TU ELECTRIC

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March 21, 1988

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
RESPONSE TO NRC INSPECTION REPORT NOS.
50-445/87-19 and 50-446/87-15

REF: 1) NRC letter dated February 8, 1988 from Mr. C. I. Grimes to to Mr. W. G. Counsil

2) TU Electric letter dated February 4, 1988 from Mr. W. G. Counsil to the NRC.

Gentlemen:

We have reviewed your report dated October 15, 1987, which provided results of your inspection of the CPSES Design Validation Program. The inspection was conducted by the Office of Special Projects as well as contractors from August 3 to September 3, 1987, at the Stone & Webster offices in Boston and Cherry Hill and at the Ebasco offices in New York.

In accordance with your request in reference (1), please find TU Electric's responses to the Mechanical/Fluid Systems open items F-1 through F-20, instrumentation & Controls open items I-1 through I-9 (excluding open items I-5 and I-6), Electrical open items E-1 through E-16 and Civil/Structural open items C/S-1 through C/S-15. TU Electric's responses to the HVAC Systems open items M-1 through M-14 were submitted via reference (2).

TU Electric's confirmation of the "project actions" pertaining to closeout of HVAC Systems open items (M-1 through M-14), as well as the responses to the open items in reference (1), will be addressed at a later date.

Very truly yours,

W. G. Counsil

JCH/grr

c-Mr. R. D. Martin, Region IV
Mr. D. P. Norkin, OSP
Resident Inspectors, CPSES (3)

OPEN ITEM C/S-1

Document Number: Calculation 16345-CS(C)-070, Revision 0, Safeguards Building

The design of roof and floor slabs uses systems supports and equipment loads as uniformly distributed attached mass. Additional equipment loads are used, as required, in the design of individual slab strips or panels. However, the design approach to estimate seismic loads due to the specific equipment is not consistent. In determining vertical seismic loads, the engineer used rigid range or zero period accelerations (ZPA) in Calculation Sets CS(C)-070, Rev. 0, Page 22 and CS(C)-074, Rev. 0, Page 9, and peak accelerations in Calculation Set CS(C)-078, Rev. 0, Page 19. No justification is provided for using ZPA. Similar inconsistency exists in determining horizontal seismic loads.

RESPONSE

Calculations 16345-CS(C)-070, 16345-CS(C)-074, and 16345-CS(C)-078 do not use the ZPA acceleration as stated in this Open Item. Calculation 16345-CS(C)-070 uses an OBE acceleration of 0.8 g vertical as an assumed acceleration of the floor, and is marked "confirmation required." This acceleration is much greater than the vertical rigid range OBE acceleration value of 0.19 g. Calculations 16345-CS(C)-074 and 16345-CS(C)-078 use an equipment acceleration equal to the peak of the original in-structure response spectra, not the ZPA. Thus all three calculations use accelerations greater than the ZPA.

The SWEC Corrective Action Program (CAP) preceeds the load verification program and is performed in parallel with the equipment qualification program. Complete validated loads are not available for the development of calculations for validation of structures. The equipment seismic loads used in the design of the structure are estimated loads. The calculation will be revised when the validated loads from the equipment qualification program are received. The validated loads will be compared to the estimated loads used in the calculation. "Confirm Required" markings will be removed from the calculation at that time.

SIGNIFICANCE/EXTENT

There is no safety concern because the accelerations used were greater than ZPA, hence more conservative.

OPEN ITEM C/S-2

Document Number: Calculation 16345-CS(C)-070, Revision 0, Safeguards Building

The multi-frequency, multi-mode factor of 1.5, used in equivalent static analysis in estimating seismic loads, was neglected without any justification, contrary to the requirement in FSAR Section 3.7B.3.5. While it is recognized that design confirmation of seismic loads can be done later, the design approach to implement basic engineering principles should be consistent, and established in the early stage in the DBDs to provide uniform directions to the designers.

RESPONSE

The equipment seismic loads used in the design of the structures are estimated loads which were not determined using the 1.5 multi-mode factor. These loads are noted in the calculation as "Confirmation Required", and these loads are being developed by IMPELL as part of the equipment qualification program. The confirmation on these loads will be removed when the validated loads from IMPELL are incorporated into the calculation.

The use of the 1.5 factor provides a conservative estimate of the loads. Use of a factor of less than 1.5 is also acceptable, however, when the equipment is judged to be rigid.

SIGNIFICANCE/EXTENT

There is no safety concern because the load verification program validates the estimated loads.

OPEN ITEM C/S-3

Document Number: Calculation 16345-CS(C)-070, Revision 0, Safeguards Building

The design of the Safeguards Building roof slab, at elevation 896 ft.-4 in. and 905 ft-9 in., is shown in this calculation. The entire roof slab is divided into several areas, and design of critical slab panels in each area is performed manually. For the area of slab bounded by Column Lines 4.5-S to 7.5-S and D-S to the Containment Building, the worst condition (critical) panel is identified between Column Lines 6-S and 7-S, and detailed calculations are performed for this panel. It appears that the panel between Column Lines 7-S and 7.5-S should also have been investigated for shear loads due to substantial loss of shear resistance caused by the penetrations near the supporting wall.

RESPONSE

The panel evaluated in Calculation 16345-CS(C)-070 was chosen based on a worst case analysis for flexure. The panel between Columns 7-S and 7.5-S was not specifically evaluated in this calculation because the shear reinforcement was adequate.

SWEC reviewed the Safeguards Building drawings and verified that slabs with openings had been evaluated. SWEC revised Calculation 16345-CS(C)-070 to document its evaluation of the panel between Columns 7-S and 7.5-S in order to demonstrate the adequacy of the design.

SIGNIFICANCE/EXTENT

There is no safety concern because the calculation reflected worst case analysis for flexure.

OPEN ITEM C/S-4

Document Number: Calculation 16345/6-CS(C)-006, Revision 0, Auxiliary Building

Supporting information is required to justify the rigidity assumption made in the floor ARS development approach used by SWEC and G&H for vertical response. The information should demonstrate that ARS based on this assumption will envelope the "spectra developed at the critical locations of each floor" such that seismic analysis of equipment, piping systems, etc. will not fail to account for the out-of-plane flexibility of the floor. Similar supporting information is required for horizontal accelerations associated with attachments to walls.

RESPONSE

SWEC concurs that building accelerations are different at various locations within the structure. Effects such as floor and wall flexibility will cause variations in the response depending upon specific location. Incorporating these effects is not necessary because of the inherent conservatisms in the seismic analysis and design. Those conservatisms have been identified in the NRC sponsored Seismic Safety Margins Research Program NUREG/CR-1489.

The design basis spectra are conservative because they were developed to envelope the ARS computed at the extreme corners or edges of the structure including effects of rocking and torsion.

To confirm the conservative nature of the design basis ARS, SWEC will perform a flexibility study of five related areas, three in the Auxiliary Building and two in the Safeguards Building. The flexibility study is anticipated to be complete by May 16, 1988.

SIGNIFICANCE/EXTENT

There is no safety concern because the design basis ARS is conservative.

OPEN ITEM C/S-5

Document Number: Calculation 16345/6-CS(C)-006, Revision 0, Auxiliary Building

Additional DBD direction is required relative to the application of floor response spectra to steel framing and/or platforms, specifically as it relates to II/I considerations or coupling of equipment and/or piping systems for seismic analysis.

RESPONSE

DBD-CS-085 was revised to clarify that structural steel (steel framing and platforms) is to be validated using an equivalent static analysis or a seismic analysis using the appropriate ARS. The DBD clarification has no effect on current calculations since these approaches have previously been implemented into the calculations for the steel framing and/or platforms.

With regard to the application of floor response spectra to seismic analysis of equipment and/or piping systems, SWEC is responsible for the validation of the design ARS and the dissemination of the results of this evaluation. Other contractors determine the proper application of the ARS as applicable to their validation/design activities.

SIGNIFICANCE/EXTENT

There is no safety concern because the DBD clarification documents previous practice and did not affect our previous calculations.

OPEN ITEM C/S-6

Document Number: Calculation 16345/6-EM(S)-009, Revision 0

The "Glastic" material partition was installed in the auxiliary relay cabinets to provide electrical separation between wire bundles of different electrical trains. The "Glastic" partitions were added as a modification after the original seismic qualification was completed.

The calculation determines whether there is any effect on the seismic qualification of the cabinet due to the modification, and provides instructions for the handling of mounting screws if the "Glastic" is removed, i.e. to remain within the seismic qualification envelope. However, the calculation neither discusses the impact of the failure of the "Glastic" partitions on the adjacent relays or other components, nor provides any justification as to why the partitions would not fail.

RESPONSE

Calculation 16345/6-EM(S)-009 was revised to include a technical justification demonstrating that "Glastic" partitions would not fail.

SIGNIFICANCE/EXTENT

There is no safety concern because the qualification of the cabinets was not affected.

OPEN ITEM C/S-7

Document Number: Calculation 16345/6-EM(S)-011, Revision 0, Auxiliary Building

This calculation determines the acceptability of the under-sized weld identified in Deviation Report I-S-STEL-146-DR2, and out-of-plumb erection of a vertical steel member in Deviation Report I-S-STEL-146-DR3. The member involved is a column for a jet shield support structure. The design load of 260 kips, for the jet shield support column, has been obtained from Gibbs & Hill (G&H) Calculation Set No. SAB-134C, Set 2. The G&H design load did not appear to be validated, and the SWEC calculation title page did not identify it under "Confirmation Required" item. Except for this open item, the calculation adequately justified the structural integrity of the jet shield support column.

RESPONSE

Calculation 16345/6-EM(S)-011 was revised to include "confirmation required" for the Gibbs & Hill jet load of 260 kips.

SIGNIFICANCE/EXTENT

SWEC is performing a surveillance of calculations to assure that "confirmation required" is properly referenced in any calculations that include unvalidated inputs. The surveillance will be completed by March 31, 1988.

OPEN ITEM C/S 8

Document Number: Calculations 16345-CS(B)-172, Revision 0, Reactor Makeup Water Storage Tank and 16345-CS(B)-133, Revision 0, Seismic Category Tanks

Confirmation is required that the "coupled" loading, used from Case 1, does actually provide enveloping element forces through the tank structure. Confirmation should include an evaluation based on "true" dynamic loading behavioral input to the computer analysis. The effect of vertical seismic force on the fluid lateral pressure should be addressed.

RESPONSE

In Revision 0 of calculations 16345-CS(B)-133 and 16345-CS(B)-172, element forces resulting from seismic excitation of the contained fluid were approximated by modeling the fluid as an equivalent weight of concrete attached to the walls. Horizontal accelerations (seismic loading) were applied and the element forces were determined using the SHELL-1 computer code. Conservatively, the maximum structural seismic acceleration (at the roof level) was applied over the entire height of the structure. This method (though not exact) results in a good approximation for the determination of the element forces in the walls of the tank.

Calculations 16345-CS(B)-133 and 16345-CS(B)-172 will be revised to include more rigorous evaluations to confirm the adequacy of the method used to approximate the dynamic fluid loads. These calculations are anticipated to be revised by June 1, 1988.

SIGNIFICANCE/EXTENT

There is no safety concern. Preliminary results indicate that the initial approximation of modeling the fluid as an equivalent weight of concrete attached to the walls was adequate. Final results will be available when the calculations are revised.

OPEN ITEM C/S-9

Document Number: DBD-CS-074, Revision 0, Containment Liner and Penetrations

The load combinations given under the Factored Load Combinations in Section 4.3.2.2 do not include the combination of Operating Temperature (To) and Accident Temperature (Ta), as tabulated in the FSAR Section 3.8.1.3.2. DBD Section 3.8.1.3.2 identifies Ta as the only temperature loading to be considered. In addition, the Ta maximum temperatures given in FSAR Section 3.8.1.3.4 have not been defined in the DBD.

The DBD section pertaining to ASME Section III, Division 2, Table 3200-1 (April 1973 Draft) does not include To with Ta under Factored Load Combinations.

RESPONSE

DBD-CS-074 Revision 1 includes the load combinations of operating temperature (To) and accident temperature (Ta). The temperature combinations and definitions were inadvertently omitted from revision 0 of the DBD but were properly applied in the calculations. The omission has no effect on the design validation process.

SIGNIFICANCE/EXTENT

There is no safety concern because the temperature combinations and definitions were properly applied in the calculation.

OPEN ITEM C/S-10

Document Number: DBD-CS-074, Revision 0, Containment Liner and Penetrations

The crane brackets shown in Figure 3.8-6 (Section 4.3.3.1) do not appear to be continuous through the liner plate. Section CC-3750 of ASME Section II, Division 2 defines additional design parameters for this situation which have not been defined in the DBD.

RESPONSE

The design requirement for evaluation of the through-thickness strength of the liner plate was not specifically addressed in Revision 0 of DBD-CS-074 although the DBD referenced the ASME B&PV Code, Section III, Division 2, Subsection CC for design. Paragraph CC-3750 of Subsection CC stipulated the requirements for consideration of through-the-thickness strength of the liner.

DBD-CS-074, Revision 1, specifically addresses the design parameters for through-the-thickness of the liner as described in CC-3750. The revision provided specific clarification of this requirement which is unique to the containment liners.

SIGNIFICANCE/EXTENT

There is no safety concern. The lack of specific description of the requirements of CC-3750 does not affect the validation process as the development of calculations for the containment liner are required to comply with the ASME III, Division 2, Subsection CC rules and requirements.

OPEN ITEM C/S-11

Document Number: DBD-CS-081, Revision 0, General Structural Design Criteria

(Sections 4.2 and 5.2) Hydrostatic loads are defined as live loads. Only 25 percent of live loads is used in seismic design of individual members, which means that only 25 percent of contained fluid mass would be used in seismic design of supporting tanks. In keeping with this approach, the roof design (Calculations CS(C)-070, -090) used a 75 percent reduced live load, when combined with seismic forces. Justification is required for treating hydrostatic loads as live loads in combination with seismic events.

RESPONSE

Hydrostatic loads are treated as live loads and the load factor associated with live loads is applied to the hydrostatic loads. For seismic analysis of contained fluid, the full weight of the fluid was considered in the calculations.

For the design of the roof for probable maximum precipitation (PMP), the full weight of the water was considered in the calculation. However, this weight of the water on the roof was not accelerated as there are no requirements to design for PMP concurrently with a seismic event.

DBD-CS-081 Revision 1 clarified this issue.

SIGNIFICANCE/EXTENT

There is no safety concern because the DBD clarification documents the approach that was used and did not affect the calculations.

OPEN ITEM C/S-12

Document Number: DBD-CS-083, Revision 0, Containment Concrete Internals

Attachments 2 and 4 are missing from the document, but not identified as missing or to be supplied later.

RESPONSE

Our review of DBD-CS-083, Rev. 0, indicates that Attachments 2 and 4 were part of the issued document.

SIGNIFICANCE/EXTENT

There is no safety concern.

OPEN ITEM C/S-13

Document Number: DBD-CS-085, Revision 0, Seismic Category I Structural Steel

Reference Section 4.1 states that "The allowable stresses of AISC are increased as defined in FSAR..." The FSAR allows no increase in allowable stresses since low probability occurrences are addressed in factored load combinations. The DBD requires clarification and/or definition of the FSAR approach to be used. Load factors are correct as stated in the DBD.

RESPONSE

DBD-CS-085 Rev. 1 sections 4.2, 4.3.2, and 4.3.3 clarified and defined the approach to be used for limitations on the increase of the allowables for factored load conditions used to design Seismic Category I Steel. The clarification and definitions reflect the criteria of FSAR Section 3.8.3.3.3 for load combinations which have a low probability of occurrence.

SIGNIFICANCE/EXTENT

There is no safety concern. The DBD clarifications have no effect on the design validation process as the increase in the allowables was properly applied in the calculations.

OPEN ITEM C/S-14

Document Number: DBD-CS-081, Revision 0, General Structural Design Criteria

Section 7.0 establishes that "Seismic Category I Buildings (with the exception of the Containment) shall be vented to the atmosphere in the event of a tornado." No directions were found to describe the analysis/design approach to be taken to account for the effects of depressurization in the building subcompartments.

RESPONSE

The tornado vent subcompartment negative design pressure used in civil/structural calculations was 3 psi for exterior building walls and 2 psi for interior walls. The 3 psi value is a bounding value and the believed to be conservative 2 psi value will be confirmed as part of PCHVP.

DBD-CS-081 Revision 1 provides specific requirements for the design of the building subcompartments for loads produced by tornado venting.

SIGNIFICANCE/EXTENT

There is no safety concern because the DBD clarification documents previous practice and did not affect the calculations.

OPEN ITEM C/S-15

Document Number: Calculation 16345/6-CS(C)-006, Revision 0, Auxiliary Building

The team reviewed the moment of inertia calculation and questioned whether it conservatively calculated bending stiffnesses. For example, we believe it assumed a larger wall width than a flange effect would typically permit. Additional justification is required for this assumption.

RESPONSE

The calculation of the moment of inertia, using the computer program Secprop3, for the safeguards building assumed the entire length of the wall was effective for establishing the inputs to Secprop3. The review team's concern was that the entire wall would not be effective for developing the bending stiffness, (moment to inertia) due to the effect of long thin walls. Calculation 16345/6-CS(C)-009, Rev. 1, evaluated the bending stiffness of a member in the safeguard building which was selected by the review team. The member selected was between elevations 858'-0" and 872'-0" of the safeguards building. The calculation demonstrated that the use of the full cross section of the beam (member) versus a selected flange portion of the beam results in insignificant effects on the stiffness for shear beam type structures.

SIGNIFICANCE/EXTENT

There is no safety concern because Calculation 16345/6-CS(1)-009 justified the assumption in Calculation 16345/6-CS(C)-006.

OPEN ITEM E-1

Document Number: Calculation 16345-EE(B)-031, Revision 0, Protective Relay Settings for 6.9 KV Safeguard Buses

For the 1,000 HP motor, the overcurrent relay tap setting has been selected as approximately 120 percent. This value is below the DBD value of 125 percent. In order to eliminate any misinterpretation, the DBD should clearly state that the overcurrent relay setting should be a minimum of 125 percent of the full load current. Also, the validation process should assure that this criterion is properly implemented for all the safeguard motors.

RESPONSE

The approach in the calculation 16345-EE(B)-031 was to set the overload protection at 125 percent as stated in DBD-EE-051; however, the exact calculated relay tap was not available and the tap closest to 125 percent of the motor full load current was chosen. For the 1,000 hp component cooling water pump, 120 percent was selected. For the auxiliary feedwater pumps and the station service water pumps, 124 percent was selected.

For the above pumps which were set at less than 125 percent, relay settings will be increased to a minimum of 125 percent as part of the final relay setting program.

SIGNIFICANCE/EXTENT

There is no safety concern for using 120 or 124 percent because these settings have taken into account undervoltage conditions and relay inaccuracies thus allowing the equipment to perform their safety function.

All other 6.9 kV Class 1E circuit breaker overload relay settings have been verified to be set at a minimum of 125 percent.

Since the DBD could have been misinterpreted by not stating a "minimum" of 125 percent, the DBD and the calculation with the above relay settings have been changed so that all 6.9 kV motor feeder overload protection will be at 125 percent minimum.

OPEN ITEM E-2

Document Number: Calculation 16345-EE(B)-031, Revision 0, Protective Relay Settings for 6.9 KV Safeguard Buses

The calculations for both the 700 HP motor and the 1,000 HP motor are based on assumed values for the full load current and the locked rotor currents. The test data values are available. (See Calculation TNE-EECA-0008-265, Revision 0, Ref. 4.1, pages 3 and 13.) The use of assumed motor data in the calculation of final relay settings may not always provide a conservative relay setting. Calculation 031 should be updated to reflect the test data. The DBD should include a requirement to use test data where available.

RESPONSE

During the review of calculation TNE-EE-CA-0008,-265, Revision 0, and the preparation of supplemental calculation 16345/6-EE(B)-031, Revision 0, locked rotor currents from the motor test data sheets were compared with calculated locked rotor currents based on the KVA code letter from the motor nameplate. The larger value was used in the calculation for conservatism. The preparer had determined that the test data available was not necessarily specific to the motors. It was a generic report submitted prior to manufacturing.

The DBD has been changed to specify the type of motor data to be used for the calculation of relay settings. The full load current should be the greater of either nameplate value or vendor test data. The locked rotor current should be a vendor test report value if available or the upper end value of nameplate KVA code letter.

Subsequent to this open item, complete data for all 6.9 KV motors has been received from the vendor. The relay setting calculations will be revised by April 29, 1988 to include this data.

SIGNIFICANCE/EXTENT

There is no safety concern because conservative locked rotor currents were used in the calculation.

OPEN ITEM E-3

Document Number: Calculation 16345-EE(B)-053, Revision 0, Sizing Verification - Class 1E Batteries and Battery Chargers

The design basis document states that the battery normal voltage is 125 V dc, with a range of 105 V (minimum) and 140 V dc (maximum). The battery vendor manual, "Stationary Battery Installation and Operating Instructures," requires that the battery be kept at a float charge level of 2.17 - 2.25 V dc per cell. This will result in a normal dc system voltage of 130.2 - 135 V dc for a 60-cell battery. This higher voltage could lead to a loss of life for the equipment designed for the DBD required 125 V dc normal voltage.

RESPONSE

IEEE Standard 946, "IEEE Recommended Practice for the Design of Safety-Related DC Auxiliary Power Systems for Nuclear Power Generating Stations," states that nominal voltages of 250, 125, 48, and 24 volts are generally utilized in station battery systems. The standard goes on to list operating voltage ranges of equipment typically connected to a nominal 125 V dc system.

CPSES FSAR Section 8.3.2.1b states that all connected loads are specified and designed for operation with a maximum input voltage of 140 V dc. Operating voltage of DC components has been validated under the component validation program. All components have been evaluated to assure that they are designed to operate with a maximum input voltage of 140 V dc.

SIGNIFICANCE/EXTENT

There is no safety concern because all components have been designed to operate with a maximum input voltage of 140 V dc.

OPEN ITEM E-4

Document Number: Calculation 16345-EE(B)-037, Revision 0, 125 V dc Load Study, Class 1E

Batteries BT1ED1 and BT1ED2 have been sized for the calculated loads on inverters IV1PC1, IV1PC2, IV1PC3, IV1PC4, IV1EC1, and IV1EC2. In order to allow for utilization of the full inverter rating, the batteries should be sized for the inverter rating. In addition, it appears that the dc power requirements have been based on a 0.8 power factor load on the inverter. The inverter load power factor can be between 0.8 and 1.0. The dc power needs should be based on the worst case power factor load (1.0) on the inverter.

RESPONSE

During original design development SWEC's practice is to use the inverter ratings to size the batteries. However, the purpose of calculations 16345-EE(B)-037, Revision 1 (125 V dc loads) and 16345-EE(B)-053, Revision 1 (Battery Sizing) was to demonstrate that these CPSES batteries are capable of supplying the present design loads. The CPSES batteries were determined to have spare capacity.

The Balance of Plant (BOP) inverter sizing calculation 16345-EE(B)-049, Revision 1, states that inverter loading is limited by the battery capacity and any loads changed or added to the BOP inverters must not exceed the battery capacity.

Calculation 16345-EE(B)-037, Revision 1, which determines loads on the DC System addresses the BOP inverters by using actual load at a 1.0 power factor. The power factor assumption in this case is the most conservative possible.

The load on the DC System from the RPS inverters is based upon full nameplate rating in KVA at a rated power factor of 0.8. The Vendor has stated that at higher power factors these machines have a lower KVA output rating. Therefore, the loading from the RPS inverters is the most conservative assumption possible.

The battery sizing calculation 16345-EE(B)-053 has been revised to incorporate this information and the results show that spare battery capacity still exists.

SIGNIFICANCE/EXTENT

There is no safety concern since the CPSES batteries were determined to have spare capacity.

OPEN ITEM E-5

Document Number: Calculation 16345-EE(B)-037, Revision 0, 125 V dc Load Study, Class 1E

Batteries BT1ED1 and BT1ED2 have been sized to provide for the diesel generator field flashing current during the first minute of the battery duty cycle. The battery capability should provide for the potential start of the diesel generator at any time during the duty cycle. As a worst case, sizing should provide for this load being added during the last minute of the battery cycle.

RESPONSE

When performing battery duty cycle calculations in accordance with IEEE-485, the largest momentary loads are considered to occur for at least a full minute. Many short duration loads are on and off during the minute but only the largest concurrent loads are considered.

The existing battery duty cycle has been based on the largest concurrent momentary loads for the first minute. The worst case diesel generator momentary load is included in the largest concurrent momentary load for the first minute.

The last minute largest momentary load is not concurrent with the diesel generator momentary load. Therefore, the last minute load envelops a diesel generator start.

Accordingly, the battery duty cycle calculation has been clarified to indicate that two diesel start attempts have been included. Only the first minute start is required for safety. Starting the diesel generator in the last minute is not safety related since the opposite train diesel would be operating and satisfy all safety load requirements.

SIGNIFICANCE/EXTENT

There is no safety concern because the worst case diesel generator momentary load is when the diesel generator is started during the first minute.

OPEN ITEM E-6

Document Number: Calculation 16345-EE(B)-037, Revision 0, 125 V dc Load Study, Class 1E

Batteries BT1ED1 and BT1ED2 provide for a momentary load for a spring charging motor for only one 7.2 kV breaker. However, the diesel generator loading tables in the FSAR (Table 8.3-1A, Sheet 3) indicates breakers for two containment spray pumps closing at the 25 second interval. Since these two breakers close at the same time, the battery sizing calculation must allow for the momentary load associated with simultaneous operation of these two spring charging motors.

RESPONSE

The battery duty cycle is based on the worst case condition which does not include two 6.9 kV breakers closing simultaneously. This condition has been determined to be loss of all ac power.

The two containment spray pumps will only operate if ac power is available and therefore the battery chargers are available. The battery chargers will provide this spring charging current and as such this load will not be seen by the battery. Therefore, it is not considered in the battery sizing calculation because it is not the worst case condition for battery sizing at Comanche Peak.

SIGNIFICANCE/EXTENT

There is no safety concern because the containment spray pumps will not start unless ac power is available.

OPEN ITEM E-7

Document Number: Specification 2323-ES-8B, Revision 2, Battery Chargers, Isolation Transformers, and Accessories

The battery charger specification requires a float voltage range of 2.15 to 2.25 volts/cell. Since the battery need is 2.17 - 2.25 volts/cell, the specification is consistent with the battery requirements. However, the battery charger specification does not indicate that the connected battery has 60 cells and, therefore, the battery requires a float voltage of 130.2 V to 135 V dc (normal). The charger specification (in the Technical Data section) indicates charger dc voltage regulation to be 128.6 V - 129.5 V dc (Item 10 on Sheet 4 of Appendix 4 to the specification). It appears that the charger is not fully compatible with the battery needs.

RESPONSE

The actual battery charger adjustable float range is 2.08-2.25 volts per cell (124.8-135 VDC) from vendor manual CP-0440B-008. Voltage regulation is $\pm$0.5 percent from the setpoint. Therefore, the battery charger range is compatible with the battery.

Technical data section, item 10 on sheet 4 of Appendix 4 of the specification, indicates charger dc voltages of 128.6 V-129.5 V which are based on Elgar acceptance test report data for determining voltage regulation. Their test was not based on a particular setpoint. The method for determining voltage regulation was...

Definition of Regulation

$$\pm\% \text{ Regulation} - \frac{E(h) - E(1)}{E(h) + E(1)} \times 100$$

where E(h) is highest UUT output voltage recorded.
E(1) is lowest UUT output voltage recorded.

(Reference: PCP PS-74-32, Production Testing of Regulated Battery Charges).

The numbers given above represent a tested voltage regulation of $\pm$0.35 percent.

Based on the above, the voltage regulating test data indicated in the Specification Technical Data Section (120 V to 129.5 V) does not represent an incompatibility between charger and battery.

SIGNIFICANCE/EXTENT

There is no safety concern because there is no incompatibiliy between the charger and the battery.

OPEN ITEM E-8

Document Number: Specification 2323-ES-8B, Revision 2, Battery Chargers, Isolation Transformers, and Accessories

The battery charger specification requires an equalizing voltage range of 2.30 to 2.50 V dc per cell. DBD-EE-044 requires the maximum system voltage to be 140 V dc, i.e., 2.33 volt/cell during equalizing, which is within the battery charger range. However, recharging the battery at this rate requires a time period of 74 to 148 hours, or more. The battery vendor manual requires, "Equalize the complete recharge of the battery in a minimum length of time..."

The charger specification (Paragraph 3.7 1.2.i) requires a 0-24 hour timer for the cell equalizing charge, which is inconsistent with the actual need of up to 148 hours or more. Since the connected equipment is designed for 125 V dc (normal), keeping the equipment at the 140 volt level for a long period could be detrimental. Also, the charger specification should state the overall equalizing voltage requirements rather than just the per cell voltage.

RESPONSE

The equalizer cycle is a completely manual operation controlled by operating procedures. Battery Charger Specification ES-8B, paragraph 3.7.1.2.i will be changed to define the timer function as being used only for the battery recharge cycle. The recharge duty is performed to bring the battery to 95 percent of capacity after a discharge. This change will bring the specification into compliance with the DBD. The charger specification will also state overall battery voltage requirements rather than on a per cell basis. Specification requirements will be revised by June 30, 1988.

The dc system voltage is discussed in response to Open Item E-3.

SIGNIFICANCE/EXTENT

There is no safety concern because the change to Specification ES-8B is a clarification only.

OPEN ITEM E-9

Document Number: Specification 2323-ES-5, 7.2 KV Metal Clad Switchgear and Accessories

The specification for 7.2 kV Metal Clad Switchgear and Accessories is consistent with Calculation 16345EE(B)-053 and requires equipment suitable for operation up to a maximum of 140 V dc. However, the data sent by the vendor (Gould, Inc.) indicates that the spring charging motor is only suitable for 90-130 V dc operation (Ref. Calculation Number 16345-EE(B)-037, Revision 0, Appendix Page 13).

RESPONSE

Subsequent to the inspection, Gould, Inc. was contacted and sent a letter stating that the equipment voltage rating of 90-140 volts dc was correct.

We have requested that Gould, Inc. submit additional information to resolve the conflicting information concerning spring charging motor operation up to 140 V dc by May 27, 1988.

SIGNIFICANCE/EXTENT

There is no safety concern because the spring charging motor will operate per specification.

OPEN ITEM E-10

Document Number: Calculation 16345-EE(B)-007, Revision 0, 480 V ac Motor Control Center (MCC) Starter Coil Pickup Analysis

Page 4 under "Assumption and Conditions" refers to ANSI/IEEE Standard C57.12.00-1980, Section 9.2. This standard is applicable to liquid-immersed distribution, power, and regulating transformers, and not to control power transformers. This reference is not applicable to this calculation and should be deleted. The assumption of ± 7.5 percent tolerance in impedance is not conservative for control power transformers. Since these transformers are not manufactured to precise tolerances, we believe that the impedance tolerances should be ± 10 percent. However, we do not expect this change to have significant impact on the calculation results.

RESPONSE

There is no industry standard to which these transformers are manufactured. In order to make allowance for some manufacturing tolerance the ±7 1/2 percent impedance tolerance was selected. The number comes from ANSI C57.12-1980 even though the standard is not applicable to these transformer sizes. The calculation failed to state that this reference was the basis for an assumption. The use of the tolerance provides conservatism in the calculation and it was our judgement that the 7 1/2 percent number was reasonable. The calculation has been modified to clarify that the standard was used as the basis for an assumption, and the calculation shows that the 10 percent tolerance does not have significant impact on the calculation results.

SIGNIFICANCE/EXTENT

There is no safety concern because the calculation shows that even with the larger tolerance there is no significant impact on the results.

OPEN ITEM E-11

Document Number: Calculation 16345-EE(B)-007, Revision 0, 480 V ac Motor Control Center (MCC) Starter Coil Pickup Analysis

The calculation on Page 4 assumes "Minimum Sustained Voltage at an MCC Bus will be 422 V." This assumption is very important and forms the basis for the whole calculation. The basis of the assumption should be documented and included in the DBD. SWEC intends to confirm this assumption as well as some others in the calculation. However, the calculation indicates that assumptions need to be verified, without identifying specific ones.

RESPONSE

In order to validate the existing voltage profiles calculation, a voltage profile calculation was prepared in parallel. Since existing voltage profile conclusions were not validated information, 422 V at the MCC bus was used as the target minimum sustained voltage that other ac system voltage calculations would aim towards.

The cover sheet of the calculation called for confirmation of all inputs. The 422 volts was an assumption which would be confirmed later by the results of Calculation 16345-EE(B)-073, Revision 1. The preparer recognized that the bus voltages would be determined in other calculations and ultimately compared against each case. If bus voltage fell below the 422 V, a new calculation would be performed for the affected circuits.

Revision 1 of Calculation 16345-EE(B)-007 has been prepared and now uses a revised minimum voltage at the MCC of 435. Based upon results obtained from Calculation 16345-EE(B)-073, Revision 1, Station Service Study - Voltage Profile Down to 480 V MCCs, the basis for selecting the MCC bus voltage will be incorporated in the DBD when the descriptive Sections 5-11 are revised.

The DBD will be revised by June 30, 1988.

SIGNIFICANCE/EXTENT

There is no safety concern because the assumptions used in the calculation are correct and will be included in a revision to the DBD.

OPEN ITEM E-12

Document Number: Calculation 16345-EE(B)-007, Revision 0, 480 V ac Motor Control Center (MCC) Starter Coil Pickup Analysis

Our review of eight randomly selected configurations revealed problems with the input data for two of those.

Configuration 7A1

Page 464 of 1010 shows relay 42x as the other load. Page 13 of 36 shows this load to be R=78, X=91.19. However, the maximum allowable circuit length calculation on Page 22 of 36 indicates the same load is R=39, X=45.6.

Configuration 8C

On Page 32 of 36, the impedance values of the 200 VA control power transformer are shown as R=.339 and X=1.085. Based on other data in the calculation, these values should be R=3.39, X=1.085. Even though this change will reduce the maximum allowable circuit length, it is unlikely to require any component changes.

In our random sample of eight configurations, we found input data errors in two cases. The input data for all of the configurations need to be verified. These data errors impact the maximum allowable circuit lengths which form the basis for acceptability for many circuits. In some cases, e.g., the 7A1 configuration, the error may have been conservative, and some of the presently projected component changes might not be needed.

RESPONSE

In the above two of approximately 40 cases, there was an error in transferring data from one place in the calculation to the individual cases. This calculation has been revised to correct the data input and transfer of information discrepancy. All cases were rechecked and no additional inconsistencies were discovered.

SIGNIFICANCE/EXTENT

There is no safety concern. Based on a sample of other electrical calculations it was determined that all electrical calculations could contain similar inconsistencies. All preparers and reviewers of electrical calculations have been retrained in calculation preparation procedures. The majority of electrical calculations have been revised by retrained personnel. All of the electrical calculations will be reviewed as part of the confirmation activity.

OPEN ITEM E-13

Document Number: Calculation 16345-EE(B)-069, Revision 0, Voltage Drop Verification - Miscellaneous DC Control

This calculation has been performed to verify the adequacy of available voltage at terminals for solenoids, relays, etc. On Page 4, Assumption No. 14, states "Load currents used are rated currents based on 125 V dc across the device...." The DBD requires use of device in-rush currents at its minimum pickup voltage. It appears that the impact of this deviation from the DBD is nonconservative. The DBD needs to be clarified because the calculation effectively assumes in-rush current to be the same as device steady state currents.

RESPONSE

The vendors of the relays and solenoids considered in the subject calculation have stated that the values of in-rush current and steady state current are the same. When a coil is connected to a DC source, the current builds gradually to a steady-state value ultimately proportional to the resistance. These devices do not have a significant change in temperature that would change the current. Therefore, the calculation is correct.

The DBD has been revised to state that if values of in-rush current differ from the steady state current, then the in-rush current value shall be used.

All vendors have been requested to provide device information for the validation of components. In-rush currents, if applicable to the device, will be included in this information. This data will be complete and calculations revised, if necessary, by August 1, 1988.

SIGNIFICANCE/EXTENT

There is no safety concern because the in-rush currents and steady state currents are the same in this instance. The DBD revision ensures that the proper current value will be used.

OPEN ITEM E-14

Document Number: Calculation 16345-EE(B)-069, Revision 0, Voltage Drop Verification - Miscellaneous DC Control

This calculation identifies approximately 290 dc schematics. Out of these, only 28 were selected for specific voltage drop analysis. Procedure PP-218 requires, "On a panel-by-panel basis, the assigned circuits will be addressed by length, loading, and minimum device voltage." The calculation should provide justification as to how the 28 analyzed circuits envelop all 290, e.g., a list of circuits enveloped by each of the 28.

RESPONSE

The calculation preparer analyzed each circuit for the three attributes as follows:

Length - The schematic indicates the location of the elements; therefore the distance between each can be estimated.

Loading the largest elements or combinations were selected,

Voltage - The elements requiring the greatest voltage were selected.

The circuit with the largest combination of these three attributes was selected for analysis. Using this branch, the worst case voltage required at the panel was calculated. The calculation did not document the basis for the judgement that all the remaining circuits were enveloped by the selected circuit. The remaining circuits on the panels have been calculated and the results documented in the revised calculation. These results are consistent with the original calculation.

SIGNIFICANCE/EXTENT

There is no safety concern because the revised calculation results are consistent with the original calculation. The same documentation requirements are applicable to and have been incorporated in the miscellaneous ac circuit calculation 16345-EE(B)-027. This calculation has been revised in a similar fashion.

OPEN ITEM E-15

Document Number: DBD-EE-054, Revision 0, Control Circuit Parameters/Loading Requirements, Section 7.1.5

The design basis document in Section 7.1.5 states, "The circuit breakers are tripped via electrically resettable lock-out relays, ITE Type J14, located in the switchgear."

The contact rating for the Type J14 relays is not sufficient to trip or close 7.2 kV breakers. As per ITE, these relay contacts have a make and break rating of 1.1 amperes. The 7.2 kV breakers have a trip current of approximately 5 amperes. Therefore, the relays specified are not suitable for the application.

RESPONSE

Subsequent to the date of the finding, the vendor was required to supply information on the contact rating of the J14 relay. We have received a letter stating that the break rating is 1.1 amps and the make rating is 60 amps as applied to the CPSES equipment. Those contacts do not perform a break function in these circuits.

The vendor is being requested to provide certification of contact tripping/closing duty ratings to the requirements of ANSI C37.90 - 1978, "Relays and Relay Systems Associated with Electric Power Apparatus, Paragraph 6.6, Make and Carry Ratings for Tripping Contacts." We anticipate this certification will be available by May 31, 1988.

SIGNIFICANCE/EXTENT

There is no safety concern because the vendor letter indicates that the relays are suitable for the application. Formal documentation is being provided by the vendor for confirmation.

OPEN ITEM E-16

Document Number: Calculation 16345-EE(S)-147, Revision 0, Cable Sizing Calculation - DC System

The approach and methodology used in calculation 16345-EE(S)-147 conform to the design criteria. Although the results are based on an unvalidated Gibbs & Hill calculation (Filing Code VII-8), the cover page of the subject calculation reads "no confirmation required." Other site calculations should be reviewed to ensure that those which are based on unvalidated data are shown as requiring confirmation. Open Item E-13 (Calculation 16345-EE(B)-069) concerning failure to address device in-rush currents in voltage drop calculations is applicable to this calculation also.

RESPONSE

Gibbs & Hill calculation VII-8 was validated by supplementary calculation 16345-EE(B)-011. This supplementary calculation indicated confirmation of inputs was required.

Calculation 16345-EE(S)-147 was issued before Calculation 16345-EE(B)-011, therefore, it was not proper to reference it.

Calculation EE(S)-147 will be modified to the extent required by the determination of in-rush currents as described in the response to open item E-13.

SIGNIFICANCE/EXTENT

Calculation 16345-EE(S)-147 will be reissued by April 29, 1988, showing confirmation of inputs is required. Site personnel are being instructed to make sure the validation status of any calculation is obtained before it is used as a reference. As stated in the response to open item C/S-7, a surveillance of calculations will be performed to assure that "Confirmation Required" is properly referenced in any calculations that include unvalidated inputs.

OPEN ITEM F-1

Document Number: Calculation 16345-ME(B)-169, Revision 0, Containment Spray Flow Rates

Calculation for NPSH in injection mode:

1. DBD-ME-232 is used to reference flowrates to other components (ECCS); however, the DBD does not delineate flow assumed in this calculation. EFE did not address.

2. 120°F RWST temperature was assumed; DBD states a 100°F RWST maximum temperature. EFE addressed.

RESPONSE

The primary source for the ECCS flow rate used in calculation 16345-ME(B)-169 was WPT-3358, "RWST Level Setpoints and ECCS Switchover" dated July 16, 1980. DBD-ME-232 was not intended to be the reference for flow rates. When calculation 16345-ME(B)-169 was being prepared, attachments from a related containment spray calculation were used as part of calculation 16345-ME(B)-169. Reference numbers were not changed to reflect the attachment and the reference for the flow value in DBD-ME-232 due to administrative errors.

New calculation 16345-ME(B)-236, which supercedes 16345-ME(B)-169 has been completed and properly references the source for the maximum allowable ECCS flow rates when determining NPSHs.

DBD-ME-232 identifies RWST water temperature correctly in the design rquirements section (Section 4.3), but incorrectly in Section 5.3. RWST temperature in Section 5.3 has been corrected to 120°F, in Revision 1 of DBD-ME-232.

SIGNIFICANCE/EXTENT

The attachment which was the source of the incorrect reference was only utilized for this calculation. Therefore, the use of an incorrect reference identified in the open item is limited to this calculation and is considered isolated. This was an administrative error and had no safety significance.

The inconsistency between RWST temperatures identified in the open item is not a safety concern because the correct temperature was used in the calculations. However, the open item is relevant to other mechanical DBDs. DBD Sections 1 through 4 (which describe system design basis criteria) were being revised at the time the open item was identified. DBD Sections 5 through 10 (which describe how the system meets the design criteria) are scheduled to be updated to reflect the results of the validation effort by June 30, 1988.

OPEN ITEM F-2

Document Number: Calculation 16345-ME(B)-169, Revision 0, Containment Spray Flow Rates

Calculation for NPSH in recirculation mode utilizes 120°F sump suction temperature. This violates Regulatory Guide 1.1, which requires utilization of maximum containment sump water temperature (>212°F). EFE was apparently insensitive to LOCA conditions and instead addressed the RWST temperature as pertaining to the recirculation mode.

RESPONSE

The maximum RWST temperature was used instead of the maximum containment sump water temperature. The calculation has been superseded by 16345-ME(B)-236, which calculates NPSH in accordance with the CPSES position on Regulatory Guide 1.1 as stated in the FSAR Appendix 1A(B) (CPSES position is that the containment pressure is equal to the vapor pressure of the sump water). This error is attributed to an isolated oversight on the part of a qualified and experienced checker and independent reviewer of calculation 16345-ME(B)-169. Adequate NPSH exists for the Containment Spray Pump in the recirculation mode as shown in completed calculation 16345-ME(B)-236.

SIGNIFICANCE/EXTENT

There is no safety concern as shown in calculation 16345-ME(B)-236. Use of improper sump temperature in determining NPSH is isolated to this case. The other ECCS systems which take suction from the sump have been evaluated in accordance with Regulatory Guide 1.1 as stated in FSAR Appendix 1A(N).

OPEN ITEM F-3

Document Number: Calculation 16345-ME(B)-169, Revision 0, Containment Spray Flow Rates

Containment Spray pump minimum flow is defined (750 GPM). However, maximum allowable flow should also be defined for comparison to both this calculation and startup flow calculation. EFE did not address.

RESPONSE

The vendor shop test curve is used as input for both calculations in this item; thus maximum allowable flow is defined. The vendor shop test curve shows a test point flow rate at 4641 gpm. Therefore, the calculated maximum flow in calculation 16345-ME(B)-169 of 4100 gpm can be met by the pump.

SIGNIFICANCE/EXTENT

There is no safety concern.

OPEN ITEM F-4

Document Number: Calculation 16345-ME(B)-169, Revision 0, Containment Spray Flow Rates

Containment Spray flow analysis neglects spray additive eductor hydraulics. EFE did not address.

RESPONSE

The eductor was not modeled because its contribution to the flowrates was judged to be negligible. There is no impact on the calculation results and the engineering judgement is correct although not documented in Calculation 16345-ME(B)-169. Eductor flow rates have been included in Calculation 16345-ME(B)-236 which supersedes 16345-ME(B)-169 and acceptable results have been achieved.

SIGNIFICANCE/EXTENT

There is no safety concern as shown in calculation 16345-ME(B)-236. This open item is limited to calculation 16345-ME(B)-169 and calculation 16345-ME(B)-057. These calculations, which were the only ones performed by the same preparer, have since been superseded by calculation 16345-ME(B)-236 (which addresses the open item) and calculation 16345-ME(B)-276.

OPEN ITEM F-5

Document Number: Calculation 16345-ME(B)-169, Revision 0, Containment Spray Flow Rates

Reference 8, G&H calculation 2323-529, Revision 0 gives minimum recirculation sump elevation water level of 810 ft. vs. 814.8 ft. in G&H sump performance study. EFE addressed this.

RESPONSE

A minimum water level of 810 feet was assumed in Calculation 16345-ME(B)-169 to provide conservatism in the NPSH analysis. This value is less than the value in either calculation 2323-529 Rev. 0 or the G&H sump performance study, and therefore is an acceptable assumption. Calculation 16345-NU(B)-10, Rev. 0 validates the correct level and is used in calculation 16345-ME(B)-236 which supersedes calculation 16345-ME(B)-169.

SIGNIFICANCE/EXTENT

There is no safety concern because a more conservative value for minimum recirculation sump elevation water level was used.

OPEN ITEM F-6

Document Number: Calculation 16345-ME(B)-169, Revision 0, Containment Spray Flow Rates

Attachment B - Pipe and Fitting Losses

Page B4 - Combining flow path resistances in parallel (equivalent header resistance calculations) - Calculation method given is only valid for parallel flow paths originating and discharging to the same HGL (Hydraulic Grade Line). Spray header parallel flow calculations originate at the same node, but discharge to nodes having different HGL. EFE addressed this.

Page B3 - 24" suction header, CS/ECCS flow is 26,000 GPM per reference 7/page 4, but the reference does not give this flow rate. EFE did not address.

Page B3 - RWST Sparger is not accounted for in the hydraulic resistance calculations. EFE did not address.

RESPONSE

Page B4 - This calculation used a combined equivalent flow path to calculate head loss. Spray header elevation differences need not be taken into account because it was assumed that the balancing orifices in each of the spray header risers are sized to counteract the effects of different elevations. Calculation 16345-ME(B)-236, which supersedes calculation 16345-ME(B)-169, addresses header elevation differences by using the most restrictive header flow path. Calculation 16345-ME(B)-236 shows that the effects of this item on the calculation results are not significant.

Page B3(1) - This item is identical to Open Item F-1, No. 1.

Page B3(2) - Calculation 16345-ME(B)-169 did account for RWST sparger hydraulic resistance by stating in the engineering judgement that it was negligible. Calculation 16345-ME(B)-236 models sparger hydraulic resistance. This calculation shows that NPSH during injection for the containment spray pumps is adequate and that the hydraulic resistance effects due to the sparger are negligible.

SIGNIFICANCE/EXTENT

The open items are limited to calculation 16345-ME()-169 and calculation 16345-ME(B)-057. These calculations which were the only ones performed by the same preparer, have since been superseded by calculation 16345-ME(B)-236 which addresses this open item and calculation 16345-ME(B)-276.

OPEN ITEM F-7

Document Number: Calculation 16345-ME(B)-169, Revision 0, Containment Spray Flow Rates

Attachment C

Page C29 - Heat exchanger K factor of calculation. 14.12 PSID is based on a velocity of 9.5 feet/sec. It is not clear whether this relates to pipe velocity, heat exchanger tube velocity or some other basis. This was not addressed by EFE.

Page C97 - Sump Suction Path

(EFE addressed some of the below items.)

- No containment sump recirculation screen pressure drop is accounted for; however, G&H Sump Performance Study assumes .4 feet head loss.

- There is no piping inlet loss factor for the protruding sump suction pipe.

- The calculation refers to a 16 x 16 x 12 tee with no flow in the run, giving a loss factor of 0.26. This loss factor appears low, and it also appears that there is flow in the run.

- The suction piping includes a transition involving both 16' x 3/8" wall pipe and 16" SCH 120 pipe. The size transition expansion and contraction losses should be accounted for.

- Hydraulic losses for only one suction path are given in the calculation. Friction losses for the other path should be calculated.

It is noted that the frictional components delineated above, although individually relatively insignificant, are collectively important due to the small NPSH margin available for the recirculation mode (i.e., >212°F temperature).

RESPONSE

Page C29- A "K" factor of 24 was calculated based on the data given on the heat exchanger data sheet (7200 GPM, DP = 14.12 psid, V = 9.5 ft/sec.). The velocity of 9.5 ft/sec is the tube velocity. The difference between the tube velocity and pipeline velocity is small, making the results acceptable. However, a complete description of the approach used was not provided. Calculation 16345-ME(B)-236, which supersedes calculation 16345-ME(B)-169, used an alternate approach in determining friction loss coefficients and has been completed with acceptable results.

OPEN ITEM F-7

RESPONSE (Continued)

Page C97 - Containment sump screen DP, pipe entrance losses, and expansion/contraction losses from 16" - SCH 120 pipe transition to 16" - 3/8" wall pipe were not included in the calculation due to their expected insignificant contribution to total head loss and the margin in the final (but not determined) result based on the conservative sump water level assumption used in calculation 16345-ME(B)-169. However, these items have been included with acceptable results in calculation 16345-ME(B)-236, which supersedes calculation 16345-ME(B)-169.

The "K" factor of 0.26 is for flow through a tee run. The correct K factor for flow through the tee branch has been included in calculation 16345-ME(B)-236 with acceptable results.

Hydraulic losses were calculated in calculation 16345-ME(B)-169 for train "A" only. A similarity analysis was performed (subsequent to the audit) to compare train "A" to train "B" and the differences have been evaluated with respect to NPSH. Calculation 16345-ME(B)-236, which supersedes 16345-ME(B)-169, addresses similarity with acceptable results.

Calculation 16345-ME(B)-236 collectively addresses these and all related findings. Acceptable results have been achieved.

SIGNIFICANCE/EXTENT

There is no safety concern as shown in calculation 16345-ME(B)-236. The open item is limited to calculation 16345-ME(B)-169 and calculation 16345-ME(B)-057. These calculations, which were the only ones performed by the same preparer, have since been superseded by calculation 16345-ME(B)-236 which addresses the open item and calculation 16345-ME(B)-276.

OPEN ITEM F-8

Document Number: Calculation 2323-535, Revision 0, RWST Sparger Sizing (Suction Line)

The calculation relies heavily on Reference 1 (Gould Pump Manual) Figure 5 to determine sparger submergence requirements but does not establish the applicability of this manual to the actual sparger configuration (82 suction holes in close proximity) and the flowrates involved.

The calculation results require a 12" minimum horizontal distance from sparger suction holes to the free surface of the borated water to preclude air entrainment. However, suction holes located at the extreme ends of the sparger (Brown & Root drawing BRP-S1-1-YD-001, Revision 16) do not meet this requirement.

RESPONSE

Calculation 2323-535 was validated based on the low level setpoint assuring 5 feet of water above the sparger. The responsible engineer's review copy states this, but this information was not added to the calculation validation record. Confirmation required based on the results of the review of calculation 2323-522 was included on the validation record.

Calculation 2323-522 was later superseded by calculation 16345-ME(B)-124, which calculates a lower setpoint. During the process of removing confirmation required from the calculation validation record for G&H Calculation 535, it was determined that verification of the adequacy of the Gould Pump Manual assumption was required.

Based on the results of this verification, the calculation record was revised and an evaluation of the sparger design was performed. This evaluation is contained in calculation 16345-ME(B)-282. The evaluation concludes that sufficient sparger submergence exists to prevent vortexing (air entrainment).

The calculation validation record for calculation 2323-535 is scheduled to be completed by October 30, 1988.

SIGNIFICANCE/EXTENT

There is no safety concern because sufficient sparger submergence exists to prevent vortexing in this case. Other safety-related free surface tanks which are drawn down by pumps to a low level will be evaluated for acceptable submergence regarding vortex formation.

OPEN ITEM F-9

Document Number: Calculation 2323-232-14, Revision 1, Setpoint Chemical Additive Tank

This document assures 4500 gallons useable volume for the chemical additive tank; however, no basis or reference for the 4500 gallon requirement is provided. Without this linkage, if the 4500 gallon requirement changes, there is no assurance that the subject calculation would be updated.

This document relies on high accuracy instruments ($\pm$1.5 percent, $\pm$3.5 percent). It is questionable whether these accuracy levels can be maintained for the plant lifetime. The calculation should explore the instrument accuracy necessary to accomplish the intended function, rather than assuming high available accuracy. It is understood that these matters are typically resolved in the mechanical/I&C interface.

RESPONSE

Calculation 16345-NU(B)-026, which superseded calculation 2323-232-7, establishes the volume requirements for the chemical additive tank.

Setpoint calculations 16345-IC(B)-006 and 16345-IC(B)-007, will be revised as part of the confirmation process (by June 30, 1988) to supercede calculation 2323-232-14 and identify calculation 16345-NU(B)-026 as the reference for the process requirement input. As part of the design reconciliation/input confirmation phase of the SWEC-CAG Design Validation Program, the inputs and assumptions for both the mechanical and I&C setpoint calculations will be confirmed. After the calculations have been confirmed, the results of the I&C setpoint calculation will be reviewed against the requirements of the mechanical setpoint calculation and the system design requirements. If the I&C setpoint calculation results are not in conformance with system design/performance requirements, corrective action will be taken. Corrective action could include (but not be limited to) revising the mechanical (and therefore the I&C) setpoint, replacement of instrumentation, or system reanalysis or redesign, as required, to bring the actual system setpoints into conformance with system design requirements.

SIGNIFICANCE/EXTENT

There is no safety concern because the correct usable volume (from calculation 16345-NU(B)-026) was used in calculations 16345-IC(B)-006/007 to establish setpoints. Additionally, design reconciliation/input confirmation phase of the SWEC-CAG Design Validation Program is specifically intended to confirm inputs and assumptions as explained above.

OPEN ITEM F-10

Document Number: Calculation 16345-ME(B)-096, Revision 0, Containment Spray Heat Exchanger Convection Coefficient

It appears that the 80 percent fouling allowance used for the containment spray heat exchanger calculations results in an overall heat transfer coefficient about 30 to 40 percent higher than the heat transfer coefficient obtained with use of Westinghouse RHR system design fouling allowance. Note that the containment spray and RHR heat exchangers utilize the same fluids on both sides. S&W should either justify the fouling allowance difference for the two heat exchangers or assess the impact of using the higher fouling allowance for the containment spray heat exchanger.

DBD-ME-232 contains numerical discrepancies (Section 10.3.3) with respect to velocities, flowrate and pressure drop for the containment spray heat exchanger.

RESPONSE

As a result of this item, a more conservative fouling factor, rather than the 80 percent cleanliness factor, was used as input in calculation 16345-ME(B)-283 which superseded calculation 16345-ME(B)-096. This new fouling factor was then used to evaluate containment spray heat exchanger capacity to ensure that containment heat removal and depressurization requirements were met.

At the time of this inspection, Section 10.3.3 of DBD-ME-232 had not been fully developed. Numerical information on the heat exchanger will be evaluated during the confirmation phase of component validation for the heat exchanger. Any discrepancies in the DBD will be corrected during reconciliation of DBD Sections 5-11 (June 30, 1988).

SIGNIFICANCE/EXTENT

The concern is limited to the Containment Spray, Spent Fuel Pool Cooling, and Component Cooling Water Heat Exchangers. Each of these heat exchangers is being reevaluated using a conservative fouling factor. These evaluations will be complete by April 30, 1988.

OPEN ITEM F-11

Document Number: DBD-0206, Auxiliary Feedwater System

Referenced Codes and Standards:

The Design Basis Document for this system does not adequately reference applicable codes, regulatory requirements and design guidance documents applicable to this system's design. USNRC Standard Review Plans are not referenced. Further, reference to all relevant design guidance documents, such as applicable NUREG documents, IE Bulletins, INPO Experience Reports, etc., should be made within those sections of the Design Basis Document which derive their technical requirements from these documents. This Design Basis Document references FSAR section extensively. However, the FSAR should not be considered as a source for system design basis.

RESPONSE

DBD-ME-206 has been issued as Revision 1 which references all relevant design guidance documents for design criteria in Sections 1 through 4. These documents included applicable NUREG documents, IE Bulletins, INPO Experience Reports, etc. from which the technical requirements are derived. However, the FSAR may contain licensing commitments not reflected in other source documents and as such is reviewed for relevant design criteria.

SIGNIFICANCE/EXTENT

The open item is relevant to all mechanical DBDs. Sections 1 through 4 (Criteria Sections) were being revised at the time the open item was identified. All DBDs have been reissued with design criteria which do not refer to the FSAR directly.

OPEN ITEM F-12

Document Number: DBD-0206, Auxiliary Feedwater System

System Function:

The Design Basis Document describes the system requirement to provide a minimum flowrate to steam generators. However, there is no discussion of the anticipated variation in flow demand, and possible control valve operational deficiencies which may surface due to the character of steam generator level response during hot standby and cooldown conditions.

The Westinghouse Steam Systems Design Manual (SIP 10-1), Appendix A, page A33 lists a criterion that auxiliary feedwater regulation "...valves be equipped with safety grade accumulators of sufficient capacity to permit operation of valves for the maximum number of anticipated cycles of operation..." While this Westinghouse manual is not currently referenced in the Design Basis Document, it is noted that accumulators are sized to provide five valve cycles during a 30 minute period allotted before manual local modulation of auxiliary feedwater valves is assumed (DBD Section 4.3.2.3).

There is no documented evidence that five valve operating cycles is adequate for the intended service. The concern here is the anticipated large level swings which may occur in hot standby conditions when safety relief valves lift and reseat. For some plants this level swing can cause level indications off-scale high or low, which in turn may induce the operator to attempt AFW flow control actions more frequently than the installed air accumulators allow. These phenomena should be technically addressed and operational cautions established if warranted.

RESPONSE

On pages 5-4-7 and 5-4-10 of SIP 10-1, Westinghouse recommends that accumulators "Permit remote valve closure for isolation of a secondary system pipe break within the required time period following an incident." For CPSES, based on system design and mass/energy release to the containment, these valves do not need to be cycled any earlier than 30 minutes following an incident. Since CPSES Operations has committed to achieving local operation at 30 minutes after an incident, the accumulators are not required to cycle the valves, only shut them once. All subsequent valve operation will be accomplished by local manual control. The five cycles have been utilized in the accumulator sizing calculations, even though the valves are not required to be cycled at all during the first 30 minutes after the accident.

DBD-ME-206, Section 5, will be revised to reflect this design by June 30, 1988. This item has previously been addressed by TU Electric Technical Evaluation Report TSR-87-28.

SIGNIFICANCE/EXTENT

There is no safety concern. Sections 1 through 4 of the mechanical DBDs were being revised at the time the open item was identified. Sections 5 through 11 are scheduled to be updated to reflect the results of the validation effort by June 30, 1988.

OPEN ITEM F-13

Document Number: DBD-0206, Auxiliary Feedwater System

Operating Modes:

Section 5.2.1A of this DBD states that Auxiliary Feedwater System operation is discontinued once "...67 percent steam generator level is maintained...".

It should be made clear if this statement applies to the narrow or wide range level instrumentation, and if the same values are applicable to Units 1 and 2, since level spans for each unit are different.

Section 5.2.2A indicates that the Auxiliary Feedwater System is used during LOCA "...to prevent primary to secondary leakage..". This statement should be modified to factor in purposes presented in the Westinghouse Steam Systems Design Manual, SIP 10-1 (heat removal and radiological concerns).

In Section 5.2.2 B&C it is stated that a steam line break or feedwater line break is "...initiated by..."; "indicated by" are apparently the intended words.

Section 5.2.2.C implies that a feedwater line break will be indicated by low steam generator levels, although a single line break of intermediate size may not cause these conditions. It is also noted that there is no discussion of the loss of offsite power operating condition, or station blackout considerations. The applicable spectrum of postulated accidents and resulting indications/actions should be addressed to determine enveloping scenarios for system design.

RESPONSE

Sections 5.2.1A, 5.2.2B, and 5.2.2C - These items have been identified by TU Electric Technical Evaluation TSR 87-28. These items will be corrected in the next revision of Auxiliary Feedwater DBD-0206, scheduled for completion by June 30, 1988.

Section 5.2.2A - The wording of Section 5.2.2A, which is taken directly from the Westinghouse Steam Systems Design Manual, SIP 10-1, describes an additional function of the auxiliary feedwater system during a LOCA when steam generator tube leaks are present. The heat removal functional requirements of the Auxiliary Feedwater System are described in Section 2.2 of the DBD.

Section 5.2.2C - The feedwater line break that is not large enough to cause a low steam generator level will not initiate the auxiliary feedwater system since the normal feedwater system would be maintaining steam generator level. The auxiliary feedwater system is required to operate only when normal feedwater is incapable of maintaining steam generator level.

The next revision to the DBD will include a discussion of auxiliary feedwater operation for the applicable spectrum of postulated accidents.

OPEN ITEM F-13 (Continued)

SIGNIFICANCE/EXTENT

The descriptive sections of all DBDs (Sections 5 through 11) will be reviewed for completeness of operating mode conditions and revised as necessary to reflect the results of the validation effort by June 30, 1988.

OPEN ITEM F-14

Document Number: DBD-0206, Auxiliary Feedwater System

System Reliability:

Auxiliary Feedwater System reliability has historically been a problem at nuclear plants. In particular this system often fails to perform its intended function due to (a) turbine driven pump steam supply and/or governor problems or (b) back leakage and steam binding of pump casings during normal operations. These concerns should be addressed within the design basis document.

RESPONSE

Reliability issues associated with the turbine pump steam supply, the turbine governor, and back leakage into the auxiliary feedwater system from the feedwater system, have been addressed in the validation review. System changes (hardware and software) have been initiated in accordance with the project procedures and are described on DMRCs 87-1-220, 87-1-038, 87-1-040, 87-1-083, 87-1-118, and DM 85-273. The specific details of these improvements will be discussed in the descriptive sections (5-11) of the DBD when the validation results are incorporated (June 30, 1988).

SIGNIFICANCE/EXTENT

There is no safety concern because the reliability issues associated with the Auxiliary Feedwater System have been addressed in the validation review and will be included in the next revision of the DBD.

OPEN ITEM F-15

Document Number: Calculation 16345-ME(B)-006, Auxiliary Feedwater System Instrument Setpoints

A pressure switch located on the pump suction piping is used to indicate low suction pressure and trip the applicable pump to protect the pump from damage. In the calculations to determine switch setpoints, errors were found due to lack of use of appropriate units. For example:

On Page 11, suction pressure is correctly calculated as 46.11; however, units of absolute feet are omitted.

46.11 feet absolute i[illegible] converted to PSIA correctly (46.11 * 61.7/144 = 19.76 PSIA). However, th[illegible] [illegible] is incorrectly labeled "Ft."

The 19.76 value is [illegible]ectly converted to "PSIG" by multiplying by 0.43.

RESPONSE

Calculation 16345-ME(B)-006 mistakenly labels 19.76 PSIA as 19.76 ft. The resultant conversion to PSIG is incorrect. A[illegible] result of this error the calculated setpoint was more conservative tha[illegible] the correct setpoint. This calculation was revised to correct this setpo[illegible]

The AFW pump trip on low suction pressure has been deleted by approved DCA 58826, dated October 9, 1987. Calculation 16345-ME(B)-006 has been revised to delete AFW pump trip as well as to revise alarm setpoints.

SIGNIFICANCE/EXTENT

There is no safety concern. Other calculations prepared by the same engineer were reviewed for similar items. No similar items were identified in these calculations. Therefore, this open item is considered isolated.

OPEN ITEM F-16

Document Number: Calculation 16345-ME(B)-006, Auxiliary Feedwater System Instrument Setpoints

If pump flow approaches a minimum value, a recirculation path must be opened to avoid pump damage or undesirable vibrations within the system. Control actions for pump recirculation valves utilize flow settings which will require orifice differential pressure instrument repeatability on the order of .01 PSID (for an instrument rated at several PSID and instrument pressure rating of thousands of PSIG). System flow latitude margins may need to be relaxed to allow less restrictive instrument requirments. The team understands that this should be resolved in the normal mechanical/I&C interface which had not been completed at the time of the review.

RESPONSE

As part of the normal Mechanical/Instrumentation & Controls interfaces, the Instrumentation & Controls Group uses mechanical setpoint calculations as input to determine the actual instrument setpoints. If it is determined that the proposed setpoint cannot be accommodated with the instruments that have been installed, the mechanical calculation is revised to accommodate the actual instrument's range while still accomplishing the required function.

For the applicable instruments, FB-2456/2457, the Mechanical/Instrumentation and Controls interfaces have been resolved. The instrument setpoint calculations, 16345-IC(B)-008/009, have been issued.

SIGNIFICANCE/EXTENT

There is no safety concern because the instrument setpoints can be accommodated with the installed instruments while still accomplishing the required function.

OPEN ITEM F-17

Document Number: Calculation 16345-ME(B)-053, Auxiliary Feedwater System Performance

Several design basis items were not adequately addressed within the calculations:

For all evaluated cases of a faulted steam generator, friction of high energy piping upstream of the steam generator was included in the calculations. This causes nonconservative spill flowrates with respect to CST inventory requirements and pump runout flowrates.

The DBD states that maximum runout flow of 700 GPM is precluded by flow restricting orifices within the system. This calculation indicates flowrates exceeding this value. When actual pump retesting is performed, test data should be obtained for operating points beyond all normally expected flowrates to verify acceptable pump operations, NPSH, etc.

The DBD presents pump test head/capacity acceptance criteria. This condition represents a worn pump that provides less capacity than the original new pump. The calculations are performed with new pump test curve input data, and do not illustrate that pumps meeting the DBD acceptance criteria will meet system function criteria. Allowable pump wear margins, and pump periodic testing acceptance criteria should be factored into the subject system performance calculation.

In addition, the calculation did not account for the pressure loss due to the steam generator inlet sparger pipe.

RESPONSE

The following response address the four items noted above in the same order:

a. Although the friction losses upstream of the steam generators were judged to be inconsequential, calculation 16345-ME(B)-053 was revised to include this term. The new flowrate is 0.08% greater than the original flowrate. There is no impact on containment overpressurization or CST inventory.

   The results of the reanalysis confirms the initial assumption.

b. The calculation is correct. Sections 5 through 11 of this DBD will be revised to reflect the calculation results by June 30, 1988. Also, manufacturers data or pump test data will be referenced in the DBD to identify the correct pump runout flow.

OPEN ITEM F-17

RESPONSE (Continued)

c. Calculation 16345-ME(B)-053 was performed to determine system performance with new pumps only. As part of the SWEC CAP validation program, the surveillance requirements of the Technical Specifications are reviewed. As part of this program, Technical Specification 3.7.1.2, Requirement 4.7.1.2 which addresses acceptable minimum auxiliary feedwater pump performance was validated. It is this validation record (No. 1-11H-T-0018) that specifically addresses pump wear. Validation record 1-11H-T-0018 identifies the need for an additional calculation to be performed. Upon completion of this additional calculation (16345-ME(B)-241), the Technical Specification and the descriptive section of the DBD will be revised to reflect the verified acceptance criteria.

d. Per Westinghouse Drawing 1105J07, there is no sparger on the auxiliary feedwater inlet of the steam generators. It is an open path; therefore, the exit loss is one (1) per Crane Technical Paper No. 410. Calculation 16345-ME(B)-053, Revision 0, uses the value "1" for this loss.

Calculation 16345-ME(B)-241 is scheduled to be completed by April 15, 1988.

SIGNIFICANCE/EXTENT

There is no safety concern because the DBD will be revised to reflect these design basis items.

OPEN ITEM F-18

Document Number: Calculation 16345-ME(B)-054, Auxiliary Feedwater Pump NPSH

The calculation utilizes pump rated flows for NPSH requirements instead of maximum expected flows, such as would occur just before pressure is reached which allows use of the RHR system.

For the case of spill flow to a faulted steam generator, common suction piping would experience flowrates in excess of those assumed for this analysis (see Run 4A).

RESPONSE

Calculation 16345-ME(B)-054 does not use motor-driven pump rated flow. It uses pump flow determined by calculation 16345-ME(B)-053. This flow is based on maximum steam generator pressure and conservatively assumes that the safety-related automatic flow control feature of the auxiliary feedwater system is not operating. The use of this flow in determining NPSH is appropriate because in the case of either flow to a faulted steam generator or decreased steam generator pressure, the operator or the automatic flow control feature will limit flow to less than that used in calculation 16345-ME(B)-054. If either of these did not control the flow, then this would be the assumed single failure and the turbine pump, which utilizes a separate suction line, would be capable of providing minimum flow to the steam generators.

SIGNIFICANCE/EXTENT

There is no safety concern because the use of pump flow rather than maximum expected flow is conservative.

OPEN ITEM F-19

Document Number: Calculation 16345-ME(B)-143, Maximum Pressure Differential for MOV's

The calculation provides static differential pressures across the valves only. It does not address the transient pressure rise which occurs during valve closure due to deceleration of a fluid column.

The BWR Owners Group Report on Operational Design Basis of Selected Safety Related Motor Operated Valves, draft dated August 1986, General Electric NEDC No. DRF-E12-00100-75 serves as an example of the type of analysis which utilizes transient valve differential pressure build-up methods.

RESPONSE

Calculation 16345-ME(B)-143 was performed to provide input to TU Electric's Motor Operated Valve Testing (MOVATS) program, which was implemented in response to IEB 85-03. The MOVATS program relies on maximum static conditions to model the system conditions for testing. The test data is then used to calculate the actual stem torque for comparison to torque setting and valve design to satisfy IEB 85-03 requirements. The program addresses the transient pressure rise which occurs during valve closure by this combination of testing and calculations.

SIGNIFICANCE/EXTENT

There is no safety concern. The MOVATS program addresses the transient pressure rise which occurs during valve closure.

OPEN ITEM F-20

Document Number: Brown and Root Inc. Piping Isometric BRP AF-1-SB-027B, Auxiliary Feedwater.

A temperature element (TE-2472) is installed to allow detection of back leakage of hot feedwater into the auxiliary feedwater system. This aids in precluding possible steam binding or overheating of the auxiliary feedwater system. However, the thermowell is placed too close (about 4 feet) to the main feedwater piping; therefore, it will probably give spurious high temperature readings and thus be ineffective in performing its intended function.

RESPONSE

BRP AF-1-SB-027B had not been validated at the time of the audit. It has since been reviewed as part of the design validation of flow diagram 2323-M1-0206 and this item was identified.

Calculation 16345-ME(B)-333 was prepared and shows that TE-2472 will not give spurious high temperature readings.

SIGNIFICANCE/EXTENT

There is no safety concern because the temperature element will not give spurious high temperature readings.

OPEN ITEM I-1

Document Numbers: Calculation IC-028, Revision 0, Motor Driven AFW Pump 01 Recirculation Flow "LO", "HI-1", "HI-2" for Channel 1-FB-2456A/B

Calculation IC-028 values for the input parameters for pump flow differ (as shown below) from values found in process Calculation 206-11. This discrepancy in the original Gibbs & Hill calculations was not pointed out in the calculation validation review by either the I&C or the process group.

	I&C-028	206-11
1-FB-2456A	50 GPM	20 GPM
1-FB-2456B1	550 GPM	500 GPM
1-FB-2456B2	650 GPM	650 GPM

RESPONSE

Data discrepancy between the two calculations was observed by the reviewer during the validation process and was noted in the confirmation remark (Item 13) of the Calculation Validation Record (CVR): "Mechanical Calculation 206-11 to be checked later for Setpoint Parameter Values."

New mechanical calculations for the auxiliary feedwater system (16345-ME(B)-006 and 063) have recently been issued with different data from those shown on calculation 206-11. The new data has been reflected into new setpoint calculations 16345-IC(B)-008 and 009 which have been issued. Existing calculation IC-028 has been superseded by 16345-IC(B)-008 and 009 and the CVR has been reissued to indicate that the previous calculations have been superseded. The original discrepancy had been adequately documented and has been properly dispositioned.

SIGNIFICANCE/EXTENT

There is no safety concern.

OPEN ITEM I-2

Document Number: Calculation IC-032, Revision 0, Containment Spray Pump 02 Discharge Header Flow

The percentage of error in the instrument channels could increase the nominal minimum flow rate from 705 GPM to 950-1000 GPM. This higher flow rate should be evaluated for potential impact on the piping design and system performance.

RESPONSE

The maximum flow through the recirculation line is dependent on line size and the pressure drops within the line. The setpoint is for the protection of the pump from running against a shutoff head and serves only to open and close the recirculation line. Thus, higher flowrate would have no impact on piping design or system performance.

SIGNIFICANCE/EXTENT

There is no safety concern.

OPEN ITEM I-3

Document Numbers: Calculations 2323-206-5 (Revision 1), 2323-206-11 (Revision 0), 16345-ME(B)-006-XXX, IC-036 (Revision 0), and SC-37-10

Instrument channel 2479 is not capable of providing control room indication for the total CST useable fluid. The current sensing location provides indication of 267,000 gallons of the required 276,000 gallon reserve based on process setpoints (206-11). This concern also applies to loops 2478 and 2478-F. The process calculations are not complete at this time. A new Calculation 16345-ME(B)-187 is being developed to address level setpoints.

Scaling Calculation SC-37-10, Revision 0 (channel 2479) and the setpoint calculation for channel 2479 are being validated at different times. In order to ensure consistency for this parameter, the team recommends that EFE review this area.

RESPONSE

FSAR Section 10.4.9.2 states that 276,000 gallons of CST volume is reserved for auxiliary feedwater per calculation 2323-206-05 (Calculation Validation Record 1-11H-C-093). There are actually 276,492 gallons available to the auxiliary feedwater system; thus the FSAR statement has been met. However, the actual requirement for volume of stored water is based on the following:

A. Westinghouse requirement of 470 GPM for RCS heat removal.

B. Westinghouse suggestion of enough reserve capacity to stay at hot standby for two hours plus a five hour cooldown period, considering 30 minutes of uncontrollable flow out of a main feedwater or main steam line break.

C. FSAR commitment to BTP RSB 5-1 which requires 4 hours at hot standby plus a cooldown period (5 hours for CPSES) considering only loss of normal feedwater (i.e., no line break).

Calculation 2323-206-5 shows that 247,044 gallons are required for 2 hours hot standby plus 5 hours cooldown plus 30 minutes uncontrollable flow out of a break. For 4 hours hot standby plus 5 hours cooldown with no flow out of a break at 470 GPM the reserve requirement is 470 gal/min x 60 min/hr x 9 hours = 253,800 gallons. Since both of these numbers are less than the 267,683 gallons above the instrument tap, there is ample volume of water that can be measured in the control room to mitigate the consequences of any design basis accident.

Setpoint and scaling calculations for safety-related CPSES systems have been prepared in accordance with Project Procedure PP-009 and are technically consistent.

SIGNIFICANCE/EXTENT

There is no safety concern because the control room indication for the total CST useable fluid is adequate.

OPEN ITEM I-4

Document Numbers: DBD-ME-003, Revision 0, Control Room Habitability
DBD-ME-304, Revision 0, Control Room Air Conditioning System

FSAR Sections 6.4.2.1 and 9.4.1.1 and the DBDs are not consistent in the definition of the areas called "Control Room Complex" and the nomenclature for the various rooms making up the control room complex.

RESPONSE

The definition of the Control Room Complex Area found in the DBDs is consistent with the FSAR, however, the areas within the control room complex were inconsistently labelled in the FSAR sections. An FSAR change was implemented in Amendment 68 to reflect the descriptions used for each area/room in the DBDs.

SIGNIFICANCE/EXTENT

There is no safety concern.

OPEN ITEM I-5

Document Numbers: DBD-ME-003, Revision 0, Control Room Habitability
DBD-ME-304, Revision 0, Control Room Air Conditioning System

The FSAR Section 6.4.2 Table 6.4-4 does not address the potential leakage paths created by piping from the supplementary air conditioning units which penetrate the west wall (Col. Line A-A). Also DBD-ME-304 does not state that this piping is seismic.

RESPONSE

This response will be included with the responses to the open items in NRC Inspection Report Nos. 50-445/87-37 and 50-446/87-28 at a later date.

OPEN ITEM I-6

Document Numbers: DBD-ME-003, Revision 0, Control Room Habitability
DBD-ME-304, Revision 0, Control Room Air Conditioning System

The drawings in Table 1 do not provide sufficient information to indicate whether personnel can pass from the Train "A" to Train "B" mechanical equipment room without exiting the control room pressure boundary. This could be a problem if radiation levels are above normal.

RESPONSE

This response will be included with the responses to the open items in NRC Inspection Report Nos. 50-445/87-37 and 50-446/87-28 at a later date.

OPEN ITEM I-7

Document Numbers: Calculations IC-026 (Revision 0: DVP 1), SC-48-07 (Revision 2: DVP-1-11I), and 232-14 (Revision 1)

Calculation IC-026 defines the range of LT-4752 as 0-112 in., while the companion scaling Calculation SC-48-07 defines the ranges as 0-120 in. This requires verification of the installed transmitters actual range. Equivalent calculations for level transmitter 4753 were not available to the team and should be reviewed for the same potential inconsistency.

The team reviewed the physical connections for the two level transmitters to determine if there were any problems relating to the generic issue on separation, and to determine how the tank level was being measured. It was noted that the pictorial representations on the flow diagram and the calculation are different.

The documents reviewed included:

Number	Title
2323-M1-2607 CP-3	Instrument Location Drawing
2323-M1-2507-02, Rev. 7	Instrument Tabulation
2323-M1-2609 CP-2	Primary Connection Location
2323-M1-2104-06 CP-3	Instrument Detail Sheet

RESPONSE

The scaling calculation (SC-48-07, Rev. 4) for the chemical additive tank level transmitters (LT-4752 and 4753) has an input range of 7.98 to 119.70 and 8.48 to 120.20 in. water (PG-003 of SC-48-07) which is a span of 111.72 in. water. This span has been corrected for in. (Water Column) using a correction factor of 1.33 (specific gravity of NaOH). The actual span corresponds to 0-84 in. tank level. The setpoint calculations (IC-026 and 027) and the scaling calculation (SC-48-07) both use a span of 112 in. (corrected for in. W.C.). This was validated by SWEC under the Corrective Action Program.

The differences between pictorial representations on the flow diagram and the calculation are inconsequential. Both are schematic representations which provide the required information for that application.

SIGNIFICANCE/EXTENT

There is no safety concern.

OPEN ITEM I-8

Document Numbers: Calculations IC-026 (Revision 0: DVP 1), SC-48-07 (Revision 2: DVP-1-11-I), and 232-14 (Revision 1)

The physical instrumentation documentation package does not reference a physical drawing defining the standpipe connections used to measure the level of the tank contents. The standard hook-up details (2323-M1-2104-06) for flow measurements (Detail 4G) is very general for a differential pressure measurement taken on a standpipe. Even with the supporting text in the standpipe "Instrument Installation & Separation" document (DBD-EE-035, Revision 0) the detail is not adequate to insure a proper installation.

RESPONSE

Various documents are used to provide all information needed to install D/P instruments. The instrument tabluation sheet, 2323-M1-2507-02, refers to:

1. 2323-M1-2104-06, Detail No. 4G which shows the general installation requirements/material to be furnished and installed by the instrument installation contractor downstream of the root valve.

2. 2323-M1-2607 which shows the instrument locations safeguard building plan at elevation 790 ft -6 in.

3. 2323-M1-2609, Part Plan "X" which is a exploded view of the chemical additive tank area. This view shows that:

	LT-4752	LT-4753
Location of LP tap (root VV) is	800' 9"	800' 9"
Location of HP tap (root VV) is	792' 3"	792' 3"
Location of transmitter is	792' 6"	792' 3 3/4"

The above documents and the instrument installation Specification CPES-I-1018 provide the necessary installations details.

SIGNIFICANCE/EXTENT

There is no safety concern.

OPEN ITEM I-9

Document Number: DBD-EE-035, Revision 0, Instrument Installation and Separation

Section 5.2 of the DBD requires impulse lines for redundant instruments to have a minimum separation in free air of eighteen inches in all directions. (The preferred separation distance is five feet.) The directions for this preferred separation distance are not defined.

For impulse lines from a common tap which split into two or more lines serving redundant instruments, paragraph 5.2.6 of the DBD states "There is no requirement for barriers in the area between the point where the lines split and where the 18 in. of separation is achieved." The team considers that this failure to provide barriers in the area where the 18 in. of separation is not met is not consistent with the governing criteria of IEEE Standard 279-1971 and its clarification documents.

The DBD also states that "... the instrument tubing coming off a shared tap shall remain a single line as far as is convenient for field routing." The team considers that the DBD should provide more specific guidelines, e.g., restricting the length of the single line, in order to preclude common mode failure.

RESPONSE

The statement in Paragraph 5.2.6 of the DBD considers that the single line from the shared tap includes not only the single line itself but also the transition area from where the line splits to the point where the 18 in. of separation is achieved. Therefore, in this context, it is felt that this design criteria does meet the governing standards and guides.

Section 5.2.6 also states that "safety-related instrument tubing will not share a common tap with other safety-related instrument tubing unless approved by the engineers." When this situation occurs, the engineers must approve each potential tubing run on a case-by-case basis. Since the DBD only provides the general design criteria of instrument and tubing installation and separation, it is not feasible to state the explicit need of barriers or a restriction of maximum length of the single line coming off the shared tap. The constructor follows the requirements of the installation specification, CPES-I-1018, not the DBD.

Specification CPES-I-1018 requires that all tubing runs be on design drawings approved by the engineers.

DBD-EE-035 has been revised such that section 5.2.6 is as follows "Safety-related instrument tubing will not share a common tap with other safety related instrument tubing unless approved by the engineers. This approval shall be based on a review consisting of, but not limited to, the following: single failure analysis, proposed tubing routing, and the need for barriers due to potential hazards. For those..."

SIGNIFICANCE/EXTENT

There is no safety concern.

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March 8, 1988

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