PSNH

Public Service of New Hampshire

NEW HAMPSHIRE YANKEE DIVISION

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November 16, 1984

SBN- 731
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United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. J. Nelson Grace, Director
Division of Quality Assurance
Safeguards and Inspection Program
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
(d) PSNH Letter, dated June 29, 1984, "Response to Integrated Design Inspection; 50-443/83-23", W. P. Johnson to R. C. DeYoung
(e) USNRC Letter, dated October 5, 1984, "Integrated Design Inspection 50-443/83-23", J. N. Grace to R. J. Harrison

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

Dear Sir:

Reference (e) provided the results of the NRC review of our responses [Reference (d)] to the Integrated Design Inspection Findings, Unresolved Items and Observations [Reference (b)]. On November 7-9, 1984, a close-out inspection was conducted at the United Engineers & Constructors, Inc. office in Philadelphia, PA. During the inspection, we committed to provided revised/additional responses to the following IDI Findings:

Finding 2-18 - CBS Motor Torque
Finding 3-11 - Isolation Valve Closure
Finding 4-2 - Live Loads
Finding 4-6 - Tank Farm Building Stiffners
Finding 4-7 - Structural Steel Bracing
Finding 6-7 - Qualification Test Report
Finding 6-8 - Qualification Test Conditions
Finding 6-12 - EAH System Failure
Finding 6-13 - RHR System Failure
Finding 6-14 - PCCW System Failure
Finding 6-15 - Temperature Control Circuit Isolation
Finding 6-30 - Conduit Marking

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The revised/additional responses are transmitted herewith as Attachment 1.

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Finding 4-10, Analysis of Eccentricity, was left open pending a revision to the FSAR. Attachment 2 is FSAR Appendix 3F marked up to include the additional information requested at the reinspection. The revised Appendix will be incorporated in Amendment 54 to the FSAR.

Attachment 3 is a listing and status of FSAR changes required as a result of our responses to the IDI findings.

Very truly yours,

John DeVincentis

J. DeVincentis, Director
Engineering and Licensing

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ATTACHMENT 1

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).

ADDITIONAL RESPONSE:

Test verification of calculated torque margins is not actually a requirement of the CBS Pump Specification 9763.006-258-3 nor the project generic Motor Specification 9763.006-128-1.

Specification 128-1, Section 3.2.1, requires the manufacturer to "supply written proof or curves", basically on analysis or calculation, to document acceptable torque margin. The FSAR, Section 8.3.1.1.i, will be revised (see attached page) to reflect the actual specification requirements.

We consider the calculation in F.P. 51849 to be sufficient to meet the specification requirements.

Verification of the ability of a motor/pump combination to produce sufficient system flow will be tested during preoperational system testing. The motor current during this test is verified to be less than the motor rated full load current to show that the motor is not overloaded. A specific test to time motor acceleration (torque margin) is not performed; system flow verification is considered sufficient to prove motor/pump acceptability.

The thermal overload protection for continuous duty motors located inside containment is part of the the design provided to satisfy the requirements of Regulatory Guide 1.63 for containment electrical penetrations. These thermal relays will be periodically tested as defined by Technical Specification 3.8.3.1. 52

h. Equipment Grounding

Copper, copperweld cable and copper bus provide low resistance ground paths wherever electrical equipment is located. All electric equipment and non-electrical conductive material such as structures, enclosures, tanks, and raceways are grounded in conformance with IEEE Standard 142-1972 and IEEE Standard 80-1971. The building grounding system is provided with adequately sized ground cables for peripheral connections to the station ground grid.

The method of system grounding utilized at the various voltage levels is discussed in the applicable sections.

i. Safety-Related System Motor Selection

All motors are sized for continuous operation of the running load and operate successfully at 90% of rated motor voltage. Motors are capable of starting their rated loads with 80% voltage and 95% frequency at the motor terminals. The system design and diesel generator specification assures that this voltage will be present at the motor terminals when needed. The calculated continuous brake horsepower is not greater than 95% of the horsepower rating of the motor. The starting torque for the motor is based on the inertia and speed-torque characteristics of the driven equipment. 52

The motor-torque curve, at its closest approach to the load-torque curve, and at the required starting voltage, is greater than the torque required by the load at that speed. This permits the motor to develop a margin of torque over that required by the load to ensure successful starting and acceleration. The insulation system for motors is NEMA Class B, as a minimum, with the actual insulation class selected on the basis of environment and service conditions in which the motor is required to operate. The factors taken into consideration in selection of the insulation system are resistance to radiation, resistance to moisture, resistance to chemicals, ambient temperature and pressure. The motor enclosure is selected to protect against adverse environmental conditions. Winding temperature detectors and bearing thermocouples are provided on large motors to alarm high temperature conditions.

The motor suppliers are required to verify that actual test data confirm that the torque margin is equal to or greater than that of the calculated data. A further check of motor capability is the preoperational testing conducted at the site under plant light

If this requirement is not met, as an alternate, the vendor is required to furnish an analysis showing that margin between motor torque and load torque is adequate to accelerate the load within an acceptable time period.

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.

ADDITIONAL RESPONSE:

There is no normal operating condition that requires the establishment of a flow path from the containment spray pump(s) to containment via the containment isolation valves in question. Surveillance testing is performed utilizing a recirculation flow path back to the RWST. The only time that spray will be established to containment is during an accident. In this case, the emergency procedure for containment spray will be strictly adhered to. The Seabrook emergency procedures are based on Westinghouse Generic Emergency Response Procedures. The Seabrook plant specific emergency procedure does not include any steps associated with the operation of the containment isolation valves. Therefore, out-of-sequence performance of steps is not an issue. Flow termination is accomplished solely by the shutdown of the spray pump. There is no automatic closure signal to the isolation valves.

As the closure of these valves would be a multiple step operation (reset the containment spray protection signal and operate the control switch), we feel that the addition of any cautions that would address the sequential operation of these valves would not reduce the potential for closing these valves before pump trip.

Drawing 9763-F-804881 is a material balance tabulation and does not reflect the presence of a relief valve at the containment spray heat exchanger (set pressure 300 psi) that protects the piping and components downstream of the spray pump (see P&ID 9763-F-805023).

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 utilizes movable live loads in combination with seismic loads. This situation is noted as a generic finding applying to all Category I structures at Seabrook.

RESPONSE:

Movable 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.

ADDITIONAL RESPONSE:

For all Category I structures, floors will be verified for the additional single concentrated live load of * kips per bay anywhere on the floor in combination with seismic loads. Appropriate sections of the FSAR and SD-66 (Structural Design Criteria) will be revised to reflect the minimum live load design condition specified above. Uniform live load which produces equivalent effects may be considered in lieu of a single concentrated live load. Imposition of any live load greater than the specified * kips live load must be verified by the responsible plant engineer. The final verification for this additional load will be performed after completion of the project design, but prior to fuel load. This limitation will be included in the technical specification and controlled by the plant operating engineer.

*Number to be established after final verification of loadings.

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 on 15 feet of fill concrete in the north-south 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.

ADDITIONAL RESPONSE:

A 3-D model was constructed to better represent the behavior of this irregular structure. Mass condensation was used to maintain a manageable model. The steel and concrete portions of the model were shown to behave as decoupled dynamic systems, and the analysis incorporated this for economy. The modeling and the analysis methods were compatible with the provisions of Standard Review Plan 3.7.2.

Construction of the new model from 'as-built' drawings pointed out other important differences in structural configuration, boundary conditions and mass from the 1976 design of the steel portion of the structure. These include:

1. The 1976 design showed the roof over the steel structure as supported on the concrete portion of the structure along column line E.7 and on the Waste Processing Building along column line 5.0.

2. The mass of this roof is now significantly greater than in the 1976 design.

FINDING 4-6: (cont'd)

3. Changes in the framing, other than noted by the NRC, exist.

NOTE: A number of these differences had been noted during the calculation close-out effort prior to the IDI review and an in-house review was planned

The findings of the UE&C study are described below:

1. Stiffening effect of concrete fill increases structural frequencies by 6% to 12%.

2. Releasing the rotational degree-of-freedom reduced the structural frequencies by 22% to 28%.

3. Addition of 'flange effects' increases structural frequencies by 12% to 28%.

The effects of items 2 and 3 are compensating, resulting in comparable natural frequencies. Adding the effect of item 1 results in a total effect of the NRC findings to be shifts in the lowest natural frequencies in the range of - 11% to + 13%. Levels of acceleration are comparable to those obtained by previous analyses. Adding the effect of separating the steel structure's roof from the concrete structure to the sum of the effects of the NRC findings results in total shifts of lowest natural frequencies of the concrete structures of - 35% to +35%. Structural accelerations of the 'as-built' structure are generally lower than design values. Review of the structure for new forces and moments is underway. No overstress is indicated at this time. New ARS have also been generated. Approximately 80% are enveloped by existing response spectra. The balance are not enveloped because of frequency shifts. The impact on mechanical systems and equipment is being evaluated.

ATTACHMENT 1

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" x 4" x 3/4". 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.

ADDITIONAL RESPONSE:

A 3-D model was constructed to better represent the behavior of this irregular structure. Mass consensation was used to maintain a manageable model. The steel and concrete portions of the model were shown to behave as decoupled dynamic systems, and the analysis incorporated this for economy. The modeling and the analysis methods were compatible with the provisions of Standard Review Plan 3.7.2.

Construction of the new model from 'as-built' drawings pointed out other important differences in structural configuration, boundary conditions and mass from the 1976 design of the steel portion of the structure. These include:

1. The 1976 design showed the roof over the steel structure as supported on the concrete portion of the structure along column line E.7 and on the Waste Processing Building along column line 5.0.

2. The mass of this roof is now significantly greater than in the 1976 design.

3. Changes in the framing, other than noted by the NRC exist.

NOTE: A number of differences had been noted during the calculation closeout effort prior to the IDI review and an in-house review was planned.

Changes in configuration and mass of the steel structure result in a seismic response (3-D model) significantly different from the 1976 model's response. Acceleration levels are comparable, but inertia forces are larger and distribution throughout the structure is different.

The impact of this result is an apparent overstress of some anchors and bracing members. A remedial design effort is underway and a confirmatory analysis will be performed.

The assessment efforts defined above are currently in progress and will be completed by 1/31/85.

ATTACHMENT 1

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 9, 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.

REVISED RESPONSE:

Our Environmental Qualification Program, described in FSAR Section 3.11, will ensure that the requirements of 10CFR50.49 are met prior to licensing.

The status of the IEEE-323 qualification of equipment located in harsh environments is documented in our Environmental Qualification Report that compiles with the requirements of 10CFR50.49 and the guidance of NUREG 0588. Equipment that is located in harsh environments is identified on the Class 1E Equipment List by tag number, make/model and location. Environment category (harsh/mild) will be included shortly.

FINDING 6-7: (cont'd)

ADDITIONAL RESPONSE:

These are controlled documents that provide adequate documentation of qualification status to enable us to determine that the requirements of 10CFR50.49 are met prior to licensing. It is not necessary for the site QC to provide an individual status tag for each piece of 1E equipment.

The UE&C Site Records Group has been directed to mark "Not Applicable (NA)" for the Vendor Surveillance Check List requirement for IEEE-323 qualification as part of the Site Data Package. Vendor Surveillance will continue to determine the status of this qualification prior to shipment of the equipment.

This approach has been discussed with the resident Inspector (A. Cerne) and found acceptable.

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.

REVISED RESPONSE:

1. We have re-evaluated the applications of the Class 1E flow indicating switches (FIS) and have determined that the switches located inside containment are associated with isolation of a ruptured thermal barrier heat exchanger. This system has been re-designed such that this function is no longer required (FSAR Section 9.2.2). The FIS will provide high and low flow alarms, but does not require harsh environment qualification for this function.

   The present qualification of the FIS envelopes the Seabrook LOCA curves. We have reviewed the circuits that share the power supply with the FIS to determine if they are required to perform a safety function if the FIS are exposed to conditions more severe than those cause by the LOCA.

   All the circuits that share power supplies with the FIS are associated with isolation of non-safety related component cooling water piping on low level in the head tank. We have determined that this isolation function is not required when the FIS is exposed to conditions more severe than what they are qualified for. Therefore, the present design and environment qualification is adequate.

   We will revise Specification 252-16S to specify the environmental curves that are enveloped by the FIS qualification program.

2. Specification 252-16 stated Section 2.4.3.2 will be revised to reflect vendors' radiation tolerance for non-qualified instruments.

FINDING 6-12: EAH SYSTEM FAILURE

ATTACHMENT 1

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.

ADDITIONAL RESPONSE:

The control switch on the main control board will be removed.

ATTACHMENT 1

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-FCV-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.

ADDITIONAL RESPONSE:

In our initial response, we committed to a Technical Specification on the control switches for the RHR temperature control valves to ensure that they are in the proper position for the ECCS function when in modes 1, 2 and 3.

We will alarm the control switches when in the modulating position to assist the operators in meeting this technical specification. The alarm will be part of our bypassed and inoperable status monitoring system that follows the guidance of Regulatory Guide 1.47.

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 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: (cont'd)

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.

ADDITIONAL RESPONSE

UE&C is preparing a formal calculation (No. 9763-3-ED-00-64-F) to document the maximum credible open circuit voltage (40V) and short circuit (150 ma) from the instrument loop electronics (Ref. Westinghouse Process Instrumentation and Control Instruction Book - NTD Card output circuitry schematic diagram). Seismic qualification of the W output circuitry has yet to be established.

In addition to the above calculation, generic studies are being performed in Calculation Nos. 9763-3-ED-00-F and 9763-5-ES-00-1F to preclude degradation of 1E electrical, instrumentation and control systems by non-1E components. The outline of this program is attached to this response.

FINDING 6-14:

ANALYSIS OF FAILURE ON NON-SAFETY-RELATED ELECTRICAL, INSTRUMENTATION AND CONTROL EQUIPMENT

PURPOSE

This analysis verifies that all credible failure modes of non-safety-related electrical, instrumentation and control equipment that is connected to or directly affects safety-related systems do not degrade safety-related systems prior to a postulated single failure within any safety-related system.

BACKGROUND

Safety-related systems are designed to perform their safety-related function assuming a postulated single failure. The single failure criterion assumes that unqualified non-safety-related equipment have failed in the worst case, credible, mode.

METHOD

1. Identify the design documents for safety-related systems to be reviewed.
2. List the unqualified non-safety-related electrical, instrumentation and control equipment that is connected to or directly effects safety-related systems.
3. Identify credible failure modes.
4. Evaluate effects of failures.
5. Justify those effects that do not degrade the performance of safety-related systems.
6. Identify any effect that degrades the performance of safety-related systems. Refer to project management for resolution.
7. Revise analysis for corrective action to resolve unacceptable effects.
8. Document analysis in accordance with QA Program.

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.

REVISED RESPONSE:

We are in the process of analyzing the non-safety related ciruits associated with CP-152B. We are listing all non-safety-related inputs and outputs, and are analyzing the credible failure modes. We have determined that all inputs are from thermocouples or instrument sources that have low fault potential that will not damage the internal circuits. The outputs are provided with output isolators or are not damaged by credible faults of the connected loads.

This analysis is predicated on the non-safety-related components internal to CP 152B being of the same quality as safety grade components and therefore, will provide the isolation function or will not fail during a seismic event. This assumption and seismic qualification of the internal components has to be verified by contact with Westinghouse.

This analysis will be documented as required by our QA Program. We have assigned internal correspondence number MM-24272A to track this item.

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 invervals 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.

REVISED RESPONSE:

FSAR Appendix 8A recommends identification every 15 feet for exposed raceways. FSAR Section 8.3.1.4k requires that conduit be "...identified at each end where the conduit terminates and at both sides of walls, floors, and in-line boxes." which was in exception to FSAR Appendix 8A but was not specifically noted as such. We will amend the FSAR (see attached sheet) to document this exception.

We feel the intent of the identification requirements given in FSAR Appendix 8A and Reg. Guide 1.75 is to insure that cables are routed into the correct raceways and that the plant separation criteria can be correctly implemented. The following describes how the Seabrook identification criteria meets this intent.

Seabrook identification criteria is documented in the Conduit Notes and Details (Drawing No. M-300228, Note E6). Construction Procedure FEP-502, Section 5.3 insures these criteria are implemented. For documentation of QC inspection of the identification tags, a QC inspector fills out and signs the checklist in Exhibit I of FEP-502. Item 15 on the checklist requires verification that the conduit is properly marked and identified. By providing identification at the ends of the conduit where the conduit terminates we insure the cable can be routed into the correct conduit.

Seabrook separation criteria is documented in the Conduit Notes and Details (Drawing No. M-300228, Note E2) which specifies a minimum one inch be maintained between conduits of different separation groups. This separation criteria is in accordance with FSAR Appendix 8A.

Conduit is installed in accordance with construction procedure FEP-502 with Section 5.2 discussing how the separation criteria should be implemented during construction. For documentation of QC inspection and acceptance of installed conduit, the QC inspector fills out and signs the checklist in Exhibit I of FEP-502. Item 8 of the checklist requires verification that the train separation is correct. If during an inspection, an inspector finds the conduit under inspection is less than one inch to another conduit, he must trace this other conduit to an identification tag to determine its separation train. If it is of the same train, the condition is acceptable. If it is of a different train, it is a violation which is documented and must be corrected before the conduit can be accepted by QC. We feel that this shows the Seabrook identification criteria is sufficient to insure correct train separation. In addition, the tags are simple and preclude the need of reference drawings to identify a conduit which meets the intent of Reg Guide 1.75, Rev. 2.

With respect to IEEE-384 1974, we indicated in FSAR Section 8.1.5.2(a) that we reviewed it to determine if there were any requirements of safety significance that Seabrook did not meet. Since Seabrook's identification criteria insures that cables are routed into the correct conduit and that the plant's separation criteria can be correctly implemented, we did not feel that there was any safety significance to not marking conduit every 15 feet. Therefore, we indicated that Seabrook meets the requirements of IEEE 384-1974.

REVISED RESPONSE: (Continued)

As mentioned above, we feel one of the intents of raceway identification is to insure that cable is routed into the correct raceways. For cable tray, we do specify identification every 15 feet (see FSAR Section 8.3.1.4k) because access to trays can usually be made anywhere along its length and frequent markings are required to insure cables are installed in the correct tray. Basically, with respect to cable routing, we specify the minimum identification requirements in terms of access points to the raceway: frequent tray marking because of continuous access to tray and at ends of conduit since these are the only points of access. Additional conduit markings at both sides of walls, floors and in-line boxes aid in implementing separation criteria.

In summary, we feel that markings provided at both ends and both sides of walls, floors, and in-line boxes are sufficient to insure that cables are pulled into the correct conduit and not one of a different separation group and are adequate to allow inspection of conduit to insure a minimum of one inch separation between conduits of different separation groups.

BTP EICSB 27	"Design Criteria for Thermal Overload Protection for Motors of Motor-Operated Valves"

8.1.5.5 Other Standards and Documents

The electric power system is in conformance with the following documents, except as noted:

ANSI C34.2 - 1968	"Practice and Requirements for Semi-Conductor Power Rectifiers"
ANSI C37.010 - 1972	"Application Guide for AC High Voltage Breakers"
ANSI C37.4 - 1953 and Suppl. of 1958 and 1970	"Definitions and Rating Structure, AC High Voltage Circuit Breakers Rated on a Total Current Basis"
ANSI C37.13 - 1973	"Low Voltage AC Power Circuit Breakers Used in Enclosure"
ANSI C37.20 - 1972	"Switchgear Assemblies Including Enclosed Bus"
ANSI C37.90 - 1971	"IEEE Standard for Relays and Relay System Associated with Electric Power Apparatus"
ANSI C37.91 - 1967	"Guide for Protective Relay Applications to Power Transformers"
ANSI C57.12.00 - 1973	"General Requirements for Distribution, Power and Regulating Transformers"
ICEA No. S-19-81 - 1969	"Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy"
ICEA No. P-46-426-1962	"Power Cable Ampacities"
ICEA No. P-54-440 - 1972	"Ampacities - Cable in Open-top Cable Trays"
ICEA No S-66-524 - 1971	"Cross-Linked Thermosetting Polyethylene Insulation for Power Cable Rated 601-15,000 Volts" 52
NEMA MG-1 - 1972	"Motors and Generators"

G.M.H. '84

Attachment "C" of AEC letter dated December 14, 1973, entitled "Physical Independence of Electric Systems" (See FSAR Appendix 8A). For exception to section 5.1.2 on conduit markings see FSAR Section 8.3.1.4k.

Documents Applicable to Equipment Purchase Orders - The issue of the documents listed above in effect on the date of the purchase orders are applicable when supplying equipment/services against the purchase order.

G.M.H. 22 '84

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Dallas, Texas 75284

APPENDIX 3F

VERIFICATION OF COMPUTER PROGRAMS USED FOR STRUCTURAL ANALYSIS AND DESIGN

Computer programs used for structural analysis and design have been verified according to the criteria described in the US NRC Standard Review Plan 3.8.1, Section II-4(e).

(a) The following computer programs are recognized in the public domain, and have had sufficient history to justify their applicability and validity without further demonstration:

	Hardware ~~(1)~~	~~Operating Sys.~~	Source ~~(2)~~
STARDYNE	CDC	~~Scope 3.4~~	CDC (1)
MARC-CDC	CDC	~~Scope 3.4~~	CDC (1)
STRU-PAK	CDC	~~NOS~~	CDC (1)
System Professional	CDC	~~NOS~~	CDC (1)
ANSYS	CDC		CDC (1)
STRUDL	UCCEL		PSDI (2)
UEMENU	UCCEL		UCCEL (3)

~~(1) CDC hardware is the CYBER 175. Honeywell hardware is the 66/60.~~

(1) ~~(2)~~ CDC - Control Data Corporation
P. O. Box O, HQW05H
Minneapolis, Minnesota 55440

(2) PSDI - Programs for Structural Design, Inc.
14 Story Street
Cambridge, Mass. 02138

(b) The following computer programs have been verified by solving test problems with a similar and independently-written and recognized program in the public domain:

SAG058 (Response Spectra)

A summary of comparison results is shown in Table 3F-1.

AX 2 (Axisymmetric Shell Program)
A verification manual comparing AX 2 with reslts obtained from either ANSYS or BOSOR4 (Lockheed Missle and Space Co. - Palo Alto, Ca.) can be obtained from Pittsburg-Des Moines Corp., 3400 Grand Ave., Neville Island, Pittsburgh, Pa. 15225

(c) The following computer programs have been verified by comparison with analytical results published in technical literature:

SAG001 (WILSON 1)
SAG010 (WILSON 2, DYN)

Summaries of comparison results are shown in Tables 3F-2 and 3F-3, respectively.

(d) The following computer programs have been verified by comparison with hand calculations for test problems which are representative of the type used in actual analyses:

SAG008 (TAPAS)
SAG017 (FOUREXP)
SAG024 (MMIC)
SAG025 (SECTION)
PM-910 (LESCAL)
* PM-906 (STRAP)

A summary of comparison results is shown in Tables 3F-4 through 3F-8.

(e) The following computer programs are verified by inspection of the graphical output data.

SAG054 (Response Envelope)

A typical verification example is presented in Table 3F-9.

* Documentation of STRAP is available in the FSAR for Carolina Power and Light Co, USNRC Docket No 50-324 and 50-325.

11/12/84

ATTACHMENT 3

FSAR Changes Required by
IDI Findings

Finding	FSAR Changes	Status
2-9	Table 6.3-1	W to provide table update one month after completion of UE&C calculations (11/16/84).
2-18	8.3-29	Dev. 379 - To be incorporated in Amendment 54.*
2-21	App. 3A	To be updated following completion of pipe break analyses (3/29/85).
UI2-2	Table 6.3-1	(See F2-9).
3-1	Table 6.2-75 (Sh. 1 and 2)	Dev. 343 - To be incorporated in Amendment 54.
4-1 4-3	3.8-120, 3.8-121 Tables 3.3-4, 3.7(B)22	Dev. 364 - Incorporated by Amendment 53.
4-10	App. 3F	Dev. 384 - To be incorporated in Amendment 54.*
6-30	8.1-9	Dev. 368 - To be incorporated in Amendment 54.*
4-2	3.8-100, 3.8-122	Revised IDI response commits to revising FSAR to reflect minimum live load conditions. No date established for FSAR update.

*Marked up FSAR page provided with SBN- 731