quotation Y-10300-11, dated September 6, 1979, which was reviewed and subsequently incorporated into change Order No. 5 of P.O. 170-1. Additionally, all panel wiring diagrams grams submitted by YEP for review (typically, York drawing E-5505) specifically call out the size of each wire and cable used for all interconnections within the Main Control Board.

b. See response to Finding 6-22.

SB

FINDING 6-24: TERMINAL BLOCK PROCUREMENT

Mercury Purchase Requisitions 66180 and 68306 for States terminal blocks were not procured as nuclear safety-related components in violation of United Engineers' Specification 171-1 as well as the Mercury bill of material DWN19691-702, and that Mercury QA personnel did not review and approve these purchase requisitions in violation of Section 5.2.3 of the Mercury QA Manual.

RESPONSE:

Mercury has written nonconformance reports (Mercury NCR 618, 619 and 620, dated June 11, 1984, UE&C Ref. VU-40259) for States terminal blocks, Rockbestos SIS switch board wires, Dekoron low level signal cables and AMP preinsulated terminal lugs. Mercury also has submitted qualification documents (Ref. VU-40253, VU-40222 and VU-40259) for UE&C review. UE&C will review the qualification documents for adequacy and conformance to the Seabrook environment. UE&C will justify and/or indicate the necessary corrective action to be undertaken to rectify the inadequacy, if required.

FINDING 6-25: NONCONFORMANCE REPORT

United Engineers stated that they were aware of the fact that the instrument racks were shipped to the site without qualification documentation for the States terminal blocks, and that they had always intended to use the results of the Acton Corp. Loss-of-Coolant-Accident testing of States blocks under Specification 129-1. Based on the above considerations, the team concludes that Mercury should have written a non-conformance report for the unqualified States terminal blocks in accordance with Mercury QA Manual Section 12.2 which requires that a non-conformance report be written and items be tagged on "hold" when nonconforming materials and services are suspected.

RESPONSE:

See response to Finding 6-24.

SB

FINDING 6-26: CABLE PURCHASE ORDER

United Engineers specification 171-1 requires Mercury to procure and install Class 1E low level signal and power wiring for inside containment and outside containment instrument racks. The Seabrook containment post accident temperature curve and pressure curve provided in United Engineer's document 171-IS shows peak containment temperature for approximately 10 minutes duration and peak containment pressure of 52 psig. Mercury's purchase order No. 66166 to Rockbestos and order No. 66165 to Dekoron contained a QA requirement form specifying that the vendor submit a certificate of compliance to meet radiation requirements and the cable to meet IEEE Std 383. These purchase orders did not provide for the vendor the Seabrook containment post accident temperature and pressure profiles and the Seabrook containment radiation dose level for the cable as required by specification 171-1.

RESPONSE:

See response to Finding 6-24.

FINDING 6-27: QA REVIEW OF CABLE REQUISITION

Mercury QA personnel signed off the QA review and approval section of the purchase requisition for the Rockbestos and Dekron Cable although (a) Section 2.3.3.3 of IEEE Std 383-1974 requires qualification to a total dose of 5 x E07 rad, which is less than the Seabrook specification of 2 x E08 rad and (b) IEEE Std 383-1974 references IEEE Std 323-1974 for Loss-of-Coolant-Accident simulation profiles that provide a peak temperature of 340°F which is less than the Seabrook peak temperature of 375°F. This violates section 5.2.3 of the Mercury QA manual.

RESPONSE:

See response to Finding 6-24.

FINDING 6-28: CABLE FLAME TEST REPORT

Upon receipt of the Dekoron low level signal cable and documentation, Mercury QA personnel completed the QC receiving inspection report and signed off the report that the QC documentation was acceptable. Eaton Corporation, Dekoron Division, submitted a Certificate of Compliance No. D-3510 which simply stated that "this cable is capable of passing on IEEE Std 383 flame test." We concluded that this certificate of compliance addressing the flame test does not comply with United Engineers' specification 9763-006-171-1, Sections 2.4.2 and 2.7.3, which require full environmental qualification to meet the criteria of IEEE Std. 323-1974 and 383-1974. We also concluded that Mercury QA personnel had determined that the Dekoron Certificate of Compliance was acceptable documentation when, in fact, the documentation did not meet the requirements of the specification.

RESPONSE:

See response to Finding 6-24.

SB

FINDING 6-29: VENDOR SURVEILLANCE CHECK PLAN

United Engineers Specification 171-1 requires that Mercury procure and install safety related Class IE equipment (such as terminal blocks, power and signal cable, and insulated terminal lugs), and to submit qualification documentation to United Engineers. The QC vendor surveillance check plan for Specification 171-1 did not identify the required IEEE Std. 323 1974 and IEEE Std. 383-1974 qualification documentation in violation of United Engineers' QA Procedure QA-7-2. Mercury did not obtain and send to United Engineers qualification test reports for the Dekoran ECI type 1952 low level signal cable, the Rockbestos SIS switchboard wires, or the AMP pre-insulated terminal lugs.

RESPONSE:

The omission of IEEE 323 qualification documentation on the Vendor Surveillance Check Plan (VSCP) was an oversight of the specification requirements. Personnel will be instructed on the requirements for IEEE 323 qualification documentation. The VSCP for P.O. 171-1 was revised and issued to Mercury via United Engineers' letter SBU-86529, dated March 28, 1984, to add IEEE 323 qualification documentation requirements. The VSCP now requires submittal of the Qualification Test Procedure and Report to UE&C for review and approval with a copy of the IEEE 323 Test Report in the Site Data Package.

Specifications pertaining to Class 1E equipment were reviewed to assure IEEE 323 and 383 qualification documentation, as applicable, were incorporated in the VSCP. As a result of the review, there are 18 VSCPs that require revision.

The required qualification test reports were submitted by Mercury to UE&C for review on June 13, 1984 (Ref. VU-40259, VU-40227 and VU-40253).

SB

FINDING 6-30: CONDUIT MARKING

The Seabrook installed and exposed Class 1E conduit is not marked distinctly and in a permanent manner to identify the separation group at intervals not to exceed 15 feet and at points of entry to, and exit from, enclosed areas in accordance with requirements of the FSAR Appendix 8A, Section 5.1.2; IEEE Std. 384-1974, Section 5.1.2; and Regulatory Guide 1.75, Revision 2, Position C11.

RESPONSE:

For the exposed conduits we have taken exception to the 15 foot marking as stated in FSAR Section 8.3.1.4k.

We propose to amend the FSAR as shown in the attached marked up page to indicate the exception to Appendix 8A. The reasons for the exception are outlined below.

Regarding Regulatory Guide 1.75, Position C11, we believe we meet the intent of this position in that our method of identification is simple and adequate. More details are outlined below.

We don't consider this exception to have safety significance for the reasons outlined below and, therefore, we did not address it in the evaluation for compliance to IEEE 384-1974 (FSAR Section 8.1.5.2).

In the Seabrook design, all cable trays are marked at intervals of 15 feet or less as given in FSAR Section 8.3.1.4k. This is required to prevent the improper routing of cable since access to a cable tray can usually be made anywhere along its length. However, access to a conduit for routing cable is available only at the conduit ends and in-line boxes and, therefore, these are the minimum points we chose to identify. FSAR Section 8.3.1.4k, Cable and Raceway Identification, requires that conduits be "... identified at each end where conduit terminates and at both sides of walls, floors and in-line boxes."

The physical separation criteria at Seabrook for conduit from different separation groups is a minimum of one inch. This is in agreement with IEEE Std. 384-1974, Regulatory Guide 1.75 (Revision 2) and FSAR Appendix 8A. Each conduit is installed and inspected in accordance with quality assurance procedures to insure that the one inch separation criteria is not violated. The results of the of the inspection of each conduit is completely documented.

In summary, we believe that the marking of each conduit at 15 foot intervals or less is excessive and unnecessary. The markings provided at the conduit ends, both sides of walls, floors and in-line boxes is sufficient to insure that cables are not pulled into a conduit of a different separation group and are adequate to allow inspection of the conduit to insure a minimum of one inch separation between separation groups.

UNRESOLVED ITEM 6-4: ACCIDENT MONITORING INSTRUMENTATION

Instruments P-I-2312, 13, 14 and 15 which provide indication of flow through containment spray pumps 9A and 9B are powered from non-safety-related Train A power, are located in a potentially harsh environment, and do not possess electrical qualification documentation. Numerous Class 1E status lights and valve position indication could be rendered inoperable due to failure of the ETC terminal blocks, and QA requirements for other Type D Category 2 variables are commercial grade.

The team believes that the accident monitoring instrumentation at Seabrook is not currently adequate for its intended service; however, since the Yankee Atomic has not informed NRC that the post-accident monitoring system meets the requirements of Regulatory Guide 1.97, revisions 2 of 3, the inspection team considers this issued to be an unresolved item.

Response:

We will be providing the NRC with a list of our accident monitoring instrumentation. Deviations from the recommendations in Regulatory Guide 1.97 will be indicated and justified.

FINDING 6-31 SET POINT CALCULATION

The alarm setpoint calculation for Refueling Water Storage Tank low-low level contained errors due to numeric value discrepancies involving level transmitters LT-930 through LT-933. The three minor errors identified are given below:

(1) a subtraction error that produced a 78.75 percent of span value having two significant digits rather than just one.

(2) a subsequent transcription error by use of 78.3 percent of span rather than the correct value of 78.8 percent, and

(3) the resultant calculation of 110.25 inches of water above the center-line of the level transmitter rather than the correct value of 110.32 inches of water.

RESPONSE:

UE&C has incorporated the IDI findings in UE&C Calculation number 4.3.5.30F Rev. 3 dated November 14, 1983.

FINDING 7-1: DOCUMENT DISTRIBUTION

Out of 800 entries in the Correspondence and Document Distribution Index found in the Project Manual of Procedure, Rev. 13, 18 entries were found to be inconsistent with those of a similar matrix in Administrative Procedure AP-1.

RESPONSE:

The Administrative Procedure Manual contains the working level procedures governing the day to day administrative workings of the project and is updated to reflect changes in those administrative workings. The Project Manual of Procedure is more of a contractual scope document distributed to the management level and updates are performed less frequently and with no intent to have this document dictate the day to day workings of the project.

The extent of impact to the working level of the project is minimal, if there is an impact at all. The Administrative Procedure Manual, containing AP-1, is distributed throughout the project for use in determining day to day actions, including distribution. Due to the more limited distribution of the Manual of Procedure, the probability of an outdated distribution matrix being utilized in determining a distribution is minimal.

Because the duplication of the distribution matrix is unnecessary and does pose some possibility for confusion when both manuals are not updated simultaneously, the Manual of Procedure will be revised to remove the matrix and to reference the distribution matrix in the Administrative Procedure Manual (AP-1). The Administrative Procedure Manual will be maintained current to reflect project administrative practices.

FINDING 7-2: ORGANIZATION CHART

The Organization Chart in the Project Manual of Procedure did not reflect the latest organization of the Seabrook Project in effect at the time.

RESPONSE:

Because the Project Manual of Procedure is basically a contractual scope document, it is not updated as frequently as working level procedure manuals. The task of maintaining the charts to reflect the various changes in personnel and organization was inadvertently allowed to slip to a low priority due to the limited exposure given the manual.

The extent of the impact is minimal due to the level of distribution of this manual.

The manual is in the process of being revised to reflect the current organization, but only to the management level. Any organization charts below this level, and their maintenance, will be the responsiblity of the individual managers. This update will be completed and the chart will be reviewed for required changes at least on a semi-annual basis.

FINDING 7-3: RECORDS OF PROCEDURE

UE&C procedures should clearly state the need to have all revisions of all procedures available within their system of records, e.g., time period to late 1975 or early 1976.

RESPONSE:

This lack of earlier revisions to procedures was due to a lack of perception that there might be a need for any revision of a procedure other than the current revision.

The impact of this deficiency is limited to the early stages of the Project. Revisions to any GEDP's or AP's and other Project related procedures over the last several years are available for audit purposes.

AP-23 will be revised to state the requirement that all revisions to all procedures governing design control be retained. A memorandum from the Project will also be issued to Corporate and Division level personnel, reminding them of this requirement and requesting they comply and document to the Project, both their agreement to comply and the method in which they will comply. This "Corrective Action" will apply to all current and future revisions to procedures.

FINDING 7-4: FILES

AP-7, "Subject File System", requires supervising engineers to transmit periodic updates to the subject file index for their discipline; however, revisions to the structural file system, which were periodically submitted by the structural supervising discipline engineer, while the file system was revised four times over the last 6 1/2 years, were not incorporated.

RESPONSE:

The "Subject File System", AP-7, in the Administrative Procedures Manual is the overall governing index for the Project. Each discipline has been assigned specific sections of the index to cover their portion of the work. The AP is the vehicle that defines to the total Project the generic filing system structure for all disciplines, any further expansion or greater level of detail within each discipline's defined areas is at the discreation of the discipline. The Structural Discipline has taken that option and further defined their sections of the Subject File System and has periodically issued the additional details for information to the rest of the Project.

The additional file structure breakdown by the Structural Discipline within their own section of the Subject File Index has been utilized by Structural and is not in conflict with any other system. Other disciplines continue to utilize the higher order file structure as shown in Administrative Procedure "AP-7". In reviewing the total index issued by Structural, there were some conflicts with the Project Index. A review of the correspondence files revealed that there were no documents utilizing the conflicting numbers and the discipline has been notified that the Project assigned subject titles will take precedence.

Structural has been reminded that modifications and/or additions to the Project Subject File Index (AP-7) require that a written request be approved by PM/PEM and submitted to the DCC, at which time AP-7 will be revised and reissued. The latest issue of the Structural Index has been reviewed against the Project Subject File Index and all conflicts resolved. Structural has been reminded by memorandum that they are not permitted to modify non-structural areas of the Subject File Index.

FINDING 7-5: ADMINISTRATIVE PROCEDURES

Within the Seabrook Project's Administrative Procedure several differences were found in AP-2, AP-14, AP-28 and AP-35.

RESPONSE:

a) The lack of update to AP-2 to reflect the change in AP-22 was an inadvertent oversight at the time the Calculation Control Program was modified.

There is no impact due to the fact that Table 8 of AP-2 is informational and provides no directive for action to anyone. It is simply a listing of the location of documents to comply with ANSI N45.2-9.

AP-2 is in the process of being revised and this oversight will be corrected. It will also be reviewed for any similar problems. This revision of AP-2 will be issued by June 30, 1984.

b) At the time the title of AP-14 was changed and the AP was reissued, the index was only updated to reflect the change in revision level of the document, the failure to pick up the title change was an oversight.

Little or no impact has occured to the fact that the contents of the AP were applicable to either title, and any person reviewing the index to identify the procedure applicable to contractor documentation would have correctly identified AP-14 as the document they were seeking.

The Index for the Administrative Procedures Manual will be modified at the next issue of an update to the manual. Further, the individuals responsible for issuing the manual have been cautioned to always check the titles for all AP's when they update the index for the revision level.

c) The reference to DEDP's in AP-28 was a carry over from an earlier period on the Project when AP-28 did apply to both GEDP's and DEDP's. Upon the issue of AP-24 in November, 1977, the reference to DEDP's was omitted from the the title of AP-28, but was overlooked in the body of the general statement.

Little or no impact has occurred because the index for the Administrative Procedure Manual correctly identifies AP-24 as the document covering DEDP's.

AP-28 will be modified to remove the reference to DEDP's.

FINDING 7-5 (continued)

RESPONSE:

d) ASP-35 was written for use on a separate project that jointly utilized the Seabrook Administrative Procedures Manual and many of the procedures therein.

There is no impact, AP-35 clearly shows that it was written for "New England Power Company, NEP-1 and NEP-2" and does not include PSNH or Seabrook anywhere in its title or subject matter.

AP-35 will be removed from the manual.

OBSERVATION 7-1: MANAGEMENT LEVEL DESIGN REVIEWS

"Preparation of Safety Analysis and Environmental Reports for Nuclear Power Plants", GEDP-0017 should cross-reference GEDP-0025, "Management Level Design Review by Chief Discipline Engineers."

RESPONSE:

GEDP-0017 was written to establish the guidelines for the preparation of Safety Analysis Reports. The requirement for Chief Engineer review was not considered a problem because it is covered in GEDP-0025. The lack of a cross-reference was simply an oversight. The Chief Engineers Review for the Seabrook FSAR was performed in accordance with procedure and is adequately documented. Upon the next revision to GEDP-0017, a cross-reference to GEDP-0025 will be added.

FINDING 7-6: COPIES OF CONTROLLED DOCUMENTS

The requirement in Administrative Procedure AP-23, "Controlled Documents", that controlled documents will have attached to them a form stating that the document is complete in accordance with the index.

RESPONSE:

AP-23 incorrectly states the intent of the action requiring the statement for completeness. The intent, as being practical, is to have the recipient of each controlled copy of a manual to review his manual in accordance with the latest index (at each index) to insure that their manual is complete and current to that index. The statement is part of the receipt, and the receipt provides room to list any omissions or problems.

The extent of impact is negligible due to the fact that the intent of the statement is in force through the receipt system. AP-23 will be revised to correctly state the intent of the statement and to better identify how it is being implemented.