DONALD C. COOK NUCLEAR PLANT

SAFETY SYSTEM FUNCTIONAL INSPECTION

Auxiliary Feedwater System

Prepared for:

American Electric Power Service Corporation
Indiana & Michigan Electric Company
One Riverside Plaza
Columbus, Ohio 43216-6631

Prepared by:

WESTEC Services, Inc.
2260 Butler Pike
Plymouth Meeting, PA 19462-1412

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1.0 Background

On June 18, 1987, the American Electric Power Service Corporation (AEPSC), on behalf of the Indiana & Michigan Electric Company (I&MECo), contracted with WESTEC Services Inc. (WESTEC) to conduct a Safety System Functional Inspection (SSFI) at I&MECo's Donald C. Cook Nuclear Plant (Contract No. C6912). The contract required an assessment of the operational readiness of the Unit No. 1 Auxiliary Feedwater System (AFW), including crosstie interfaces with Unit No. 2. The assessment was to utilize U.S. Nuclear Regulatory Commission (NRC) SSFI techniques and criteria, as detailed in the NRC IE Manual Chapter 2515, including an NRC type schedule of activities to determine:

1. The capability of the AFW to perform its safety functions as required by its design bases.

2. If the as-built design and installation of the AFW is consistent with the current design/licensing basis requirements.

3. If the current AFW testing is adequate to demonstrate that the system would perform all of its required safety functions.

4. If the current maintenance practices are adequate to ensure AFW operability under postulated accident conditions.

5. If operations, maintenance, surveillance, and test documentation (including procedures) completely and accurately support a determination that the AFW is capable of performing its safety functions.

6. If the training of operations and maintenance department personnel is adequate to ensure proper AFW operations and maintenance of the AFW.

7. If human factors considerations and procedures are adequate to ensure proper AFW operations (normal, abnormal, emergency conditions).

8. If management controls are adequate to ensure that the AFW will fulfill the safety function required by its design bases.

2.0 Methodology

An SSFI is an interactive inspection in which a team of highly qualified and experienced inspectors focus on a single sample system over a 10 to 11 week period. The team of 9 contractor inspectors, supplemented by 5

AEPSC engineers, examined plant activities in essentially three areas; design, operations, and management. The inspection methodology relies upon two basic principles:

1. Through the interaction (at daily team meetings) of a relatively small number of senior, experience inspectors, deficiencies can be identified which otherwise have remained undetected.

2. By conducting a detailed review of a single sample system (called a deep vertical review), conclusions can be drawn as to the overall plant design process, and operations and management controls.

Prior to commencing the inspection, both a project management plan (Attachment 1) and an inspection plan (Attachment 2) were prepared. The intent of the inspection plan was to provide a framework to answer the following questions:

1. How is the system operated compared with how it was designed to operate?

2. Have modifications since the plant was licensed altered the design in a manner such that it may not function as expected?

3. Are system components and components of essential support systems properly maintained?

4. Does post-modification testing functionally verify the adequacy of a modification?

5. Does surveillance testing confirm the readiness of the system if called upon? Does acceptance criteria accurately reflect the design basis?

6. Have the operators been properly trained to operate the system? Are modifications accurately reflected in training documents?

7. Are management control programs effective to insure that the system will function on demand?

8. Have modifications to essential support systems altered the likelihood that the safety system will function as expected?

The inspection plan was provided as guidance to the reviewers, not as a rigid check-list but as a starting point for the various directions that the inspection might take. Where weaknesses were identified, the inspection was intensified in the areas of weakness, including reviews outside of the sample system (AFW), to determine the extent of potential weakness. In addition, the review was not limited to the licensing basis of the plant, but was often extended beyond the original licensing basis in order to determine the functionality of the system.

In the case of D.C. Cook, plant engineering and design support is provided by AEPSC, located in Columbus Ohio, while the plant site is in

Bridgman, Michigan. Consequently, this inspection was conducted in two locations, with the design reviewers in Columbus, and the plant reviewers (i.e. maintenance, operations, testing, training) in Bridgman. Team meetings were conducted each evening via telephone conference call.

3.0 The Inspection Team

The inspection team was comprised of the following contractor members:

Position	Inspector
Team Leader	G. Overbeck
Design Team Leader	T. DelGaizo
Mechanical Design	S. Klein
Electrical Design	S. Kobylarz
I&C Design	R. Porter
Operations	M. Beers
Maintenance	W. Levis
Surveillance Testing	R. Boyd*
Training	C. Walenga*

* R. Boyd and C. Walenga are employees of another division of ERC International (WESTEC's parent company), ERCI's Systems Integration and Management Corporation (SIMCO).

The contractor team represented a total of 168 staff-years of engineering experience, 133 staff-years of which represent nuclear plant engineering experience. A number of these inspectors have participated in NRC sponsored design inspections since 1982, including Integrated Design Inspections, Independent Design Verification Programs, Safety System Functional Inspections, and Safety System Outage Modification Inspections. Specifically in the case of Safety System Functional Inspections, one or more team members participated in NRC sponsored SSFIs at the following nuclear units:

Turkey Point
Arkansas Nuclear One
Pilgrim 1
Palisades
TMI-1
Trojan
Oconee 1,2,3
Robinson
Monticello
Cooper

In addition to contractor inspectors, the team was supplemented by a number of AEPSC personnel. These individuals participated in all phases of the inspection, attended all team meetings, and were contributing members of the inspection team.

Name	AEPSC Division	Technical Area
R. Vasey	Nuclear Safety & Licensing	Team Leader
D. Powell	Mechanical Engineering	Mechanical Design
K. Munson	Electrical Engineering	Electrical Design
P. Mangan	Quality Assurance	Operations
D. Kruer	Quality Assurance	Testing

4.0 Schedule

The schedule of activities included three weeks of actual on-site inspection, three additional weeks of inspection conducted at WESTEC's offices, and several weeks of final evaluation and report writing. The actual schedule follows:

Week of July 6, 1987

Team meeting to review objectives and the program plan.
Preparation of individual check-lists.
Site specific training and badging.
Walkdown of sample system.
Obtain key documents (FSAR, P&IDs, systems descriptions, etc.).
Commence design portion of the review.

Week of July 13, 1987

Continue review in WESTEC's offices, using information gathered in previous week.

Week of July 20, 1987

Conduct interactive review using SSFI techniques. Design team in Columbus, Site team at D.C. Cook.

Week of July 27, 1987

Continue review in WESTEC's offices, using information gathered in previous week.

Week of August 3, 1987

Continue interactive review. Design team in Columbus, Site team at D.C. Cook. Exit meeting with AEPSC and I&MECo in Columbus on August 7, 1987.

Weeks of August 10 and 17, 1987

Complete technical review and finalize observations. Prepare draft report.

Weeks of August 17 and 24, 1987

Discuss final report with AEPSC and I&MECo. Complete and submit final report to AEPSC.

5.0 General Conclusions

The inspection involved review of a substantial number of design, operations, and management related documents (the preliminary document list is shown in Attachment 3), walkdowns of the sample system and interfacing equipment, and interviews with engineering, licensing, operations, maintenance and management personnel. Where questions arose or weaknesses were perceived, inspection observations were prepared, using the inspection observation form given in the project management plan (Attachment 1). As additional information was developed relative to a specific observation, the observation was revised appropriately. The final form of each of the inspection observations is included as Attachment 4 to this report. (Note: As additional information was obtained, some observations were determined to be invalid. All observations, including invalid observations, are contained in Attachment 4 for continuity). In addition to specific observations, individual summaries of each of the disciplines or technical areas reviewed are contained in Section 6.0. These summaries include both strengths and weaknesses noted in the specific reviews.

In order to evaluate the overall results of the inspection and assist in drawing general conclusions from the specific observations, the individual observations were classified into a number of generic categories such as design related, design process related, equipment qualification related, etc.. The results of this classification process is shown in the matrix of Attachment 5. Considering the information of Attachments 4 and 5, the following general conclusions are provided:

1. In spite of a number weaknesses identified, as enumerated in this report, the AFW system was demonstrated to be capable of functioning in accordance with its design requirements. In certain instances design margins were reduced or failure-modes-and-effects analyses were required to demonstrate functionality. Nevertheless, functionality was demonstrated.

2. Generic weaknesses were identified which, when corrected, will improve plant reliability. These areas include (1) the lack of a well documented plant design basis, (2) weaknesses in the formal documentation of interface information (both interdiscipline interfaces and engineering/site interfaces), and (3) weaknesses in the design control and verification process. Each of these areas is discussed further below.

   <u>Design Basis</u>

   The original design of D.C. Cook was performed in the early 1970s. Consequently, much of the documentation of the original design basis of the plant fails to meet current day standards and consequently, the actual design basis requirements are difficult to identify, particularly if there is no recourse to personnel involved in the original design. In view of the above, there is a risk that future plant modifications can be prepared which might unknowingly eliminate certain necessary design features. To preclude this possibility, future design modifications should consider the original design basis of the system or equipment being modified, including preparation of calculations or analyses as necessary to establish the design basis.

Interface Information

Technical information which is transmitted between engineering disciplines (e.g. electrical to HVAC, etc.) or between AEPSC engineering and the site (e.g. torque switch setting data, etc.) has not been formally controlled. Discrepancies in the transmission of this information which were observed were minor and did not impact upon the functionality of the system. Nevertheless, there is a concern that unless this information is formally and rigidly controlled, erroneous information can be transmitted which can adversely impact the functionality of safety grade equipment.

Design Control Process

The design control process encompasses a wide variety of activities needed to achieve and document the validity of the design, vis-a-vis the design requirements, criteria, or commitments. During the inspection, instances of inability to trace design input to its source (without recourse to the originator), insufficient design verification activities, and a general lack of stand-alone documentation packages were noted. As was pointed out in the discussion of design basis documentation above, much of the D.C. Cook design documentation predates a number of regulatory requirements in this area. However, even in more recent design documentation, several weaknesses in design control were noted. While documentation prepared within the past several years indicates considerable improvement over documentation as recent as the early 1980s, there is still need for improvement.

3. In view of the nature and technical depth of the inspection, a similar inspection of another safety system may reveal a comparable number of deficiencies but it can not be concluded that such concerns would be of greater safety significance or that the functionality of the system would be in doubt. Nevertheless, an on-going program of such inspections would (1) provide confirmation of functionality of other safety systems (2) verify the effectiveness of corrective actions from this inspection and (3) might reveal the existence of concerns upon which further improvements can be based.

6.0 Specific Technical Area Summaries

The following subparagraphs summarize the observation, findings, and conclusions of the several contractor inspectors in their respective technical areas. Since a major objective of this inspection was to identify areas where improvements are needed, strengths or positive items which were observed are only briefly mentioned while weaknesses or deficient areas are emphasized. Also, for the convenience of the reader, Sketches No. 1 through No. 4 are attached to the end of this section of the report.

6.1 Electrical Design

6.2 Mechanical Design

6.3 Instrumentation & Control Design

6.4 Operations

6.5 Maintenance

6.6 Surveillance Testing

6.7 Training

6.1 Electrical Design

A. Review and Approach

The electrical system design in support of auxiliary feedwater system components was reviewed during the design inspection. The object of the review was to evaluate whether the electrical design adequately ensures that the auxiliary feedwater system will perform as required. The review focused on both the changes to the design of the auxiliary feedwater system and the design features of major electrical equipment supporting the AFW, such as the station batteries. Documents reviewed include the FSAR and Technical Specifications, RFCs, design calculations, equipment specifications and vendor data, flow diagrams, and one-line and elementary diagrams. The team also performed plant walkdowns to verify equipment layout and nameplate information, and to observe the design features of the installed equipment.

On various discussions with the electrical section personnel the team found a knowledgeable and competent staff, with the necessary awareness and focus on the required safety aspects of the electrical design. The team also found that the staff was aware of the need to improve the design basis documentation for the electrical systems. The plans to implement ASDOP (Auxiliary System Design Optimization Program) and plant bus load studies in the section were considered by the team to be important strengths. The team also identified, for consideration by the section, the concept of a controlled calculation file or notebook as a useful element in the documentation of the design bases.

The team found that weakness in the documentation of the plant electrical design bases was a factor which contributed to the problems identified in the design and design verification activities which were observed during the inspection.

B. Summary of Significant Findings

I. Potential for Common Mode Failure of Safety-Related 250 VDC Circuit Breaker Distribution Panels

The team identified two (2) separate design problems which subject the safety-related 250 VDC circuit breaker panels to potential common mode failure.

a. The circuit breakers do not coordinate with upstream fuses, and in the case where a circuit breaker feeds another circuit breaker panel, the breakers may not be coordinated.

b. The circuit breakers are not rated for application at 250 VDC. The capability to interrupt faults on the system on which they are applied has not been demonstrated by test. Preliminary calculations by AEPSC engineers indicate that the fault current available at 250 VDC exceeds the manufacturers published interrupting capability of 5,000 amperes at 125 VDC.

The safety-related circuit breaker panels in question are as follows: CCV-AB, CCV-CD, SSV-A1, SSV-A2, and SSV-B. The circuit breaker panels feed both ESS (safety-related) and BOP (non-safety-related) circuits. BOP circuits can be postulated to fail non-mechanistically or in the case where circuits from redundant distribution panels may come together in close proximity, such as in the cable spreading area, they can fail from a single event such as a fire. Since the circuit breakers which feed the BOP circuits are not electrically coordinated with upstream circuit breakers or fuses (as applicable), the upstream protective device could operate (trip or fuse open) to clear the faulted circuit, thereby causing the loss of power to the entire circuit breaker distribution panel, which includes the power to the ESS circuits fed from the panel. The loss of power could occur in both of the redundant ESS trains due to the common failure of the BOP circuits in each train. Likewise, since the circuit breakers do not have an adequate rated fault current interrupting capability, the same postulated failure scenario, as described above, could result in circuit breaker failure on attempting to clear faulted circuit conditions in the BOP circuits. The faulted circuits, on failure of the breaker, would be cleared by upstream fuses in panels MCAB and MCCD. Again, the failure mode could be common to both ESS trains resulting in a loss of power to redundant ESS circuits.

Electrical protective device coordination is necessary to satisfy the requirement for independence of onsite electric distribution systems required by General Design Criteria (GDC) 17 of 10CFR50 Appendix "A", as well as the requirements for shutdown capability and associated circuits of 10CFR50 Appendix "R". The adequacy of protective device rating is considered to be a requirement of GDC 17 to ensure the capability of the onsite distribution system to function when required. In addition, since the potential for breaker failure on fault conditions exists, secondary effects due to the breaker failure can occur, such as equipment damage to the circuit breaker panel. Since this equipment damage can occur in both trains, this failure mode should be evaluated for compliance with the requirements of Appendix "R", Section III.G. For example, equipment provided to satisfy Section III.G.1.a must remain free of fire damage, which does not allow for any repair action, such as fuse replacement, from being taken to achieve and maintain hot shutdown conditions.

II. Lack of Motor Operated Valve Overload Protection

RFC-12-2180 changed the overload protection criteria for motor operated valve motors to trip on 200% of full load current. This change was initiated as a result of a commitment made to the NRC in the response to Question

40.7, Appendix Q, Unit 2 FSAR. Question 40.7 requested the degree of conformance of the design to Regulatory Position C(2) of Regulatory Guide 1.106, "Thermal Overload Protection for Electric Motors on Motor-Operated Valves." The plant response states that an overload device setting at 200% of nameplate current will be provided and will prevent permanent damage to motors due to "correctable mechanical failures" of the valve. The team requested to review a design basis analysis which documents and demonstrates the compliance on the above commitment, but apparently no such analysis was ever performed.

On review of the overload relay heater coil selection data and information contained in RFC-12-2180 the team found that the heater coil selection tables utilized applied to continuous duty motors with 1.15 service factor ratings. Typical motor operated valve motors, as supplied by the Limitorque corporation are 5 minute or 15 minute duty motors, with 10 to 15 second allowable stall times. Also, a specification for valve motor starters, which was used as part of RFC-12-2222 which upgraded the Turbine Driven Auxiliary Feedwater Pump Motor Operated Valves from AC to DC, stated that "Heaters shall be provided to operate at 200% of full load current and shall trip off in not less than twice the valve travel time at stalled rotor current." The requirements of this specification were meant to implement RFC-12-2180 criteria. The team found that the heaters provided on RFC-12-2222 for FMO-221 and FMO-231, as an example, would trip the overload relay in a minimum of 30 to 40 seconds on stalled/locked rotor current conditions. The existence of stalled rotor current for a duration of this magnitude has a definite potential for causing damage to a typical valve motor in most applications. The team considers this operating time to be a typical result of the RFC-12-2180 heater sizing criteria, resulting in a lack of adequate stalled/locked rotor protection for valve motors.

The team considers the lack of analysis to document the design basis for the overload relay protection scheme for motor operated valve motors to be an example of the weakness in design basis documentation. The lack of adequate motor overload protection subjects valve motors to potential damage, which may go undetected, during the normal operation of the plant. This lack of motor overload protection is in apparent conflict with the plant licensing commitment on conformance with Regulatory Guide 1.106.

III. <u>Inadequate Battery Capacity at Minimum Design Ambient Temperature</u>

RFC-01-2764 sized the existing 1-AB Battery based on a minimum room ambient temperature above 70°F. HVAC Engineers have indicated that the minimum design ambient temperature for 1-AB Battery is 60°F. At 60°F the existing battery is undersized by 7%. However, 1-AB Battery surveillance records indicate that between December 1984 and March 1986, during winter months, 1-AB battery cell temperatures have been below 70°F, generally in the 60°F range, and on certain occasions in 1984 and 1985 have been as low as 47°F and 43°F respectively. At 43°F the existing battery is undersized by over 20%. Plant personnel were aware that a problem existed with minimum battery temperature but aggressive action to correct the situation had not been taken.

The subject RFC also indicated that low temperature alarms would be provided for the battery rooms. No low temperature alarms were found to be included in the design. The team considers the failure to adequately translate design ambient temperature requirements and alarm requirements into the plant design as a significant weakness from both the design and design process aspects.

IV. Incorrect East Auxiliary Feedwater Pump Motor Voltage Rating

On review of motor data for the East Motor Driven Auxiliary Feedwater Pump the team noted a motor rating of 4160 volts. On a plant walkdown the team confirmed the motor nameplate rating of 4160 volts. The D.C. Cook Voltage Performance Study, dated December 1985, shows on Exhibit 9 and 10 for case (d): Shutdown and accident auxiliary load of one unit with shutdown auxiliary load of the other unit, 92.7% voltage on transformer 101CD low side (on a 4000 volt base) or 3708 volts. The minimum continuous operating voltage for the East AFPM is 90% of 4160 volts or 3744 volts at the motor terminals. The sizing of the feeder cable from bus T11D to the East AFPM allows a drop in voltage of 19 volts. Therefore, the calculated minimum steady state voltage available at the motor terminals is (3708-19) or 3689 volts (neglecting the voltage drop in the feeder from the transformer to the bus). 3689 volts is 88.7% on a 4160 volt base, which does not satisfy the minimum operating motor terminal voltage requirement of 90% rated voltage. The West Motor Driven Auxiliary Feedwater Pump motor is correctly rated as a 4000 volt motor.

The East Motor Driven Auxiliary Feedwater Pump motor is not rated by NEMA (National Electrical Manufacturers Association) to operate continuously with less than 90% rated voltage at the terminals. The minimum voltage at the motor terminals should be determined based on an analysis which includes all significant elements of impedance, such as the feeder from the auxiliary transformer, and the motor capability to operate continuously at this voltage should be confirmed.

V. Insufficient Control of Motor Overload Relay Heater Coil Selection Data

The team noted that different heater coil data, for the same coil catalog number, exists for the Cutler Hammer Type ST overload relays. This observation resulted from a comparison of the manufacturer's coil selection data on RFC-12-2180 and RFC-12-2903. The difference in data is of sufficient magnitude to account for different heater coils to be selected depending on which table is utilized. Since the coil tables apparently apply to hardware manufactured during different time frames, design control of the use of the proper selection table for the hardware installed, or to be installed, is required.

An error made in the use of the wrong heater coil selection table for the hardware installed results, at most, in being off by one coil size or catalog number. This error would not be safety significant for motor operated valve motor protection due to the intentional margin in the overload selection criteria (200% of motor full load amperes). However, fan and pump motor protection should be reviewed to ensure that adequate overloads were provided in accordance with the applicable manufacturers heater selection criteria.

VI. Discrepancy in Instantaneous Relay Setting for West Motor Driven Auxiliary Feedwater Pump Motor

On plant walkdown on 8/5/87, the team noted that the subject pump motor breaker instantaneous relay, Type PJC, was set at 27 amperes. The setting at 27 amperes did not agree with the prior required setting of 23 amperes as noted on the relay setting sheets maintained by AEPSC Engineering. The relay setpoint is safety related and any change in a setpoint is required to be approved by AEPSC Engineers and recorded in the engineers relay setting book. No evidence of approval could be found for the change in setting from 23 amperes to 27 amperes which occurred on 7/11/87.

Since the change in relay setting increased the relay trip setpoint, which is in a conservative direction to ensure motor starting, the team considers that this relay setting change was not safety significant. However, the design control measures which were apparently violated on this change should be reviewed and strengthened to preclude any similar occurrences.

C. Conclusions

The team believes that improvement in plant design can be directly or indirectly realized as a result of strengthening the observed weakness in the design bases documentation. As an example, on changeout of the AB and CD station batteries on RFC-01-2764, updated DC short circuit calculations were not performed, even though the battery manufacturer was changed and higher capacity battery cells were installed. As a result, the fault current available from the CD battery increased by 43%. Subsequent design verification of the increased short circuit level would have identified the inadequacy in the circuit breaker interrupting capability described in Section 6.1.B.I.b above.

Design verification activity can also be improved. The process of specification, procurement, receipt inspection, and finally RFC closeout should be structured to ensure that the equipment nameplate data problems observed during the inspection are eliminated.

Finally, the technical evaluation as part of the Unreviewed Safety Question Evaluation, 10CFR50.59 reporting requirements, should be strengthened as evidenced by observations of inaccurate technical information in a safety evaluation, and an incomplete evaluation in the partial completion of a design change (RFC).

6.2 Mechanical Design

A. Review and Approach

The mechanical systems portion of the design inspection included a review of a wide range of design documents. Portions of the FSAR related to the auxiliary feedwater system and its support systems (emergency service water, main steam, condensate storage) were reviewed to identify regulatory commitments, design requirements, and design criteria. System descriptions and flow diagrams were also reviewed to determine how these requirements were implemented in the systems design.

The inspection focused on modifications made (and in progress) to the auxiliary feedwater system. Detailed reviews were conducted of selected modification packages to identify areas which deserved further investigation. Based on these reviews, supporting documentation was identified for inspection to assure that modifications were being made consistent with original design basis requirements. The team reviewed analyses, licensing letters, and design documentation supporting the modifications made to the auxiliary feedwater system.

During the course of the inspection, the team had the benefit of interchanges with AEPSC engineering personnel and found that they were competent and understood the technical and safety significant issues involved. Other strengths were identified during the inspection, e.g. a MOVATS program to supplement work conducted on motor operated valve torque switch settings, and the development of design basis documentation for HVAC systems. However, the team identified weaknesses in the documentation supporting the design of the auxiliary feedwater system. In many instances, design documentation for modifications made to the auxiliary feedwater system was deficient, or in some cases, did not exist.

B. Summary of Significant Findings

I. Errors in Motor Operated Valve Design Bases Documentation

The team identified a number of inspection observations related to the auxiliary feedwater system and its ability to function as intended. The team found several instances where motor operated valves had not been properly evaluated for worst case maximum differential pressures. For example, the team reviewed a calculation developed in response to IE Bulletin 85-03 to establish the maximum differential pressures against which the safety related flow retention valves must open or close. The team found errors in the calculation related to the source of the AFW supply. The calculation reduced the maximum differential pressure across the valve by the emergency service water system supply pressure. However, the emergency service water system is the alternate source of auxiliary feedwater if the condensate storage tanks are not available. Therefore, the emergency service water system supply pressure should be included in the maximum differential pressure across the valve. An incorrect steam generator back pressure was also used for the AFW turbine steam supply in determining the worst case maximum differential pressure for the flow retention valve in the turbine driven AFW pump discharge line. The combination of these errors significantly increased the maximum differential pressure across the valves. The team found that the valve data sheet used to procure new flow retention valves as part of a current plant modification did not reflect the same maximum differential pressures as those in the calculation reviewed. However, a letter from the valve manufacturer, Hammel Dahl, indicated that the vendor is supplying a valve with a design differential pressure equal to the maximum specified inlet pressure. For the conditions evaluated in the calculation, the inlet pressure is, coincidentally, the same as the maximum differential pressure. Therefore, there is no safety concern relative to the actual capabilities of the new flow retention valves.

The team reviewed a status report provided to the NRC in response to IE Bulletin 85-03 identifying maximum differential pressures for motor operated valves in the auxiliary feedwater and safety injection systems. The listing included the maximum differential pressure, 600 psig, for the steam admitting valves to the turbine driven AFW pump turbine. These valves isolate flow to the turbine. The rationale given for the differential pressure was that 600 psig is the low steam generator pressure alarm setpoint at which the operator would close the valve in the event of a steam line break downstream of the valves (outside containment). However, during power operation, pressures can reach 1097 psig under conditions causing safety relief valve actuation. Although this is a personnel safety issue rather than one of plant safety, the team was concerned that this was another case of inadequate evaluation and documentation of worst case design differential pressures for critical safety related motor operated valves.

The team found that these were examples of weaknesses in the licensee's design control process, design bases documentation, and the control of information flow across interdiscipline interfaces.

II. Inconsistent Piping Design Pressures

A number of discrepancies were identified in the review of the Pipe Material Specification related to design pressures for piping systems. For example:

- o The team found that in several instances, the design pressures listed were not consistent with maximum pressures in the system. The AFW suction line design pressure is specified as 105 psig, however the suction line relief valve is set at 150 psig.
- o There was no documented basis to substantiate the rationale for AFW system design pressures. The turbine driven AFW pump discharge line design pressure does not include consideration of the overspeed trip set point for the AFW turbine. Higher than normal turbine speed during an overspeed condition could affect maximum system pressures.
- o There was no documented analyses to substantiate the selection of piping wall thickness for AFW piping, including recent system modifications.
- o There was no documentation to substantiate the size of AFW suction line relief valves.

III. Lack of HVAC Design Basis Documentation

In the area of HVAC, the team was unable to identify design documentation to substantiate the design of critical, safety related HVAC systems supporting the AFW system. There was no documentation of design basis requirements, system descriptions, flow diagrams, or design criteria. There was no analysis to confirm that design requirements had been met. (Note: AEPSC is aware of the need to develop design basis HVAC documentation and is proceeding to correct this situation. HVAC calculations and analyses were observed for in progress design modifications.)

IV. Deficiencies in Various Design Analyses

The team reviewed design basis documentation and analyses supporting FSAR commitments to supply adequate flow to the steam generators in the event of postulated accidents such as feedline or steam line breaks. Much of this documentation was based on early analyses with significant gaps in traceability in the data used. Undocumented engineering judgement and a lack of substantiation for design input was identified in several cases. For example:

- o There was no traceability to source documents used as input to computerized hydraulic analyses;
- o Superseded calculations were used as referenced sources;
- o The output results of one computer analysis was used as the input to another, however the numbers used as input did not agree with the output printout.

In general, the team found that, contrary to ANSI N45.2.11, calculations could not be reviewed without recourse to the originator for further explanation of the documentation, analysis, and methods used. The lack of traceability of design input indicates a weakness in the licensee's capability to document the design basis for the plant and modifications made to the plant design. This deficiency in the design control process can impact future design changes since the engineers using design documentation may utilize incorrect design analyses and data to develop additional plant modifications. This could result in design deficiencies which compromise the ability of safety related equipment to perform their safety functions.

C. Conclusions

Based on the documents reviewed and discussions with AEPSC engineering personnel, the team concluded that weaknesses exist in the design bases documentation for the auxiliary feedwater system. The team was concerned that:

- o The design of the AFW system was not adequately documented to assure that future modifications made to the system would be consistent with the original design intent.
- o Existing design analyses are not documented in a form which is traceable and auditable.
- o Design efforts are not being consistently coordinated and documented to assure that essential design information is accurately communicated across interdiscipline boundaries.
- o Inadequacies in design verification have resulted in incorrect engineering evaluations and analyses.
- o The design and modification of safety related motor operated valves has largely been performed on a component basis without

adequate systems engineering input. In some instances, this has resulted in the development of an inadequate design for these valves.

The team found that these weaknesses contributed to a lack of control of the design process which can result in design deficiencies and compromise the ability of safety related systems and equipment to perform their intended function.

6.3 Instrumentation and Control Design

A. Review and Approach

The instrumentation and controls systems portion of the inspection included a review of a wide range of design documents. Portions of the FSAR related to the auxiliary feedwater system and its support systems (essential service water, main steam, condensate storage) were reviewed to identify regulatory commitments, design requirements, and design criteria. I.E. Notices/Bulletins related to D.C. Cook were reviewed for applicability to these systems. AEP to NRC letter 0773S dated June 29, 1987 regarding "Additional Information and Requests For Deviations From Regulatory Guide 1.97, Rev. 3 Recommendations" was reviewed to determine AEPs plans for implementing Reg Guide 1.97. System descriptions, flow diagrams, elementary diagrams, functional diagrams, panel layouts, engineering calculations, instrument piping diagrams and modifications related to the condensate storage tank were also reviewed to determine how these requirements were implemented in the systems design.

The inspection focused on modifications made (and in progress) to the condensate storage tank. Detailed reviews were conducted of selected modification packages to identify areas which deserved further investigation. Based on these reviews, supporting documentation was identified for inspection to assure that modifications were being made consistent with original design basis requirements. The team reviewed analyses, licensing letters, and design documentation supporting the modifications made to the auxiliary feedwater system.

During the inspection, the team interfaced with AEPSC engineering personnel on technical issues and found them to be competent, responsive, and cognizant of the technical and safety significant issues involved. While the inspection was in progress, AEP initiated a review of all tank setpoints to identify possible safety significant design deficiencies. However, the team identified weaknesses in the design approach and documentation supporting the design of the auxiliary feedwater system.

B. Summary of Significant Inspection Findings

I. Instrument Errors Not Considered in Setpoint Calculations

Instrument errors were not considered in calculating the setpoints for tank level setpoints for controls and alarms on the condensate storage tank and the refueling water storage tank. This can lead to an overlap between setpoints which are close together, causing the wrong setpoint to operate first; or lead to a control action or alarm too late to take corrective action. For these tanks, this is not a plant safety problem because of design margins involved, but the team believes that this is a generic item which should be addressed. AEP's I&C department started a review of tank setpoints calculations during the inspection.

II. Inconsistent Units of Measure

Various units of measure, which are used in the plant operating procedures and on control panel indications, present confusing information to the operators. This confusing information could lead to misinterpretation by the operator during a critical time and result in him taking incorrect action; or pausing to analyze the data from other sources, delaying his action.

III. Inconsistent Calibration Procedures

Functional and calibration tests in the plant calibration procedure allow instrument setpoints to be set inconsistently with the technical specification trip setpoints for steam generator water level low-low and high-high. The technical specifications call for equal to or greater than values while the procedure allows plus and minus manufacturer's error. The team believes that this indicates a reluctance by AEP to recognize the technicalities of satisfying technical specifications and design basis requirements. These types of inconsistencies can lead to erroneous calibrations on instruments, which do not have safety margins planned into a value.

IV. Failure to Meet FSAR Required Water Volume

The FSAR requirement to have sufficient water in the condensate storage tank for 9 hours at hot shutdown conditions, above the low-low level alarm setpoint is not satisfied. This is identified in the technical specification as 175,000 gallons of water above the low-low level setpoint. In fact, there is less than this available. Although this is not a plant safety problem, since the actual water volume required is less, the design basis for the condensate storage tank level setpoints is unclear and the real operation requirements are not completely justified.

V. Design Control Process Weaknesses

The design control process for preparation, checking and verification of design calculations needs to be improved. The original design calculations for D.C. Cook are early 1970's vintage with revisions in the early 1980's. These are deficient by today's standards with regard to traceability of design input information back to the design basis, formal independent design verification and formal interdisciplinary review of modification packages. This situation is acceptable if the design of the system can be demonstrated to be functional. However, calculations completed in 1985, although they indicate a sensitivity to instrument errors, have not always factored errors into the setpoints. The new calculations have been added to the originals as addenda with no cover sheet control and with new page numbers starting as page 1. It is difficult, at best, to know if one has a complete calculation and what changes to the original calculations are caused by new addenda. There is no independent or interdisciplinary review sign off sheets attached to the calculations.

C. Conclusions

The team believes that improvements to the plant design can be achieved by well documented setpoint calculations which incorporate instrument errors and by controlled transmission of this information into a form which is useful to plant operations.

6.4 Operations

A. Review and Approach

In the area of operations, the inspection team evaluated the adequacy of shift manning; control of ongoing maintenance and operations activities; normal operating; emergency operating; and off normal operating procedures; operator familiarity with the physical location of various electrical and mechanical components; equipment operation in abnormal situations; reactor system status verifications; and operator training. This evaluation focused on how each of these elements interfaced with operation of the AFW system under various operating conditions.

The inspection team observed licensed reactor operators and auxiliary equipment operators perform portions of their shift rounds on six occasions and shift turnovers on two occasions. On the basis of the sample reviewed, the team considered that these operations personnel were knowledgeable of plant conditions, electrical and mechanical equipment locations, capabilities of the AFW system and plant operations in general. The inspection team observed a Unit 1 control room and auxiliary equipment operator turnover on August 3, 1987 and on August 5, 1987. These were accomplished in accordance with administrative requirements and appeared to be effective. While monitoring operations in the control rooms and tours through the plant, operators were observed to be familiar with procedures and drawings and could effectively answer questions related to plant operations. The overall level of professionalism by the operators was satisfactory and access to the control rooms appeared to be controlled effectively.

The team conducted a review of the experience level of the licensed operators which included licensed personnel on shift and off shift. The summary provided to the team revealed that D.C. Cook presently has a total of 84 licensed personnel for both units. Of this total, 50 are on shift with SRO licenses and 16 with RO licenses. The average experience level for on shift personnel since their licensing date was 4.6 years for SRO and 1.9 years for RO. The average experience level for all licensed operators was 4.8 years for SRO and 2.1 years for RO. The maximum time 13 years (SRO) and the minimum 6 months. Although the average RO experience level is generally low, the team noted that the number of supervisory personnel (SRO) on shift well exceeded the Technical Specification requirements.

The team performed a review of the control room log for the period 2-11-84 through 7-5-84 and 5-27-87 through 7-10-87. The review focused on out of specification and open item log entries. No discrepancies were noted during the review. A review was performed on the Non Conforming Equipment log in the Unit 1 control room. The entries appeared to be in accordance with administrative requirements.

The team conducted a review of the normal operating and emergency procedures for the AFW system and other related emergency procedures. The team observed that numerous revisions had recently been performed on most of the procedures reviewed. Interviews conducted with operations personnel and procedure coordinators revealed that most emergency and abnormal procedures were undergoing a format change. While the majority of the procedures reviewed were adequate, the following weaknesses were noted with the directions provided to operations personnel.

B. <u>Summary of Significant Inspection Findings</u>

I. <u>Apparent Weaknesses in Detecting AFW Steam Binding</u>

In response to IE Bulletin 85-01, AEP developed procedure OHP 4022.056.001, Steam Binding in Auxiliary Feed Pumps, and added steps to OHP 4021.056.002, Operation of Auxiliary Feed Pumps, and OHP 4030.STP.017T,E,W, Auxiliary Feed Pump Operability Tests. The operating and surveillance procedures direct the operator to verify after AFP operation that the AFP discharge lines are at ambient temperature by observing that "Teletemp" indicators affixed to the AFP discharge lines are less than 140 degrees F. The team observed that many of the temperature indicators were missing and that one indicator on a Unit 2 line was black (greater than 180 degrees F) and had not been replaced. The team is concerned that the procedures to detect steam binding and therefore verify operability of the AFW system are weak.

II. <u>Various Procedural Inconsistencies</u>

There is inconsistency in various procedures in the required operator response for the Condensate Storage Tank level associated alarms and switchover to alternate AFW supply. Procedures OHP 4023 ECA-0.0, Loss of All AC Power, and OHP 4023 ES-0.2, Natural Circulation Cooldown, direct the operator to switch to alternate AFW supply at 13% CST level. OHP 4024.116.043, CST LO-LO Level Alarm, response says that the SRO should consider shifting suction to the other Unit CST. This alarm setpoint is slightly lower than the 13% value. OHP 4024.113.016,017.018, AFP Suction Low/Trip Alarm response manual action says that the SRO should consider cross-tieing Unit 1 and Unit 2 CST's. This alarm setpoint is at approximately 5.7%. The team is concerned about the confusion to the operator as to the required response depending on what procedure is in use or referred to.

Procedure OHP4021.056.002, Operation of Auxiliary Feed Pumps during Plant Startup and Shutdown, directs the operator to: adjust bearing cooling water outlet valves as necessary to maintain bearing temperature at about 140 degree F. The inspection team observed that there is no temperature indication associated with the pump bearings. If bearing cooling is desired, the team recommends that guidelines be provided to the operator such that cooling water flow can be adjusted in a minimum amount of time if the Auxiliary Feedwater are required to operate in an emergency situation.

A walk through was performed of the Auxiliary Feedwater portion of OHP 4023.001.001, Alternate Emergency Shutdown and Cooldown Procedure Due to Loss of Normal and Preferred Alternate Methods, and OHP 4023.ECA-0.0, Loss of All AC Power. The Unit Supervisor and Reactor Operator who conducted the walk through were very knowledgeable with the details of the procedures, and location of controls and components. The implementation of OHP 4023.001.001 requires stripping wires from various terminal strips throughout the plant and installing jumper wires at the terminal strips in order to gain local control of the component. Attachment #12 is a Modification Equipment List which shows the location and content of dedicated tool boxes to accomplish the necessary local control. The team noted that there are no dedicated tool boxes located in the Auxiliary Building or dedicated jumpers at the TDAFP Turbine Subpanel TFP. The team noted that there is a dedicated tool box at the Shift Supervisors office. The procedure could be expedited if more dedicated tool boxes were placed at the locations required.

C. Conclusions

A substantial review of plant operations associated with the AFW System revealed some minor inconsistencies which should be rectified. In general, however, the system is being operated satisfactorily and no major weaknesses were noted.

6.5 Maintenance

A. Review and Approach

The maintenance portion of the inspection included a review of plant maintenance procedures, work orders associated with the auxiliary feedwater system since 1981, condition reports concerning maintenance practices for the last 3 years, the response to IE Bulletin 85-03, and recent MOVATS test data. In addition, a walkdown of selected auxiliary feedwater system components, review of warehouse stored items, and review of supporting equipment qualification procedures and system component evaluation work-sheets was conducted when necessary to verify and clarify plant actions.

Detailed review of the work orders was conducted to determine if present plant maintenance practices were sufficient to ensure the continued operability of the auxiliary feedwater system. Plant actions were compared against the vendor requirements and an assessment was made to determine if current maintenance practices corrected noted discrepancies and if root cause determination of equipment failures and its generic implications were evaluated.

Several strengths were noted with regard to the maintenance program. The performance of MOVATS testing on motor operated valves was considered to be a significant asset. In addition, the maintenance personnel interviewed were knowledgeable and had a good understanding of their equipment. Plant procedures were generally good, and the system of processing work orders was recently improved to provide further instructions for those components which are Technical Specifications related or are required to be environmentally qualified. The following findings constitute what the team considers to be significant with regard to the maintenance area.

B. Summary of Significant Findings

I. Lack of Control of MOV Lubricants

The lubrication program for motor operated valves (MOV's) did not adequately control lubricants or provide coverage for all safety related valves. Present plant maintenance procedures allow the use of an unqualified lubricant, create the potential of mixing greases with different soap bases and do not require the lubrication inspection specified by the vendor for all safety related MOV's.

II. Weaknesses in Control of Electrical Tape Splices

The reliance on skill of the craft to install environmentally qualified tape splices is a weakness which has resulted in some inadequate tape splice installations. Although a qualified configuration exists and an electrical design standard addresses the installation of the splice, the potential for incorrect installation exists due to the presence of unqualified tapes in the storerooms and the reliance on skill of the craft to select the proper tapes and apply them correctly without requiring the installation procedure to be in hand.

III. Weaknesses in Control of MOV Torque Switch Settings

The program for control of MOV torque switch and limit switch setpoints was not controlled and placed excessive reliance on skill of the craft to establish the switch settings. This has resulted in actual torque switch settings differing from design values and in improper limit switch settings.

IV. Non Performance of Vendor Recommended Maintenance

Vendor recommended preventative maintenance is not being performed for all safety related MOV's. The current requirement for MOV preventative maintenance is to perform the vendor recommended maintenance on 20% of the environmentally qualified motor operated valves each refueling outage.

V. Weaknesses in Installation Practices

Weaknesses were found with regard to installation practices of environmentally qualified equipment. Although plant procedures require that the actual installation configuration be consistent with the tested and vendor required configuration several examples were found when this was not the case.

C. Conclusions

Based on documents reviewed and the weaknesses previously noted, the team concluded that the maintenance program for MOV's is weak. Maintenance activities to date have been heavily slanted toward corrective maintenance; repairing components only after they have failed. In light of the large number of condition reports generated concerning MOV failures (44 from 1985 to July 1987) and the MOV discrepancies, such as lubrication breakdown, a more proactive posture with regard to preventive maintenance is recommended. The team recognizes that it is not always practical, economically feasible, or technically justified to perform all of the vendor recommended maintenance. This determination, however, should be the result of engineering evaluation combined with plant operating history with sufficient flexibility to allow changes as more data becomes available.

6.6 Surveillance and Testing

A. Review and Approach

The surveillance and testing portion of the inspection included a review of the surveillance test procedures, special tests, maintenance and operating procedures. Portions of the FSAR and Technical Specifications were reviewed to identify design criteria and regulatory commitments for testing the Auxiliary Feedwater System. Flow diagrams, elementary, and functional diagrams were also reviewed to verify testing and system operation as directed by the different procedures.

This portion of the inspection focused mainly on surveillance testing of the auxiliary feedwater system. Detailed reviews of specific tests were conducted when weaknesses were observed in these areas. Licensing letters, audit responses, internal memoranda and past completed tests were reviewed and personnel interviews conducted to ascertain the background for areas where weaknesses were thought to exist.

Most of the procedures reviewed were found to have been revised within the past two years. These revisions ranged from typographical to changes required to comply with testing as required by Technical specifications. New procedures had been developed to test the system in areas where testing had been previously overlooked. Weaknesses, however, were identified in the areas of response time testing and the application of human factor principles to the procedures. Plant personnel from the I&C, Performance, and Production departments were found to be competent and very knowledgeable of the AFW system and their associated procedures. However, weaknesses were identified at the interfaces between these departments.

B. Summary of Significant Findings

I. Response Time Testing Deficiencies

The team identified several inspection observations relating to the testing of the auxiliary feedwater system to ensure its ability to function as designed. In most instances, the surveillance test procedures were found to be technically adequate. Several of the technical deficiencies discovered in the procedures were at the interface of different departments. For example, the team reviewed the surveillance test procedures associated with time response testing of the Turbine Driven AFW Pump on an RCP Bus Undervoltage. The team found that the time associated with a time delay in the circuitry to actuate was not being included in the test. The time delay was being physically actuated in the test, but was not included in the response time of the circuit. The two departments responsible for response time testing this circuitry were under the impression that the other was including the time delay in their test. Further investigation showed that this time delay was not being calibrated or was any calibration data available for the time delay. A preliminary indication of the possible maximum delay associated with the time delay was thirty seconds, which is half of the Tech spec allowable limit of ≤ 60 seconds for this function. However, a review of past completed tests showed that assuming a maximum time of 30 seconds for the time delay, the Tech Spec allowable limit would not have been exceeded. Therefore, since the time delay has been verified to actuate during the response time testing of the loop, there is no safety concern to the ability of the Turbine Driven AFW Pump to respond within the time required.

These are examples of typical SSFI findings at the interface in testing involving different departments where there is a reliance upon other departments to ensure adequate testing is being performed.

II. Non Compliance With Technical Specification Surveillance Requirements

The team also reviewed the other response time test procedures associated with the AFW System and found some procedures in noncompliance with the Technical Specification Surveillance Requirements. For example:

- o Start of the Motor Driven AFW Pumps on Loss of Main Feedwater Pumps includes only the east Main FPT stop valve closure relays being timed in response time testing with the west Main FPT stop valve closure relays being omitted. Tech Specs require each channel to be response time tested.

- o When comparing the response time for the Motor Driven AFW Pumps to start on 4160 Volt Emergency Bus Loss of Voltage to the Tech Spec allowable limit, the time from sensing the loss of voltage to the start of the diesel generator is being omitted. The time is small in magnitude but must be included in order to ensure compliance with the Tech Spec.

- o The AFW Pumps are being response time tested (pump start to pressure time) until the pump discharge pressures reach existing steam generator pressure. This does not ensure that test conditions will be the same for each test, nor that the pumps are tied until reaching the required pressures/flow, as assumed in the accident analysis.

III. Special Test Instrumentation

The team reviewed tests of the flow retention valve setting, turbine mechanical and electrical overspeed, preoperational test of the AFW system and the addition of the west MDAFP. The flow retention and overspeed tests have just been developed and performed for the first time within the past couple years and will be performed on an outage basis. Prior to performing the mechanical overspeed test, this setting was 125% as set by the manufacturer. Throughout review of the surveillance test procedures that required operation of any of the AFW pumps, a limitation appears that requires a minimum flow of ≥ 50 gpm for each pump. There are no instruments available that give indication of flow through the emergency leakoff lines which are used at times as the only means of pump discharge flow. The minimum flow has not been checked in any of the tests including the preoperational tests of the east and west MDAFP, and TDAFP.

IV. Human Factors

A number of procedural deficiencies in the area of human factors were identified that are included in NUREG/CR-1369 and INPO Guide 85-026. For example:

o When specifying test equipment, the phrase "or equivalent" is frequently used. This increases the possibility of using test equipment with accuracies less than that of the equipment being tested.

o When referencing from one document to another, the section, paragraph, page, steps or specific data to be retrieved is not being specified. This increases the possibility of the personnel performing the procedure to use the wrong part of the referenced document.

o Some steps direct more than one action or three functionally related actions. This increases the potential for oversight of instructions and errors in misinterpretation.

o Items requiring restoration are not being individually specified, verified and checked off or signed off. These are some of the major contribution factors to misalignment.

B. Conclusions

While the past testing at D.C. Cook appeared weak and in noncompliance with Technical Specifications in some areas, new procedures and revised procedures have made a significant improvement that should ensure that the Auxiliary Feedwater System can meet its intended design. However, based on the documents reviewed and discussions with D.C. Cook plant personnel, testing improvements can be made as follows:

o Time response testing of the AFW system was not being adequately reviewed, in whole, to ensure the complete system is tested and each partial response time is included in the comparison with Technical Specification values. The testing process should be structured to ensure that at some point, a reviewer or other responsible person verifies that all required partial time responses have been tested and the total response is within allowed limits.

6.7 Training

A. Review and Approach

An assessment of the training of operators and maintenance department personnel was conducted for areas identified by the inspection team as being potential weaknesses in the plant's activities. This selective review approach enabled a more focused, in-depth review of each area of the team's concern. In general, the training lessons for each area of concern, the records of the training conducted, the experience level of the specific group involved, the task qualification and requalification program used by that group, and the documented work activities of the group were reviewed to determine if weaknesses in the training program may have contributed to the concerns identified by the inspection team.

Several strengths were noted during the review. An extensive training development program had been undertaken by D.C. Cook. The training program was scheduled to be reviewed by INPO for accreditation in September, 1987. A new training complex had just been completed onsite and had been available for training since May, 1987, although many of the hands-on labs are not yet fully functional. Also, the training staff exhibited an aggressive attitude towards developing and conducting relevant training.

B. Summary of Significant Findings

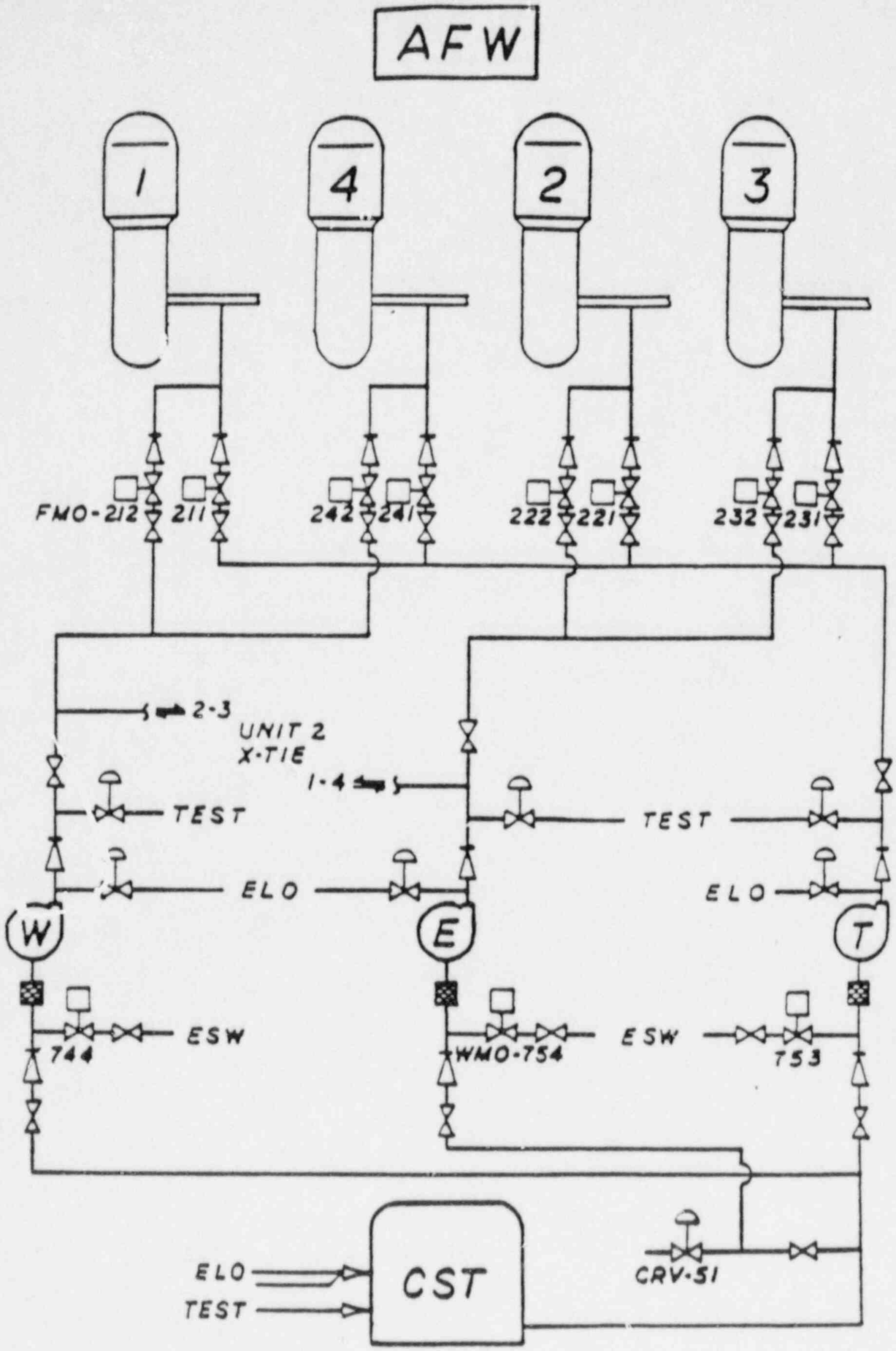
I. Excessive Reliance on "Skill of the Trade"

A potential weakness in the training program was identified in the electrical maintenance group's high degree of reliance on skill of the trade. This degree of reliance on skill of the trade may not be justified in that the team identified problems with environmentally qualified splices and in the maintenance of Limitorque motor-operated valves. While the electrical maintenance group has a very experienced staff, the waiving of many, if not all, of the new task qualification matrix requirements for the senior staff members, coupled with the recent development of very detailed training programs in these areas, indicates possible inconsistencies in the implementation of the training program. It was noted that for the new task qualification matrix, no member of the electrical maintenance group had taken the courses and completed the practical demonstration required for low voltage terminations and motor-operated valves. Since requalification training enforces the attention to the details of a procedure, this reliance on skill of the trade requires reconsideration.

C. Conclusions

The newly-developed training program for INPO accreditation represents a significant improvement that should enhance the efficiency of plant operations. The emphasis on both the development of a training program and the building of a dedicated training center reflects management's awareness of the critical importance of personnel training. It was apparent that the training staff understands their mission and is highly motivated to properly implement the training program.

Sketch No. 1


AFW
1
4
2
3
FMO-212
211
242
241
222
221
232
231
2-3
UNIT 2
X-TIE
1-4
TEST
TEST
ELO
ELO
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T
ESW
ESW
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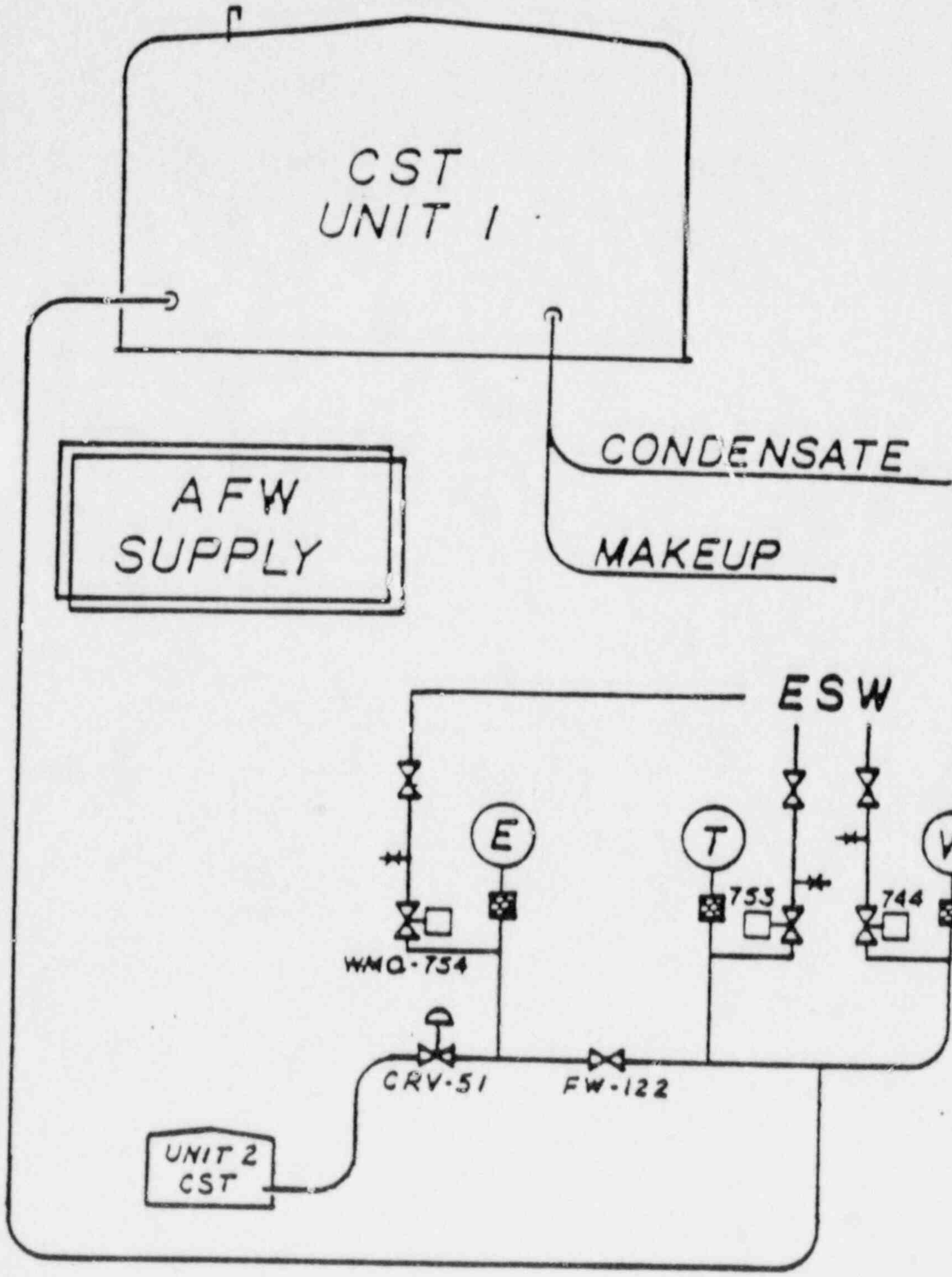
WMO-754
753
CST
ELO
TEST
CRV-51

Sketch No. 2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CONDENSATE
MAKEUP
AFW
SUPPLY
ESW
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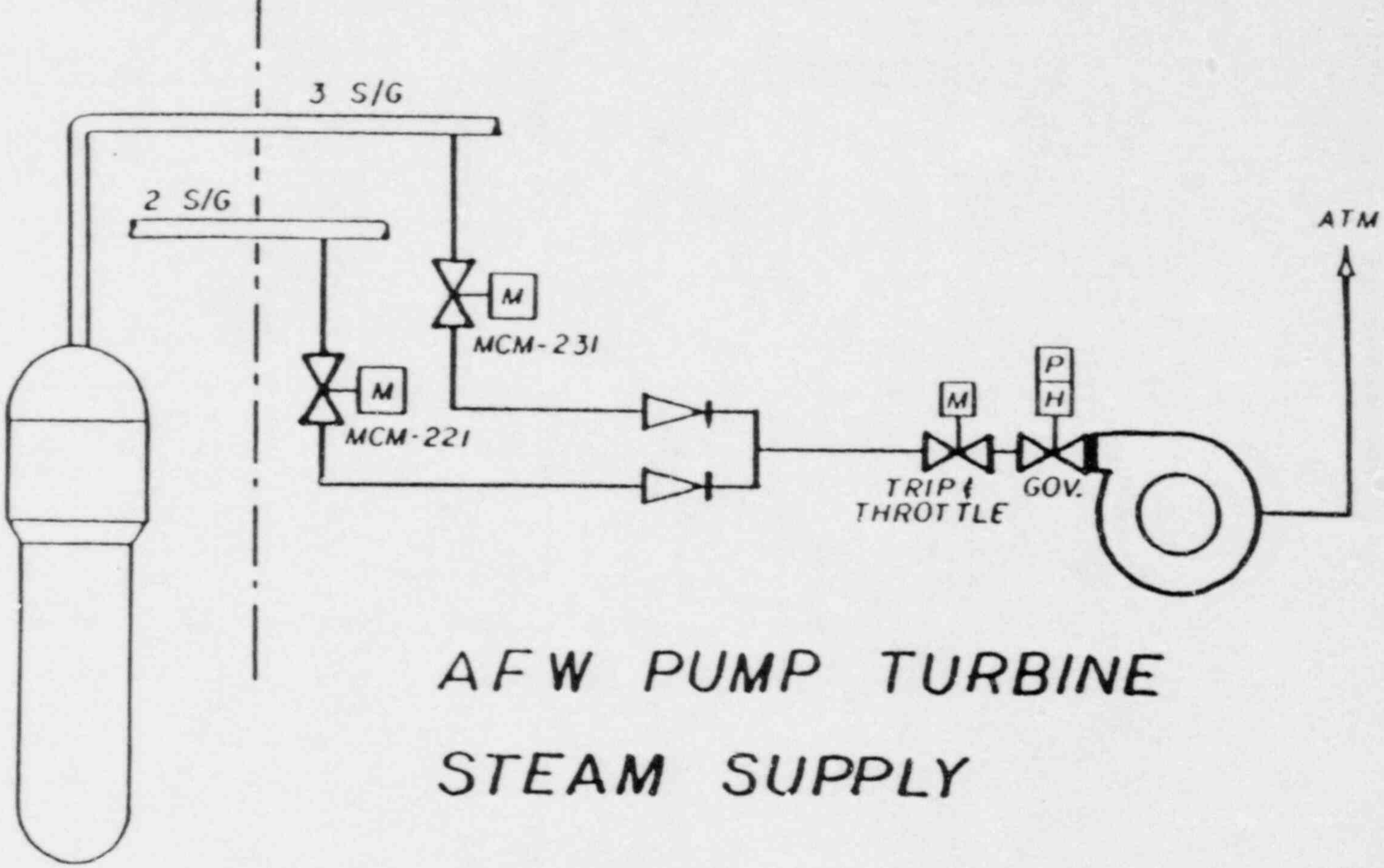
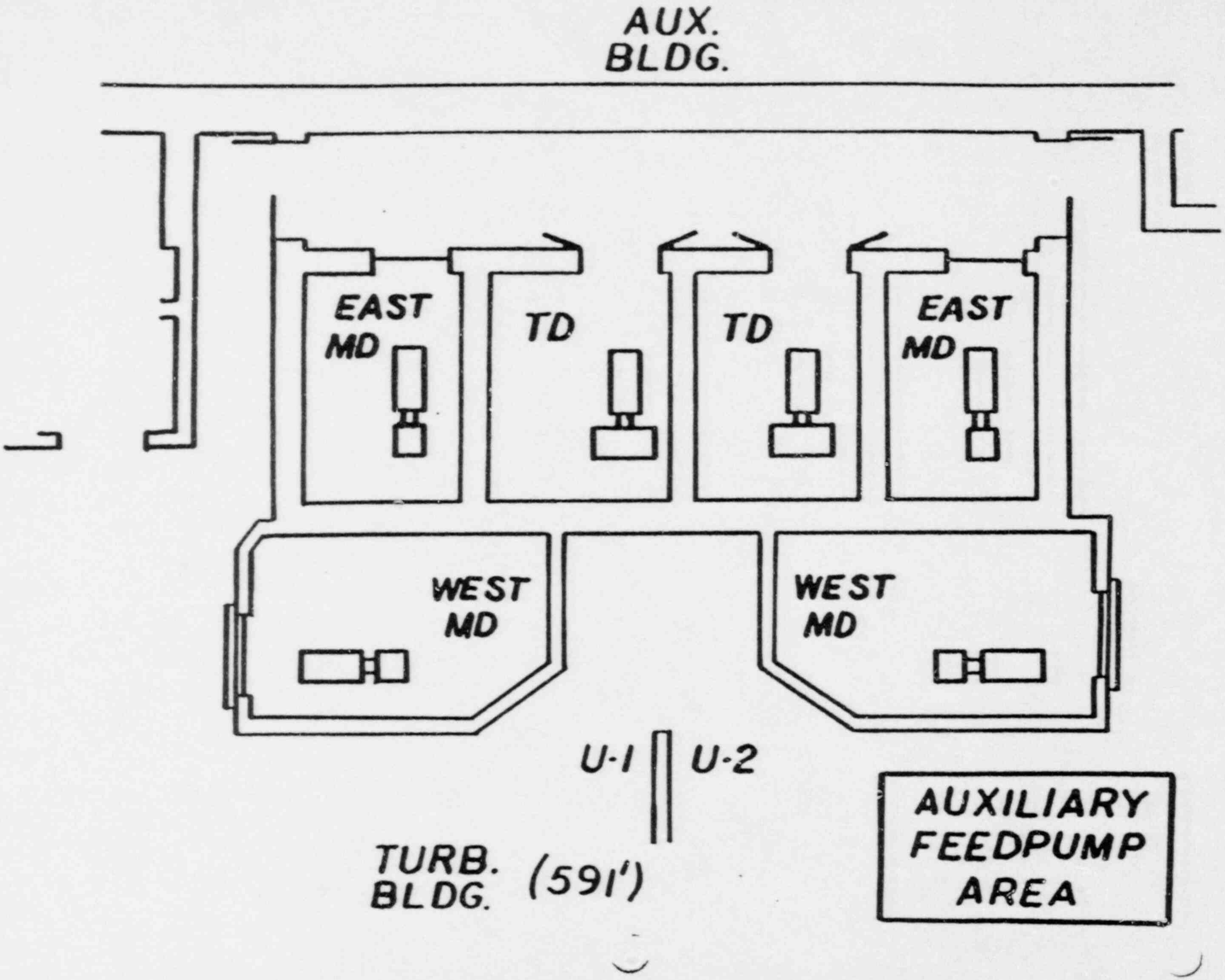
744
WMO-754
CRV-51
FW-122
UNIT 2
CST



AFW PUMP TURBINE STEAM SUPPLY

Sketch No. 3

Sketch No. 4


AUX.
BLDG.
EAST
MD
TD
TD
EAST
MD
WEST
MD
WEST
MD
U-1
U-2
TURB.
BLDG.
(591')
AUXILIARY
FEEDPUMP
AREA

Attachment 3

PRELIMINARY DOCUMENT LIST

PRELIMINARY LIST OF DOCUMENTS FOR AUXILIARY FEEDWATER SYSTEMS AND SUPPORT SYSTEMS SSFI ASSESSMENT

	PREPARATION OF ASSESSMENT PLAN	USE DURING ASSESEMENT ACTIVITIES	DEFINITION OF DESIGN BASIS	SAFETY FUNCTIONS	NORMAL, ABNORMAL, E[illegible]ENCY COND.
ORIGINAL AND UPDATED FSAR	X	X	X	X	X
SYSTEM DESCRIPTIONS	X	X	X	X	
DESIGN CALCULATIONS WITH ORIGINAL DESIGN REQUIREMENTS (flows, temperatures, pressures)		X	X		X
SAFETY EVALUATION REPORTS		X	X	X	
ALL LICENSING CORRESPONDENCE AND COMMITMENTS		X	X	X	
FLOW DIAGRAMS	X	X		X	X
INSTRUMENTATION DRAWINGS		X			X
ELECTRICAL ELEMENTARY DIAGRAMS		X		X	
SYSTEM OPERATING PROCEDURES (normal, abnormal, emergency)	X	X		X	X
DESIGN CHANGE PACKAGES (RFCs, PMs), INCLUDING 50.59 REVIEWS		X	X	X	X
AS-BUILT DRAWINGS (including wiring, physical, hanger sketches, isometrics, etc.)		X			
ALL 50.59 SAFETY EVALUATION (other than those contained in Design Change Packages)		X	X	X	
RESPONCE TO IE BULLETIN 79-14					
SYSTEM/EQUIPMENT MAINTENANCE PROCEDURES		X			X
EQUIPMENT VENDOR MANUALS AND DRAWINGS		X			
COPIES OF JOB ORDERS (open and closed)		X			X
NPRDS REPORTS FOR EQUIPMENT ON AFW AND SUPPORTING SYSTEMS		X			X
APPLICABLE TECHNICAL SPECIFICATIONS	X	X	X	X	
APPLICABLE SURVEILLANCE TEST PROCEDURES		X	X		X
RESPONSE TO NRC GENERIC LETTER 83-28 (ATWS)		X			
STATION Q LISTS (N-LIST, FACILITY DATA BASE)		X			
SPECIFICATIONS (procurement, installation, testing, etc.)		X		X	X
TRAINING MATERIAL		X			
NSSS INTERFACE CRITERIA	X	X	X		

ADDITIONAL LIST OF DOCUMENTS REQUIRED

	PREPARATION OF ASSESSMENT PLAN	USE DURING ASSESEMENT ACTIVITIES	DEFINITION OF DESIGN BASIS	SAFETY FUNCTIONS	NORMAL, ABNORMAL, E[illegible]ENCY COND.
SEPARATION CRITERIA DOCUMENT	X	X	X	X	
CONTROL PANEL LAYOUTS (INCLUDING FRONT VIEWS)		X		X	X
DRAWING INDEX	X	X			
CALCULATION INDEX	X	X			
PLANT AND EQUIPMENT GENERAL ARRANGEMENTS	X	X			
PUMP PERFORMANCE CURVES		X			X
PUMP MOTOR DATA (INCLUDING SPEED TORQUE CURVE, ACCELERATION CURVE, AND SAFE-TIME-CURRENT CURVE)		X			X
PUMP AND DRIVER OUTLINES		X			X
DETAILED ORGANIZATION CHART (WITH REPORTING INTERFACES)	X	X			
INSTRUMENT LIST AND SETPOINT LIST		X	X		
LINE LIST		X			
VALVE LIST		X			X
PIPING DESIGN SPECIFICATION		X			X

Attachment 4

SPECIFIC OBSERVATIONS

Contents

Obs. No.	Rev.	Date	Discipline/Area
SFK-1	1	8/10/87	Electrical
SFK-2	1	8/11/87	Electrical
SFK-3	1	8/20/87	Electrical
SFK-4	1	8/11/87	Electrical
SFK-5	1	8/21/87	Electrical
SFK-6	1	8/11/87	Electrical
SFK-7	2	8/14/87	Electrical
SFK-8	1	8/14/87	Electrical
SFK-9	2	8/14/87	Electrical
SFK-10	1	8/17/87	Electrical
SFK-11	1	8/17/87	Electrical
SFK-12	1	8/21/87	Electrical
SFK-13	1	8/21/87	Electrical
SFK-14	1	8/17/87	Electrical
SMK-1	2	8/10/87	Mechanical
SMK-2	1	8/11/87	Mechanical
SMK-3	1	8/11/87	Mechanical
SMK-4	1	8/11/87	Mechanical
SMK-5	2	8/21/87	Mechanical
SMK-6	2	8/12/87	Mechanical
SMK-7	1	8/12/87	Mechanical
SMK-8	1	8/08/87	INVALID
SMK-9	3	8/12/87	Mechanical
SMK-10	1	8/12/87	Mechanical
TDG-1	1	8/03/87	Mechanical
TDG-2	1	7/22/87	Mechanical
TDG-3	0	8/12/87	Mechanical
TDG-4	1	9/12/87	Mechanical
TDG-5	1	8/08/87	INVALID
TDG-6	0	8/05/87	Mechanical
RBP-1			Controls
RBP-2	1	8/12/87	Controls
RBP-3	0	8/06/87	Controls
RBP-4	1	8/12/87	Controls

Obs. No.	Rev.	Date	Discipline/Area
MB-1	1	8/10/87	Operations
MB-2	0	7/22/87	Operations
MB-3	0	7/22/87	INVALID
MB-4	0	8/06/87	Operations
MB-5	0	8/11/87	Operations
MB-6	0	8/12/87	Operations
WL-1	2	8/12/87	Maintenance
WL-2	1	8/12/87	Maintenance
WL-3	0	7/24/87	Maintenance
WL-4	1	8/12/87	Maintenance
WL-5	1	8/12/87	Maintenance
WL-6	1	8/03/87	INVALID
WL-7	1	8/12/87	Maintenance
WL-8	1	8/12/87	Maintenance
WL-9	1	8/12/87	Maintenance
WL-10	0	8/06/87	Maintenance
RB-1	0	8/04/87	Surveillance Testing
RB-2	0	8/04/87	Surveillance Testing
RB-3	1	8/21/87	Surveillance Testing
RB-4	0	8/11/87	Surveillance Testing
RB-5	0	8/17/87	Surveillance Testing
RB-6	0	8/17/87	Surveillance Testing
RB-7	0	8/17/87	Surveillance Testing
RB-8	0	8/19/87	Surveillance Testing
RB-9	0	8/19/87	Surveillance Testing
RB-10	0	8/19/87	Surveillance Testing
GJO-1	0	7/22/87	Training
CW-1	0	8/17/87	Training
PM-1	0	8/05/87	General
DK-1	0	8/04/87	General

NUMBER: SFK-1
REVISION: 1
DATE: 8/10/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: Error in motor data resulting in incorrect required instantaneous relay setting for West Motor Driven Auxiliary Feedwater Pump (MDAFP).

REQUIREMENT: Relay setting chosen must ensure motor starting at maximum bus voltage conditions, and considering asymmetrical starting current.

DISCUSSION: RFC-12-2862 was initiated as a result of spurious tripping of 4Kv safety motors during surveillance starting. The RFC established the instantaneous (Type PJC) relay setting based on motor full load current. The RFC used a value of current of 62 amperes for the West MDAFP, apparently assuming that the current was the same as the East MDAFP full load current value of 62 amperes. The team noted during a plant walkdown that the West MDAFP had a full load current value of 66 amperes based on motor nameplate data. The RFC calculation based on the erroneous input data resulted in a relay setting requirement of 31 amperes, whereas using 66 amperes full load current and RFC-12-2862 criteria results in a relay setting of 33 amperes, which is 6% higher.

EXAMPLES: West Motor Driven Auxiliary Feed Water Pump
4Kv Circuit Breaker T11A2
BUS T11A

COMMENT AS TO SAFETY SIGNIFICANCE:

The error in the recommended relay setting could result in spurious motor tripping on starting. During accident conditions, and considering a single failure of the redundant Auxiliary Feedwater Pump (Turbine or Motor Driven), a spurious trip of the West MDAFP on starting would result in a minimum of 50% flow of auxiliary feedwater to the steam generators (assuming Turbine Pump failure) when required. However, the operator could attempt to manually restart the motor from the control room.

NUMBER: SFK-2
REVISION: 1
DATE: 8/11/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: Inadequate 1-AB Battery Capacity at Minimum Design Ambient Temperature

REQUIREMENT: Battery shall have adequate capacity at minimum design ambient temperature for the design load in accordance with 10CFR50, Appendix "A", General Design Criterion 17, "Electric Power Systems"

DISCUSSION: RFC-01-2764 sized the existing 1-AB Battery based on a minimum room ambient temperature above 70°F. HVAC Engineers have indicated that the minimum design ambient temperature for 1-AB Battery is 60°F. At 60°F the existing battery is undersized by 7%. However, on review of 1-AB Battery surveillance records the team notes that between December 1984 through March 1986, during winter months, 1-AB battery cell temperatures have been below 70°F, generally in the 60°F range, and on certain occasions in 1984 and 1985 as low as 47°F and 43°F respectively. At 43°F the existing battery is undersized by over 20%.

COMMENT AS TO SAFETY SIGNIFICANCE:

For design ambient temperatures below 70°F, the 1-AB Battery does not have adequate capacity to satisfy the design load profile of RFC-01-2764.

The apparent failure to translate design ambient temperature requirements into the plant design is a violation of ANSI N45.2.11-1974, Section 3, Design Input requirements.

NUMBER: SFK-3
REVISION: 1
DATE: 8/20/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: Potential for undetected damage to valve motors and inadequate overload protection provided by vendor for FMO-221 and FMO-231.

REQUIREMENT: RFC-12-2180 provides criteria to select overload relay heater coils for safety related motor operated valve protection. Specification DCCEE-182-QCN, Revision 3, 250 VDC Valve Control Centers, issued as part of work related to RFC-12-2222, instructed the motor control equipment vendor to provide heaters to operate at 200% of full load current, in accordance with RFC-12-2180 criteria.

DISCUSSION: Overload relay heater selected by vendor, Coil No. H1040, for FMO-221 and FMO-231, minimum trip current is between 17.38 amperes and 18.5 amperes, which does not comply with the specification requirement to trip at 200% of full load current (i.e., 2 x 7.4 amperes = 14.8 amperes). Also, the team estimates that the overload relay provided would operate in a minimum of approximately 30 to 40 seconds with motor stall/locked rotor current flowing. The team contacted Mr. J. Drab of Limitorque Corporation, the valve actuator manufacturer, and found that the typical allowable locked rotor/stall time for Limitorque provided direct current motors is approximately 10 seconds. Therefore, the overload protection provided on RFC-12-2222 and, in general, provided by RFC-12-2180 does not protect the motor from damage due to locked rotor conditions which exceed the motor allowable stall time.

COMMENTS AS TO SAFETY SIGNIFICANCE:

The overload relay protection provided is intended to satisfy Regulatory Guide 1.106 requirements to ensure valve motor operators perform the required safety function during accidents. However, since effective motor stall or overload protection is not provided, valve motors could be damaged during normal plant operation which may go undetected.

NUMBER: SFK-4
REVISION: 1
DATE: 8/11/87

INSPECTION OBSERVATION

AREA: Electrical Surveillance

INSPECTOR: S. F. Kobylarz

ISSUE: Battery Technical Specification Surveillance

REQUIREMENT: Technical specification 4.8.2.3.2 d surveillance requires, once per 18 months, verification that battery capacity is adequate for the emergency loads and the times specified in Table 4.8-1A.

DISCUSSION: The Diesel Inverter provides field flashing to the standby emergency diesel generators. Diesel Inverter load, 6 amperes for 8 hours duration, is missing from Table 4.8-1A of the Surveillance Requirements for the AB and CD station batteries.

COMMENT AS TO SAFETY SIGNIFICANCE:

Verification of AB and CD battery capacity is important to plant safety.

NUMBER: SFK-5
REVISION:
DATE: 8/21/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: Inadequate voltage rating of the East Motor Driven Auxiliary Feedwater Pump

REQUIREMENT: Motor shall be rated at 4000 volts in accordance with specification DCCEE-101-QCN Requirements

DISCUSSION: On review of motor data for the East Motor Driven Auxiliary Feedwater Pump the team noted a motor rating of 4160 volts. On a plant walkdown the team confirmed the motor nameplate rating of 4160 volts. The D.C. Cook Voltage Performance Study, dated December 1985, shows on Exhibit 9 and 10 for case (d): Shutdown and accident auxiliary load of one unit with shutdown auxiliary load of the other unit, 92.7% voltage on transformer 101CD low side (on a 4000 volt base) or 3708 volts. The minimum continuous operating voltage for the East AFPM is 90% of 4160 volts or 3744 volts at the motor terminals. The sizing of the feeder cable from bus T11D to the East AFPM allows a drop in voltage of 19 volts. Therefore, the calculated minimum steady state voltage available at the motor terminals is (3708-19) or 3689 volts (neglecting the voltage drop in the feeder from the transformer to the bus). 3689 volts is 88.7% on a 4160 volt base, which does not satisfy the minimum operating motor terminal voltage requirement of 90% rated voltage. The West Motor Driven Auxiliary Feedwater Pump motor is correctly rated as a 4000 volt motor.

COMMENT AS TO SAFETY SIGNIFICANCE:

The subject motor is not rated to continuously operate with less than 90% rated voltage at the terminals. The motor is subject to potential failure if operated during accident conditions at less than 90% rated voltage.

NUMBER: SFK-6
REVISION: 1
DATE: 8/11/87

INSPECTION OBSERVATION

AREA: Electrical/HVAC Design

INSPECTOR: S. F. Kobylarz

ISSUE: Lack of battery room low temperature alarm for 1-AB and 1-CD Batteries

REQUIREMENT: RFC-01-2764 which replaced the 1-AB and 1-CD Batteries stated in the design package that battery room low temperature alarms will be provided on RFC-12-2788.

DISCUSSION: Battery performance is dependent on maintaining a minimum battery cell temperature. RFC-01-2764 sized the safety related batteries assuming adequate ambient temperature control and low temperature alarms will be provided on ventilation RFC-12-2788. No battery room low temperature alarms have been provided in the design, and an inadequate minimum design ambient temperature has been utilized in the HVAC design for the 1-AB Battery Room (Observation SFK-2). Also, the 1-AB battery cell temperature has been observed to be over twenty-five (25) degrees less than the required minimum design temperature, and approximately fifteen (15) degrees less than the stated HVAC design ambient minimum temperature.

COMMENT AS TO SAFETY SIGNIFICANCE:

Inadequate instrumentation or alarms are provided to the operator to identify that environmental conditions detrimental to the safety related performance requirements for the station batteries exist in the plant. The low ambient temperature conditions which adversely affect battery performance have not been adequately addressed in HVAC design and also have been observed to be significantly less than anticipated.

The lack of adequate alarm(s) to alert the operators to take appropriate action is considered to be a design deficiency and a violation of ANSI Std N45.2.11-1974 identification of Design Input and Design Verification Requirements.

NUMBER: SFK-7
REVISION: 2
DATE: 8/14/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: Technical errors in safety review memorandum RFC DC-12-2934

REQUIREMENT: 10 CFR 50.59 approval requirements

DISCUSSION: Subject memorandum dated 11/20/86 on RFC DC-12-2934 states that as justification to remove the open torque switches from de-energizing the valve motors on the opening stroke, a heat sensor in the motor will turn off the motor and prevent damage to the motor if the valve sticks when the operator attempts to open it.

COMMENT AS TO SAFETY SIGNIFICANCE:

A thorough technical review to determine the potential for an unreviewed safety question has not been performed.

In a strict technical sense, the heat sensor described indicates integral (internal) motor stator protection which is not a design feature of the motor operated valves on RFC-12-2934. Also, the safety evaluation is based on the motors being protected for mechanical failure of the valve which is erroneous since the motors are neither protected for stuck valve conditions, which would exceed the motors rated stall time, nor for conditions of mechanical overload, such as due to stem binding, or valve disc/wedge binding, or tight packing, or dirty or inadequate stem lubrication. (See also Observation SFK-10).

NUMBER: SFK-8
REVISION: 1
DATE: 8/14/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: Potential for common mode failure of 250VDC circuit breaker panels.

REQUIREMENT: Circuit breakers shall have adequate interrupting capability on systems on which they are applied.

DISCUSSION: On replacement of station batteries AB & CD (Reference "FC-01-2764) higher capacity batteries were furnished and installed. Short circuit current calculations were not performed at that time to verify adequate system capability for the new batteries. On review of the 250 VDC system the team notea the use of circuit breakers which do not have a high DC interrupting capability. The circuit breakers utilized are Heinemann Type 2X0415, catalog No. 41-598. These circuit breakers are not rated by the manufacturer for 250 VDC service. On discussion with Heinemann's Engineer the team was advised that the catalog No. 41-598 is a special number utilized for AEP, whereby two (2) breakers are wired in series (By AEP) to achieve a 250 VDC rating. No testing was performed by Heinemann to verify this breaker-in-series capability. Likewise, no documentation was available from AEP files to demonstrate successful fault testing of this arrangement.

Also, on review of the 250 VDC main one-line diagram and wiring diagrams, and on verification on a field walkdown, the team observed that two-in-series circuit breakers per leg have not been shown on drawings or installed in the 250 VDC panels. The actual Heinemann model of breaker utilized in the panel could not be verified.

At the teams request, a 250 VDC system short circuit calculation was performed to determine the fault current available at a "worse case" panel CCV-CD fed from the CD battery. The calculation, preliminary and unverified, showed that over 5,200 amperes at 250 VDC are available at the panelboard. The published interrupting rating for the breaker is 5,000 amperes at 125 VDC. However, the team found in the published literature, Bulletin 3105, dated February 1969, that this interrupting rating applied to breakers rated at up to 3 amperes continuous. The circuit breakers utilized on the 250 VDC panelboards are rated 10 amperes continuous. Therefore, the team finds that the published interrupting capability for the circuit breakers in use is questionable.

In summary, the circuit breakers applied on the subject panels, Heinemann catalog number 2X0415, are neither designed nor tested for application at 250 VDC. The interrupting capability for the subject breakers at 250 VDC is not known. Preliminary calculations indicate that the fault current available at the subject breakers exceeds the manufacturers published capability at 125 VDC, let alone 250 VDC.

Therefore, the circuit breakers are subject to failure on an attempt to interrupt faults. Failure of the circuit breaker to interrupt faults would require an upstream protective device to clear the fault, which would cause the interruption of power to the entire panelboard. Also, possible damage to the panelboard could result due to the circuit breaker failure.

COMMENT AS TO SAFETY SIGNIFICANCE:

Postulated failure of BOP circuits fed from redundant circuit breaker distribution panels (CCV-CD and CCV-AB for example), and postulated subsequent failure of those panels due to circuit breaker failure due to inadequate rating, and subsequent upstream automatic fuse operation results in loss of power to redundant train ESS circuits. The safety significance of this failure mode needs to be evaluated.

NUMBER: SFK-9
REVISION: 2
DATE: 8/14/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: Failure to evaluate the consequences of a partial implementation of design change to ensure successful starting of ESS Motors

REQUIREMENT: Safety related motors must start on demand to mitigate design basis accident conditions

DISCUSSION: The setting of motor overload/fault current protection must ensure successful motor starting for all design conditions, such as during maximum bus voltage conditions. The plant experienced nuisance trips of safety bus motors on starting resulting in 1) a change in tap setting of an offsite transformer to lower the auxiliary bus voltage, and 2) a review of the motor instantaneous or PJC Relay settings. RFC-12-2862 was initiated to increase the motor PJC Relay settings in accordance with standard industry practice. Previously the relays were set by testing which did not provide sufficient starting current margin to account for current asymetry, thereby resulting in relays set too low which contributed to nuisance/spurious motor trips.

A memorandum dated August 30, 1985 on 4Kv safety motor protection circuits, RFC-12-2862 PJC Calibration, and RFC-01-2213 Cable Replacement, acknowledge that the implementation of RFC-12-2862 relay setting changes during the outage may not be completed, since cable replacement changes required to eleviate current transformer saturation problems may also not be completed. The memorandum recommended an intermediate measure to improve the probability that the PJC Relay would operate on a fault but which would not completely resolve the PJC tripping problem on motor starting. No analysis was performed at that time to demonstrate that the remaining safety motors had adequate relay settings to ensure motor starting. On 7/24/87 at the request of the team, a preliminary calculation was done to show that for the West Auxiliary Feedwater Pump Motor the PJC Relay would probably not trip spuriously with the existing setting on August 30, 1985.

COMMENT AS TO SAFETY SIGNIFICANCE:

On partial completion of RFC-12-2862 a safety evaluation should have been performed to ensure that an unreviewed safety question did not exist in the plant, in accordance with the requirements of 10CFR50.59, for the "temporary fix" as described in the subject August 30, 1985 memorandum.

NUMBER: SFK-10
REVISION: 1
DATE: 8/17/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: 1) Inadequate motor overload protection in accordance with licensing commitment on conformance with Regulatory Guide 1.106, Regulatory Position C(2)

2) Lack of design basis documentation to support 200% overload protection for motor operated valves

REQUIREMENT: Response to NRC Question 40.7 (Appendix Q, Unit 2 FSAR) states that an overload device setting at 200% of motor nameplate current will prevent permanent damage to motors due to "correctable mechanical failures."

DISCUSSION: RFC-12-2180 increased the overload trip setpoint on safety related motor operated valves to 200% of full load current. No design basis calculation/analysis is available to demonstrate that the motors are protected from damage due to the correctable mechanical failures. The overload relay heater coil selection tables utilized in the RFC were noted by the team to apply to continuous duty motors with 1.15 service factors. Typical motor operated valve motors, as supplied by Limitorque Corporation, are 5 minute or 15 minute duty motors. The selection criteria in the RFC did not account for this difference in the motor duty requirements. Also, specification DCC EE-182-QCN, Revision 3, as part of RFC-12-2222, indicated in part VI.E., Thermal Overload Heaters, requirements on the selection of motor overload protection meant to satisfy RFC-12-2180 criteria. Part VI.E.1 stated that "heaters shall be provided to operate at 200% of full load current and shall trip off in not less than twice the valve travel time at stalled rotor current." The typical allowable stall time for Limitorque supplied motors is 10-15 seconds. Overload tripping in not less than twice valve travel time at stalled/locked rotor conditions will in most applications significantly damage or destroy a typical valve motor.

On review of the overload protection provided on RFC-12-2222 the team found that the overload relay would operate in a minimum of 30 to 40 seconds on stalled motor conditions (See Observation SFK-3). The team considers this operating time to be a typical result of the RFC-12-2180 heater sizing criteria, resulting in a lack of adequate stalled/locked rotor protection for valve motors.

COMMENT AS TO SAFETY SIGNIFICANCE:

Inadequate motor overload protection exposes valve motors to potential damage, during normal plant operation, which may go undetected. A design basis analysis, which demonstrates the adequacy of the motor overload protection scheme for motor operated valves, should be provided to satisfy ANSI Std N45.2.11-1974 Requirements in accordance with plant commitments on conformance with Regulatory Guide 1.106, "Thermal Overload Protection For Electric Motors On Motor Operated Valves."

NUMBER: SFK-11
REVISION: 1
DATE: 8/17/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: Inadequate protective device coordination on safety related 250VDC System

REQUIREMENT: Protective device coordination is required to satisfy 10CFR50 Appendix "A" General Design Criteria 17 and Appendix "R" design requirements.

DISCUSSION: Inadequate protective device coordination between molded case circuit breakers on panels SSV-A1 or SSV-A2 and CCV-CD, and breaker panel CCV-CD and fuse panel MCCD was noted. Protective device coordination between BOP and safety related (ESS) protective devices is required to satisfy the requirements for isolation devices in implementing the single failure criteria of 10CFR50 Appendix "A" General Design Criteria 17 and Appendix "R" design requirements for associated circuits and shutdown capability.

EXAMPLES: DRAWING 1-12071-1, CCV-CD & SSV-A1 & A2
1-12061-1, CCV-AB & SSV-B
1-12060-2, MCAB
1-12070-2, MCCD

COMMENT AS TO SAFETY SIGNIFICANCE:

Since the circuit breakers which feed BOP circuits from distribution panels (SSV-A1 and SSV-A2, and CCV-CD; or SSV-B and CCV-AB) are not electrically coordinated with upstream protective devices, a postulated single failure of the BOP circuits would cause the loss of power to redundant train ESS circuits.

A loss of power to redundant ESS trains occurs due to the automatic operation of main upstream protective devices in clearing the faulted downstream BOP branch circuits, which are fed from each of the redundant panels. When the main protective device operates (fuse open or circuit breaker trip as applicable) the power to the entire panel is lost. This failure mode is common to both ESS trains since distribution panels in both trains power BOP branch circuits.

The safety significance of the postulated failure needs to be evaluated for Appendix "A", General Design Criteria 17 and Appendix "R" design requirements.

NUMBER: SFK-12
REVISION: 1
DATE: 8/21/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: Lack of documentation on PJC relay setting of safety related breaker T11A2 West Motor Driven Auxiliary Feedwater Pump Motor

REQUIREMENT: Protective Relays shall be set in accordance with relay setting sheets for each breaker

DISCUSSION: On plant walkdown on 8/5/87, the team noted that the subject breaker instantaneous relay, Type PJC, was set at 27 amperes. The setting at 27 amperes did not agree with the prior required setting of 23 amperes as noted on the relay setting sheets maintained by AEPSC Engineering.

COMMENT AS TO SAFETY SIGNIFICANCE:

No direct impact on plant safety. The relay was set at an acceptable point to avoid motor tripping. However, the relay setpoint is safety related and any change in a setpoint is required to be approved by AEPSC Engineers and recorded in the engineers relay setting book. No evidence of approval could be found for the change in setting from 23 amperes to 27 amperes which occured on 7-11-87.

NUMBER: SFK-13
REVISION: 1
DATE: 8/21/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: Difference in overload relay heater coil selection data between RFC-12-2180 and RFC-12-2903

REQUIREMENT: Heater coil selection should be based on the applicable coil selection table for the hardware supplied.

DISCUSSION: The team noted that different heater coil data, for the same coil catalog number, exists for the Cutler Hammer Type ST overload relays. This observation resulted from a comparison of the manufacturers' heater coil selection data on RFC-12-2180 and RFC-12-2903. The difference in data is of sufficient magnitude to account for different heater coils to be selected depending on which table is utilized. Since apparently the coil tables apply to hardware manufactured during different time frames, design control of the use of the proper selection table for the hardware installed, or to be installed, is required.

COMMENT AS TO SAFETY SIGNIFICANCE:

An error made in the use of the wrong heater coil selection table for the hardware installed results, at most, in being off by one coil size or catalog number. This error would not be safety significant for motor operated valve motor protection due to the intentional margin in the overload selection criteria (200% of motor full load amperes).

Fan and pump motor protection should be reviewed to ensure that adequate overloads were provided in accordance with the applicable manufacturers heater selection criteria.

protective device operates (fuse open or circuit breaker trip as applicable) the power to the entire panel is lost. This failure mode is common to both ESS trains since distribution panels in both trains power BOP branch circuits.

The safety significance of the postulated failure needs to be evaluated for Appendix "A", General Design Criteria 17 and Appendix "R" design requirements.

NUMBER: SFK-14
REVISION: 1
DATE: 8/17/87

INSPECTION OBSERVATION

AREA: Electrical Design

INSPECTOR: S. F. Kobylarz

ISSUE: Valve nameplate data differences in design data resulting in drawing inconsistencies and incorrect overload relay heater coil selection

REQUIREMENT: Equipment nameplate data should be verified.

DISCUSSION: The team noted on RFC-2222 and RFC-2903 that nameplate data, determined during a plant walkdown, differed from the design data utilized in the RFC and as shown on the one-line diagrams.

EXAMPLES:

1) Nameplate data for FMO-221 and 231 (for example) which were installed on RFC-2222 showed a nameplate horsepower (HP) of 1.805 Hp. Drawing 1-12065-1, Revision 1, showed the valves as 1.6 Hp. These valves were replaced on RFC-2903.

2) Nameplate data on FMO-231, 232, 221 and 222 on Hp and full load amperes was found to differ with the certified "approximate" data utilized in RFC-2903 design calculations which impact the selection of the motor overload heater coils.

COMMENT AS TO SAFETY SIGNIFICANCE:

Design verification of as-installed or equipment nameplate data is required by ANSI STD. N45-2.11-1974 and is important to safety. The above noted discrepancies are not safety significant.

NUMBER: SMK-1
REVISION: 2
DATE: 8/10/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: S. M. Klein

ISSUE: Incorrect Evaluation of Maximum Differential Pressure Across Flow Retention MOV's

REQUIREMENT: Flow retention valves FMO 211, 212, 221, 222, 231, 232, 241, and 242 must open and close against maximum anticipated differential pressures existing during worst case accident scenarios to satisfy their safety function.

DISCUSSION: The AFW flow retention valves are designed to limit flow to levels which do not exceed the runout capacity of the AFW pumps during a main steam line or main feed line break. In addition, the valves must isolate an affected steam generator in the event of a main feedwater line break accident. Therefore the valves must open against maximum anticipated differential pressures resulting from maximum pump discharge pressures and minimum steam generator pressures during the worst case accident. Contrary to this requirement, engineering analyses did not identify the worst case maximum valve differential pressures against which the valves must open and close.

EXAMPLES: In response to IE Bulletin No. 85-03, Calculation HXP860522AF dated 5/22/86, was developed to establish the maximum differential pressures across the flow retention valves. The calculation incorrectly adjusted the maximum differential pressure across valves FMO 212, 222, 232, and 242, for the 120 psi emergency service water pump discharge pressure which was included in the maximum MDAFW pump discharge pressure, 1550 psig, appearing on the AFW flow diagram. This adjustment was made since the emergency service water system is not the normal preferred source of auxiliary feedwater. However, the emergency service water system is the alternate source of auxiliary feedwater if the condensate storage tanks are not available. Consequently, maximum MDAFW pump discharge pressure could be raised by 120 psi when the emergency service water system is used as the source of cooling water to establish the maximum differential pressure against which these FMO's must close. Similarly, the maximum differential pressure against which the valves must open must be increased by 120 psi to account for the emergency service water system pressure.

For the maximum differential pressure across valves FMO 211, 221, 231, and 241, the calculation incorrectly deducted emergency service water pressure from maximum TDAFW pump discharge pressure. In addition, the calculation erroneously adjusted the result for a minimum steam generator pressure of 310 psig. This was based on the minimum pressure required to operate the AFW turbine and achieve AFW required flows for this accident scenario. However, the TDAFW pump is capable of providing much lower flows through the emergency leak off line at much lower steam pressures, near 165 psig. The combined effects of these errors significantly increase the opening and closing maximum differential pressures across these FMO's.

COMMENT AS TO SAFETY SIGNIFICANCE:

A review of the valve data for the existing FMO'S indicate that the maximum differential pressures provided to the valve manufacturer was incorrect (1200 psig). Therefore the existing valves might have been incapable of performing their safety function. The valve data sheets for the new valves purchased to replace the old FMO's indicate maximum differential pressures which are less than those specified in the analysis, and appear substantially less than those required considering the effects of the errors identified. However, the valve manufacturer provided a valve capable of opening against 1550 psid, which is sufficient to open the valve against maximum differential pressure. Therefore, there is no safety concern relative to the actual capabilities of the new valves.

POST INSPECTION:

Subsequent to the completion of the inspection, AEP provided additional information concerning these valves:

1. AEP stated that since these valves are normally open and automatically travel to a preset position, a faulted steam generator's FMO would not be closed against a pump operating at shut-off. AEP noted, however, that during pump surveillance testing, the FMO valves are closed for the pump being tested. AEP stated that the valves would be opened automatically, or manually if required, and the FMO valve to the faulted steam generator would be left closed. Consequently, the valves which are opened would be operating against pressurized steam generators.

2. AEP noted that in the event ESW is supplied to the AFW pumps, the maximum pressure supplied should be at operating conditions for the ESW pumps, rather than ESW pump shutoff.

The team has reviewed the AEP information and has the following additional observations:

1. The team is concerned that the inability of the FMO to open against the depressurized steam generator in an accident which might occur during surveillance testing may impose additional unnecessary burdens on the operator at this time. In addition to identifying the faulted steam generator, the operator would be reqaired to conclude that the reason for one FMO not opening is that it is in the feedline to a depressurized steam generator. The team is concerned that this may cause further distraction to the operator. The team concludes that a system design which defeats the safety function of critical motor operated valve during a postulated accident scenario is not sound.

2. Although the team notes that taking credit for ESW system pressure losses in establishing maximum AFW system pressures and maximum differential pressures across the FMO's is not conservative, the team agrees that this is a reasonable approach. However, AEP should assure that a revised calculation for the maximum differential pressures across the FMO's should include, but not be limited to the following considerations:

o Evaluation of all operating conditions for the valves to open and close and the worst case differential pressures for each condition;

o Traceability and specific reference to any dependent calculations of ESW pressure and the specific values used for the cases considered;

o Justification for reliance on the ESW system pressure losses. (The team notes that most hydraulic analyses employ methods to maximize system pressure drops to assure conservative results to meet minimum system flow requirements. However, this would not produce conservative results for system design pressures or maximum differential pressure across the FMO's.)

3. The team is concerned that a rational documented basis for the maximum (design) differential pressure across the flow retention valves still does not exist.

NUMBER: SMK-2
REVISION: 1
DATE: 8/11/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: S. M. Klein

ISSUE: No design calculations to substantiate the size of the AFW suction line pressure relief valves which were added as part of a modification to the plant design.

REQUIREMENT: ANSI N45.2.11 requires that "design acitivities shall be documented in sufficient detail to permit verification and auditing" and that "methods shall provide for relating the final design back to the source of design input."

DISCUSSION: RFC 12-2540 is a modification to the AFW system in which the existing check valves FW 153 and 160 in the motor driven auxiliary feed pump emergency leakoff lines were replaced with swing check valves. The MDAFW pump suction line relief valves SV 169E and 169W were added in this modification.

EXAMPLES: The team could find no documented evidence to substantiate the size of the suction line relief valves. There is no analyses to confirm that the valves are adequately sized to accommodate flows necessary to maintain pressures within system design pressures.

COMMENT AS TO SAFETY SIGNIFICANCE:

There is no documented evidence that the MDAFW pump suction line relief valves are sized to relieve flows which could result from potential check valve leakage during instances such as emergency leak off check valve leakage which would impose an operating MDAFW pump discharge pressure on an idle MDAFW pump's suction potentially exceeding suction line design pressures.

NUMBER: SMK-3
REVISION: 1
DATE: 8/11/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: S. M. Klein

ISSUE: Incorrect and inconsistent design pressures in Pipe Material Specifications.

REQUIREMENT: ANSI B31.1 requires that system design pressures should be identified and include consideration of the maximum possible pressure which can exist in the system under all operating modes.

DISCUSSION: AEP Pipe Material Specification DCCPV104QCS, Revision 10 identifies system design pressures and temperatures for various system applications. The AFW pump suction line design presssure is specified as 105 psig. This pressure is not consistent with worst case maximum pressures which might result from leakage through the emergency leak off line check valve. RFC DC-12-2540, Rev. 2 added suction line relief valves the MDAFW pump suction lines to preclude such occurrences. However, the set pressure for these valves is 150 psig.

EXAMPLES: The team was advised that design pressures and temperatures listed in AEP Pipe Material Specifiction DCCPV104QCS, Rev. 10 may not necessarily reflect worst case maximum operating conditions. In some cases, such as for the AFW pump suction line, normal operating conditions are listed. There was no documented evidence that worst case conditions had been evaluated to establish system design pressures for modifications made to the plant design. The team was unable to identify what conditions the plant design reflected as related to piping design. In addition, there was no documentation to substantiate whether appropriate piping wall thicknesses had been calculated for the suction line (or other) piping.

COMMENT AS TO SAFETY SIGNIFICANCE:

The team was concerned that system design pressures could be exceeded during instances when check valves leaked or other situations in which maximum system pressures had not been properly evaluated, thereby compromising the integrity of the AFW system.

NUMBER: SMK-4
REVISION: 1
DATE: 8/11/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: S. M. Klein

ISSUE: Worst case maximum differential pressure not identified for MOV's MCM-221 and 231

REQUIREMENT: IE Bulletin 85-03, "Motor Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings," requested licensees "to develop and implement a program to insure that switch settings on certain safety-related motor-operated valves (MOVs) are selected, set and maintained correctly to accommodate the maximum differential pressures expected on these valves during both normal and abnormal events within the design basis."

DISCUSSION: In response to IE Bulletin 85-03, the licensee provided a status report (AEP:NRC:0966) identifying maximum differential pressures for motor operated valves in the auxiliary feedwater and safety injection systems. Contrary to the above requirement, the licensee did not identify the maximum differential pressure for the worst case which could be expected on several valves.

EXAMPLES: Table II of AEP:NRC:0966 lists the following motor operated valves in the auxiliary feedwater system with their associated design differential and maximum operating differential pressures in the opening and closing directions, as follows:

MOV	Valve No.	Design Close	Design Open	Max Operating Close	Max Operating Open
Steam Admitting Valves	MCM-221,131	758	758	600	0
Mechanical Trip and Throttle	QT-506	1190	1190	1097	1097

The steam admitting valves, MCM-221 and 231 are used to isolate a faulted steam generator. The rationale for the 600 psi maximum differential pressure across the valve is given as the maximum differential pressure across the valve during a steam line break downstream of the valve. The justification is that operator action to close the valve would occur following low steam generator pressure alarm at 600 psi. However, this is not the maximum pressure which could occur in the steam generator to which the valve would be exposed. During power operation, pressures can reach levels in excess of 700 psi and, during hot standby, over 1000 psig (as described in a memorandum from J. D. Hoffman to M. Marrocco on April 2, 1986).

During power operation, under conditions which cause steam generator safety relief valve actuation, pressures can reach 1097 psig. In such situations, the operator would be unable to isolate the break since the maximum differential pressure would exceed the capability of the operator. In fact, this is exactly the rationale offered in note 4. of Table II for the maximum differential pressure across the trip and throttle valve, QT-506. Even assuming normal operating pressure levels of 750 psig, the operator would be faced with equally unattractive alternatives. Since the steam generator would maintain steam pressure at saturated conditions by continuing to boil off water through the break, his choices would be limited to tripping the reactor or boiling dry the two steam generators supplying the turbine.

Refer to Inspection Observation SMK-1 for details concerning incorrect maximum differential pressures identified for other motor operated valves.

COMMENT AS TO SAFETY SIGNIFICANCE:

In the event of a steam line break described above, the break could be isolated only through alternatives which require unnecessary challenges to plant safety systems, as well as presenting the potential for personnel safety hazards to those who might be in the vicinity of the break.

Further, IE Bulletin 85-03 requires that the maximum anticipated differential pressure be identified for all motor operated valves. For valves MCM-221 and 231, the licensee failed to identify the maximum differential pressure for several valves indicating the potential for a weakness in the design process which establishes these parameters for motor operated valves.

NUMBER: SMK-5
REVISION: 2
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: S. M. Klein

ISSUE: Various deficiencies in design analyses and design input.

REQUIREMENT: ANSI N45.2.11 requires that design "activities shall be documented in sufficient detail to permit verification and auditing as required by this standard," and that "methods shall provide for relating the final design back to the source of design input." Contrary to these requirements, design analyses were performed with out providing adequate documentation of design input.

DISCUSSION: The team reviewed a number of calculations performed to substantiate modifications to the plant design for the AFW system.

EXAMPLES: Calculation No. HXP860522, dated 5/22/87. The subject of this calculation was to "determine max delta-p's (open/close) for the auxiliary FW FMO valves." The calculation was performed to determine the maximum differential pressure across the flow retention valves, FMO 211, 212, 221, 222, 231, 232, 241, and 242, in response to IE Bulletin 85-03. The team found that in addition to the deficiencies identified in Observation SMK-1 related to the methodology used, in several cases, design input was not substantiated. For example, the maximum discharge pressure for the emergency service water system was given as 120 psig. No reference to the source of this design number was identified. The minimum pressure required to operate the turbine driven auxiliary feed pump was given as 310 psi. However, no basis was given for this value. The team was advised that this value represented the pressure required for the TDAFW pump to develop required AFW flow. As noted in Observation SMK-1, this value was not the correct value to be used in this calculation since the TDAFW pump would be developing a flow lower than required AFW flow with the FMO valves shut. The lower required steam pressure would increase the maximum differential pressure across the valve.

Calculation HXP841005AF, Rev. 1, dated 10/5/84. This calculation was performed to "redo the 1980 analysis performed for AEP:NRC:0300C," which supported the capability of the auxiliary feedwater system to develop required flows during the accident conditions identified. The team found that objectives and conclusions of the calculations were generally presented in a clear and concise manner. The purpose was clearly stated, and the particular cases examined were identified in the text preceding the computerized output. However, a number of deficiencies were identified:

o No basis or reference was given for the flow retention pressure drops used;

o There was no traceability to the source documents used as input to the computerized hydraulic analyses included in the calculation. The team could find no L/D values or calculations used to substantiate the values in the calculations. A package which appeared to be the previous revision of this calculation which included some of this design input attached to the calculation, but this portion of the calculation was stamped "SUPERSEDED." One sheet of the computer output did contain the following notation:

"See File 10.4.4 for pipe friction calc sheets:

TDFP Disch - 1/25/73
E:NMDAFP Disch - 10/29/80
Suction pipe - 11/20/79"

However, the 10/29/80 calc sheets were the attached calcs which were stamped superseded. The other sheets were not included. The team questioned whether the data used in the 1/25/73 calculation was still valid since these calculations may have been affected by changes to the plant design since that time.

The team was advised that the calculations stamped superseded should have been stamped "superseded for results only" and that the input data was still valid and applicable to the revised calculation. However, upon further review, the team found that only certain portions of the superseded calculation were applicable. It was not obvious which portions could be used and which could not without recourse to the originator. The team found that it would be necessary to rebuild a complete calculation set from many pieces in order to complete the review.

The team noted that the output of one computer analysis was used as input to another computer program. However, in comparing output to input, the team determined small unexplained differences between the output values obtained and those used as input to the second program. This compounded traceability problems.

The team found that many of the calculation sheets were not legible and included computer printout sheets that were not adequately labelled. The team found that all of these factors contributed to the conclusion that the design analyses was not traceable back to the design input as required by ANSI N 45.2.11.

Calculation HXP841026AF1, dated 10/26/87. This calculation was performed to "re-evaluate the feedwater line break analysis to include operator action" in response to a Westinghouse owners group question. The calculation did not include any references or substantiation for the computerized input used in the analysis. The team was unable to determine design input for the computer input without recourse to the originator. The team was advised that all calculations shared the pipe friction data used as the bases for Calculation HXP841005AF, Rev. 1, dated 10/5/84. However, the calculations did not specifically indicate this, or how they should be applied.

In general, the team found that it was not obvious which calculations were the latest and final calculations for the design of the AFW.

The team also reviewed a preliminary calculation "to determine the total heat gain in the auxiliary feedwater pump rooms and to verify the adequacy of installed cooling capacity." The calculation was not identified by any number (notation after E/C ID No. "N/A"), but it was given a subject file number of 3.N.8-1. This calculation was initiated during the inspection in apparent response to a lack of documentation for the HVAC associated with modifications made to the AFW system. The calculation was unchecked and unverified. The team identified several concerns with the calculations:

1. No basis is given for the turbine room area (supply air) temperature of 110 °F;

2. No basis is given for the turbine surface area of 30 square feet;

3. No justification is provided for the use of engineering judgement to account for miscellaneous heat gains from supports, hangers, etc. through the use of a 15% safety factor applied to total heat gain;

4. Undocumented engineering judgement is also used to account for electrical heating loads, e.g., lighting by the application of an additional 10% safety factor to total heat gain;

5. An assumed motor efficiency (93%) is used rather than the actual motor efficiency without any substantiation;

6. An additional 5% safety factor is applied to the calculated motor heat rejection rate to account for further unidentified "misc. electrical loads" without justification of this factor.

The room temperature determined from this calculation was 119.31 °F compared to the 120 °F design temperature. Because of the small indicated margin and the extensive use of undocumented engineering judgement throughout this calculation, the team was concerned that unaccounted for and unidentified miscellaneous heat loads could result in temperatures which might exceed the 120 °F design temperature. The team found that the use of an arbitrary safety factor to account for miscellaneous heat loads without adequate substantiation was not acceptable. There was no justification demonstrated for the factor used and no reason given to assure that these loads might not exceed the values used.

In general, the team found that, contrary to ANSI N45.2.11, calculations could not be reviewed without recourse to the originator for further explanation of the documentation, analysis and methods used. Inadequate documentation of design input further exacerbated this problem.

COMMENT AS TO SAFETY SIGNIFICANCE:

The lack of traceability of design input indicates a weakness in the licensee's capability to document the design basis for the plant and modifications made to the plant design. This deficiency in the design control process can impact future design changes since the engineers using design documentation may utilize incorrect design analyses and data to develop additional plant modifications. This could result in design deficiencies which compromise the ability of safety related equipment to perform their safety functions.

NUMBER: SMK-6
REVISION: 2
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: S. M. Klein

ISSUE: Potential loss of valve backseat capability not considered in safety review of RFC-DC-12-2934.

REQUIREMENT: 10 CFR 50.59 requires that design modifications to plant systems should be reviewed to evaluate unreviewed safety issues which might be introduced as a result of the change. AEP NSL Procedure 7, Appendix B identifies the review process and provides a checklist for the review of safety related modifications to the plant design. For modification RFC-DC-12-2934, neither the completed checklist or the safety review memorandum addressed the effects of potential leakage of radioactive liquid through valve packing which might result from the design change.

DISCUSSION: RFC-DC-12-2934 is a modification which removed the open torque switches and associated bypass limit switches from all Limitorque motor operated valves which use the open torque switches in the open circuit. The purpose of the change is to preclude problems described in INPO SER 12-86 and IE Bulletin 85-03. A June 18, 1986 memorandum included in the RFC package notes that since the open torque switches will not be used, limit witch settings will not be changed in response to IE Bulletin 85-03, and the valve position indication lights will remain accurate, eliminating the problem described in INPO SER 12-86. However, removal of the open torque switch effectively eliminates reliance on the torque switches for backseating the valve during valve opening. In discussions with AEPSC engineering, the team was informed that none of the valves rely on the backseat to assure positive wide open position of the valve. The valve stroke is limited to a position less than wide open by the open limit switch. External valve leakage is precluded by the valve packing. The team was informed that the only time the valve could be backseated is to facilitate maintenance on the packing.

The team was concerned that the valve backseat might be relied upon to prevent leakage during operation, but the wide open position for the valve may be inaccurately established using a limit switch setting to determine when the valve is fully backseated, rather than using a torque switch setting. If the limit switch setting is not used to fully backseat the valve, i.e., the valve is not fully backseated, the team was concerned that complete failure of the valve packing (during operation, when the valve is in the open position) could result in excessive leakage of reactor coolant from valves which are in lines containing reactor coolant.

The team found that this aspect of the design modification had not been properly addressed in the 10 CFR 50.59 Safety Review Evaluation performed for modification RFC-DC-12-2934.

EXAMPLES: Modification RFC-DC-12-2934 includes a list of motor operated valves which use the open torque switches in the open circuit. The change will remove the open torque switch from these valves. However, some of the valves, such as IMO-128 and ICM-129, contain reactor coolant. Valves IMO-128 and ICM-129 are in the suction line to the residual heat removal pumps and are open during a plant cooldown.

Contrary to this fact, the team found that both the ALARA Review Checklist and the 10 CFR 50.59 Safety Review Checklist indicated that the change did <u>not</u> involve piping carrying radioactive fluid. Further the Safety Review Memorandum did not address the potential for radioactive leakage should the valve packing fail when the valve is wide open and not fully backseated. The team identified several other deficiencies in the safety review checklist:

1. A "YES" answer to I.A, I.B, I.C, or I.D requires answers to three additional questions in section III.A on the checklist. Only question III.A.2 was answered on the form. Questions III.A.1 and III.A.3 (concerning whether changes in Tech Specs or the FSAR were involved) were not answered.

2. No consideration was given to the interconnection with the reactor coolant system through these valves as provided in the guidance given under "key points" for question III.B.1.

3. The responses to question III.B.2,3,4, and 5 were "N/A", apparently based on the "No" response to III.B.1. The team found that a "Yes" or "No" answer may have been more appropriate considering that the proper response to III.B.2 is "Yes."

4. Question III.B.16, which involved fail safe modes of electrical or control equipment, was not answered.

The team also found that the Safety Review Memorandum (dated November 20, 1986) erroneously indicated that if "the valve sticks when the operator attempts to open it, a heat sensor in the motor will turn off the motor and prevent damage to the motor." No such protection is provided in the motor (See Inspection Observation SFK-7).

COMMENT AS TO SAFETY SIGNIFICANCE:

The effect of relying on valve packing rather than the valve backseat to prevent excessive leakage of reactor coolant for valves such as IMO-128 and ICM-129 has not been adequately evaluated. Removal of the open torque switches from motor operated valves in lines containing reactor coolant removes the capability to prevent such leakage without relying on the packing itself. The safety evaluation for this modification should have addressed these issues.

NUMBER: SMK-7
REVISION: 1
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: S. M. Klein

ISSUE: Incorrect Valve Specification Data Sheet

REQUIREMENT: ANSI N45.2.11 requires that "design activities shall be documented in sufficient detail to permit verification and auditing" and that "methods shall provide for relating the final design back to the source of design input."

DISCUSSION: The AFW flow retention valves are designed to limit flow to less than AFW pump runout levels during a main steam line or main feed line break. The Control Valve Specification Data sheet, Revision 2, dated 11/12/86 (for new flow retention valves currently being provided under modification DC-12-2903) indicates the following pressures under "Design Operating Conditions":

Inlet Pressure:	1550 psig	1450 psig	(Two conditions given
Outlet Pressure:	200 psig	1050 psig	on data sheet.)

Maximum Inlet Pressure: 1550 psig
Maximum Outlet Pressure:1150 psig

The data sheet does not specifically indicate the design maximum differential pressure across the valve under which the valve must open or close. However, the team was advised that the maximum differential pressure across the valve is the difference between the inlet and outlet pressures, or a maximum of 1350 psig for the conditions specified. As backup documentation for these values, the team was provided a memorandum dated November 25, 1985 from A. Feliciano to R. D. Kadlec concerning the flow retention valves. This memorandum only addressed the pressure drop across the valves under certain flow conditions. However, some data was penciled in across the bottom of the page indicating the pressure drop at 100 gpm. The team was advised that this represented the maximum differential pressure to which the valves would be subjected since this was the approximate flow through the emergency leakoff line when the pumps are started and the flow retention valves are closed. The maximum differential pressure specified on the memorandum was 1390 psid which exceeds the 1350 psig indicated by the valve data sheet. In addition there was no rational basis for the data given in the memorandum. A calculation developed subsequent to this memorandum indicated a maximum differential pressure of 1430 psig, but this calculation was found to include errors (Observation SMK-1). Based on information provided to the team and the data given in the calculation discussed in Observation SMK-1, the team independently determined that the maximum differential pressure across the valve is 1550 psig (adjusting for the errors in the calculation).

The team reviewed a letter from the valve manufacturer, Hammel Dahl, Inc., dated March 13, 1987, which indicated that the vendor had selected the maximum inlet pressure, coincidentally, 1550 psig, as the design differential pressure across the valve, rather than the maximum difference between the specified inlet and outlet pressures on the data sheet.

The team also noted that the original data sheets for the (old) flow retention valves dated 3/23/70 indicated a differential pressure of 1200 psig. This indicates that the valves originally purchased may not have had the capability to open or close under design differential pressure conditions.

EXAMPLES: Flow retention valves 211, 212, 221, 222, 231, 232, 241, and 242.

COMMENT AS TO SAFETY SIGNIFICANCE:

The licensee failed to adequately document the rational used to establish the design maximum differential pressure across the flow retention valves. Had the vendor used the data provided to size the valves, the valve may not have been capable of performing its safety function. This indicates weaknesses in the licensee's design control process, design bases documentation, and the ability of the licensee to control the flow of information across interdiscipline interfaces.

NUMBER: SMK-9
REVISION: 3
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: S. M. Klein

ISSUE: No design basis documentation for HVAC design.

REQUIREMENT: ANSI N45.2.11 requires that "design activities shall be documented in sufficient detail to permit verification and auditing" and that "methods shall provide for relating the final design back to the source of design input."

DISCUSSION: The team found that there was no evidence of documentation to substantiate the design of HVAC systems supporting the auxiliary feedwater system. The team could find no system flow diagrams, system descriptions, or analyses to confirm that design requirements have been met. The team could find no design bases document which established critical system parameters. For those modifications reviewed, the team found that modification packages did not include adequate design documentation, but that calculations were in the process of being developed.

EXAMPLES: There were no calculations or other design bases documentation to substantiate the design of HVAC systems. Modification RFC DC 12-2868 did not include analyses supporting the changes made.

COMMENT AS TO SAFETY SIGNIFICANCE:

The team was concerned that original design bases requirements have not been clearly documented for HVAC systems at D. C. Cook. In addition, there is no documented evidence that the HVAC systems supporting the AFW system can meet design requirements or commitments. (Note: The team noted that AEPSC had previously recognized that there is a problem with HVAC design documentation and is taking steps to rectify the situation.)

NUMBER: SMK-10
REVISION: 1
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: S. M. Klein

ISSUE: Inadequate design differential pressure for IMO-390

REQUIREMENT: In the event of a design basis accident during a cooldown, IMO-390 must open to permit the residual heat removal pumps to take suction from the refueling water storage tank.

DISCUSSION: IMO-390 is a normally open motor operated valve in the suction line from the refueling water storage tank to tbe residual heat removal (RHR) pumps. The valve is open during normal power operation to permit the RHR pumps to take suction from the tank in the event of a design basis accident. The valve has an equalizing line connecting the space between the valve disks to a point downstream of the valve. This equalizing line has a check valve (SI-150) which prevents backflow from the downstream connection to the valve disks. However, several Condition Reports (e.g., 86-899. 87-393, 87-747 indicate this check valve is leaking and can impose high downstream pressure in between the valve disks when the valve is closed. This condition causes the disks to be subjected to high closing forces which exceed the capacity of the valve operator. The reports indicate that under these conditions the valve operator is incapable of opening IMO-390.

EXAMPLES: The team reviewed the valve specification data sheet and found that the design differential pressure for the valve is 700 psi. The team found that although this valve is normally open, it is closed during plant cooldown (See Procedure OHP4021.017002). Since the check valve has a history of leaking, there is a significant potential for the valve to leak during a plant cooldown. This leakage can impose high downstream pressures (in excess of 350 psig) in between the valve disks of IMO-390. This doubles the load on the valve disk, effectively increasing the imposed differential pressure to 700 psi or more, exceeding the design differential pressure. Consequently, the valve operator will not have the capability to open the valve under these conditions. Should a LOCA occur during these conditions, the RHR pumps will not be able to take suction from the refueling water storage tank, precluding injection of borated water as required.

COMMENT AS TO SAFETY SIGNIFICANCE:

The loss of safety injection capability under the conditions described could be safety significant. Other steps would be required to bleed off the pressure separating the discs in order to continue with safety injection. These additional steps would increase the burden imposed on operators during this critical time period in an accident.

NUMBER: TDG-1
REVISION: 1
DATE: 8/03/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: T. J. DELGAIZO

ISSUE: Suction side of AFW pumps can be overpressurized through the 3" test line, if a single check valve leaks or sticks open.

REQUIREMENT: ANSI B31.1 requires piping systems to be designed to the maximum sustained fluid pressures to which the piping is subjected. Where this is not done, a relief valve capable of maintaining internal pressure below the design value should be installed.

DISCUSSION: A portion of the AFW pump suction side piping has a design pressure of 23 psig (the remainder is 105 psig). This piping is schedule 40, A106 Grade B carbon steel with ANSI flange ratings of 150 psig. ANSI B16.5 flange ratings of 150 psig are capable of withstanding approximately 245 psig, for fluid temperatures below 100 F.

EXAMPLES: When any of the AFW pumps are run for test, rated flow is established by throttling the manual valve FW 125. For a typical motor pump the flow is set at 450 gpm which corresponds to a pump head of 1180 psig. The air operated test valves of the idle pumps (e.g. FRV 256 for the TDAFW pump) is subjected to the 1180 psig in the reverse direction of normal test flow. This pressure is under the disc of the valve and may be sufficient to open the valve by compressing the closing spring (the spring generates 823 pounds per inch of compression with 1 1/8" disc stroke). With FRV 256 open, the suction side of the TDAFW pump can be subjected to the entire 1180 psig if check valve FW 135 were to fail to seat or was leaking. This would substantially overpressurize the suction side piping. (NOTE: This pressure is normally relieved or vented since the minimum flow by-pass line of the idle pump should be open back to the CST. However, should this line be blocked, the pump suction piping will be pressurized.)

COMMENT AS TO SAFETY SIGNIFICANCE:

Failure of suction side piping of any of the three pumps impacts the suction capability of all three pumps until manual isolation valves are shut, at which time the capabilities of the other two pumps are fully restored. Since this condition exists during the test mode only, there is no direct impact on plant safety, other than in the highly unusual situation where an accident occurs coincident with pump testing and the minimum flow by-pass line (emergency leakoff line) is isolated. Nevertheless, loss of one of the AFW pumps results in a Technical Spec/LCO condition.

NUMBER: TDG-2
REVISION: 1
DATE: 7/22/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: T. J. DELGAIZO

ISSUE: The design pressure of the discharge side piping of the TDAFW pump does not consider the over speed condition of the turbine and also, the design pressure of the emergency leak off lines is less than normal system working pressure.

REQUIREMENT: ANSI B31.1 requires piping internal design pressure to be equal to maximum sustained operating pressure. Where these pressures are exceeded by occasional loads, maximum stress limits of article 102.2.4 of ANSI B31.1 apply.

DISCUSSION: The piping material specification for pipe class L-14 indicates that the design pressure of the AFW pump discharge piping is 1635 psig at 102 F. The specification also indicates that the leak off lines from the AFW pumps to the condensate storage tank have 1000 psig design pressure. There are two problems:

(1) At the highest possible turbine over speed trip point (112%), maximum pump discharge pressure exceeds 2100 psig.
(2) With the leak off line isolation valve shut (e.g. FW 126 or FW 127), the leak off line is exposed to full pump head which exceeds 1000 psig.

EXAMPLES: The specification allows ANSI B16.5 flanges rated at 900 psig in this section of pipe. At 100 F and below, these flanges can withstand 2160 psig of internal pressure. During a turbine overspeed condition, the pressure could reach 2150 psig which leaves essentially no safety margin.

COMMENT AS TO SAFETY SIGNIFICANCE:

There is no direct impact on safety unless piping or components are identified which will exceed stress limits. (The team noted no cases where limits were exceeded) This may be a violation of B31.1, but the margins involved appear to be sufficient to preclude safety impact.

NUMBER: TDG-3
REVISION: 0
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Mechanical Systems

INSPECTOR: T. J. DelGaizo

ISSUE: The basis for the minimum water inventory needed to sustain 9 hours in hot standby has not been provided. Further, once CST low level is reached, there are no design or operational provisions to prevent drawing down the reserved 175,000 gal. by non-AFW users (e.g. hot well make-up, feed pump seals, etc.).

REQUIREMENT: The FSAR states that 175,000 gallons of CST inventory is required to maintain the plant in a hot standby condition for 9 hours.

DISCUSSION: The 175,000 gallons was calculated on a thumb-rule that 50 gallons of auxiliary feedwater is needed per megawatt thermal of reactor rating. The basis for this number (50 gal/MWt) is unknown. Further, there should be design provisions to ensure that the CST does not drop below the required 175,000 gallons.

EXAMPLES: There is an 8" make-up line to the condenser hotwell from the CST. This line penetrates the tank near the tank bottom. Anytime there is vacuum in the condenser and hotwell level is low, this line will be open. Similarly, the Main Feed Pump seal pump uses CST water regardless of the level in the CST. The Technical Specifications give the operator _4 hours to restore CST level on receipt of a tank low alarm (i.e. when the CST is down to the 175,000 gallons). During this time, a substantial amount of the 175,000 gallons can be used by hotwell makeup, through an 8" line with a d/p of about 20 psig.

COMMENT AS TO SAFETY SIGNIFICANCE:

This item is not safety significant since the ESW supply is always available should insufficient CST water (from either or both units) is unavailable. However, there is an FSAR commitment to supply 9 hours of water and also, in a practical sense, ESW supply will be only be used as an absolute last resort. (Note: The original source of the 50 gal/MWt calculation was not identified, however, NS&L calculation 87-03 (performed in early 1987 in response to certain fire-protection questions) provides sufficient information to conclude that the 175,000 gallons of CST inventory is more than sufficient to meet the design commitment of remaining in hot standby for 9 hours following a plant trip from full power. Since the original calculation (using the 50 gal/MWt) was performed in 1972 and since the functionality of the system, as designed, has been demonstrated, the issue relative to the source of the 50 gal/MWt is closed.)

NUMBER: TDG-4
REVISION: 1
DATE: 9/12/87

INSPECTION OBSERVATION

AREA: Mechanical Systems

INSPECTOR: T. J. DelGaizo

ISSUE: The design control process for preparation, checking, and verification of design calculations needs to be improved.

REQUIREMENT: NS&L Procedure No. 15, Rev 2 (1/21/87)
ANSI N45.2.11

DISCUSSION: The original design calculations for D.C. COOK are early 1970's vintage calculations which are deficient by todays standards with regard to traceability of design input information, formal verification, etc.. This is not an unacceptable situation as long as the design of the system has been or can be demonstrated to be functional. However, more recent calculations indicate that design control process improvements are needed. Specifically, recent calculations have been reviewed which contain nonconservative assumptions, and which contain various administrative deficiencies which indicate weaknesses in a formal, controlled process.

EXAMPLES: In calculation TH-87-03 (dated 5-12-87), CST Inventory Needed to Cool the RCS from Mode 1 to RHR Operation, the following problems were noted:

The CST liquid inventory temperature was assumed to be 60F. This is not a conservative assumption for this calculation. The conservative assumption would have been 120F.

100% reactor power was used as the starting point for the calculation. 102% would provide additional conservativism.

The RCS temperature was taken as Tave. Much of the system is at Th or some temperature higher than Tave. Using Th would have been more conservative.

The additional calculation of Appendix 5 is in error in that the equation for production of decay heat was incorrectly applied to this situation, although the error is in the conservative direction.

Appendix 5 was prepared by someone other than the original preparer (initials RWH) and it was prepared subsequent to the approval of the original calculation (approved on 5-12-87 with the Appendix prepared on 6-2-87), however it was not treated as a revision to the calculation.

Neither the total number of pages of the calculation nor the total number of attachments are identified. Hence, it is not clear where the calculation ends.

One of the key formula of this calculation was taken from NS&L calculation 86-08, which was prepared and checked in January 1987 but was never approved.

COMMENT AS TO SAFETY SIGNIFICANCE:

With regard to the specific calculation cited above, there is no safety significance because there was so much margin in the original design that the conclusion that sufficient CST inventory exists remains valid when the nonconservative assumptions are replaced. Further, the incorrect application of the decay heat formula in Appendix 5 was in the conservative direction. In addition, an independent calculation prepared by the Impell Corporation (Calc. TH-1 dated 4/7/87) was used to confirm the results of NS&L calculation TH-87-03.

Nevertheless, the generic issue of the design control process is significant in that these types of problems could lead to functionality concerns in calculations with less margin and where independent calculations are not used for verification.

NUMBER: TDG-6
REVISION: 0
DATE: 8/05/87

INSPECTION OBSERVATION

AREA: Mechanical

INSPECTOR: T. J. DelGaizo

ISSUE: A number or plant valves, including normally open valves in high pressure systems, are not torqued on their backseats which effectively eliminates one of the two pressure barriers designed into the valve (i.e. the backseat and the packing). In the case of MCM 221 and MCM 231 (steam supply to the TDAFW pump), this practice has led to a substantial amount of valve repacking and stress on the motor operator from exposure to steam leaks and excessive ambient temperatures.

REQUIREMENT: Good engineering practice suggests that two barriers be used against high pressure fluid or steam, where available, rather than one. Normally open valves in high pressure systems typically use valve back-seats as the primary pressure barrier, with the stem packing as a back-up. The stem packing becomes the primary barrier only while the valve is in operation. Further, in the case of remotely operated valves with environmentally qualified motor operators (e.g. MCM 221 and 231), excessive packing leakage over sustained periods of time may create localized ambient temperature conditions which exceed the qualification basis of the valves.

DISCUSSION: In spite of the above considerations, there is no indication in the design documents or in the safety evaluation for RFC DC-12-2934 of a conscious engineering decision that the open back-seats are not needed. (NOTE: RFC 2934 removes open torque swithches from a number of Westinghouse supplied valves, effectively eliminating the back-seat capability of the valves with back-seats. AEP purchased motor operators never contained open torque switches.)

EXAMPLES: MCM 221 and MCM 231 have AEP purchased motor operators which never contained open torque switches, therefore the valves, although normally open, do not use the open back-seats as a barrier to high pressure main steam. These valves are built by ROCKWELL and contain stellite back-seats. IMO 128 and ICM 129 are Westinghouse supplied valves, for which the open torque switches are being removed in accordance with RFC 2934. These valves are normally shut during plant operation and are open during RHR system operation. They also contain back-seat capabilities which will be lost when the open torque switches are removed. The safety evaluation for RFC 2934 does not raise the question of the potential need or aovisability of backseating the valves. In view of the advantages of backseating certain valves, as evidenced by the maintenance history of MCM 221 and 231, it appears that the consequences of removing the torque switches should have been addressed.

COMMENT AS TO SAFETY SIGNIFICANCE:

The concern of this observation is that safety review are being conducted and modifications are being performed which may not reflect the original design basis of the system or equipment. For example, in RFC 2934, the reason for open torque swithches (i.e. valve back-seats) was not considered. Similarly, in RFC 2788, heaters which were removed from the AB battery room several years earlier over concerns for use of non-explosive equipment in a hydrogen environment are being reinstalled to prevent low battery temperatures from affecting battery capacity. Apparently, the prior RFC did not consider the need to remain above a minimum battery temperature when the original heaters were removed.

With regard to MCM 221 and MCM 231, there is no safety concern in that other than the fact that should the stem packing fail during plant operation, the appropriate MCM would have to be shut to isolate the leak, which creates an inoperable condition on the turbine driven AFW pump for technical specification purposes, until the valve is reopened.

NUMBER. RBP-1
REVISION: 2
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Instrumentation and Control

INSPECTOR: R. B. Porter

ISSUE: Instrumentation errors are not considered in calculating setpoints for alarms and controls

REQUIREMENT: Setpoints must include margins to compensate for loop errors to ensure safe or conservative control actions are initiated and unambiguous information is provided to the operator. Regulatory Guide 1.105 details the requirement.

When the CST low low level alarm activates, AEP has advised the NRC that the operator has 20 minutes to find an alternate water source before he must trip the AFW pump at minimum NPSH on the AFW pump.

DISCUSSION: The CST serves as the normal (or primary) sources of supply for the auxiliary feedpumps. A signal to start either auxiliary feed pump will result in immediate flow to the pump from the CST, since the line from the tank to all of the auxiliary feedpumps is kept full always. This allows the auxiliary feed pumps to start immediately.

The setpoints on the CST Levels and minimum NPSH for the AFW pump are designed to provide warnings to the operator as follows:

1. High Tank Level at 638'-4"

Warns the operator that the CST is about to overflow.

2. Low Tank Level at 625'-9"

Warns the operator that he has 175000 gallons of water above the Lo Lo Level. This is the amount required to last 9 hours at hot shutdown conditions. This quantity will alternately provide for two hours at hot shutdown plus four hours cooldown to cold shutdown.

3. Low Low Tank Level at 614'-0"

Warns the operator that he has about 20 minutes of full auxiliary feed water flow before he must trip the pump on minimum NPSH. He should be looking for an alternate source of water [illegible]oint.

4. Minimum [illegible]ank Level at 612'-0"

Warns the operator that he is at minimum NPSH for the auxiliary feedpumps and that he should trip them after verifying by level indications that minimum NPSH has been reached.

EXAMPLES: 1. <u>CONDENSATE STORAGE TANK LEVEL</u>

Refer to the Sketch 1, CST Error Band. The error band of Lo Lo Level Switch XPS110 is ± 12.3". The error band of min. NPSH switch CPS245A is ± 32.2". The min. NPSH switch could activate as high as 614'-8.2", while the Lo Lo Level switch could activate as low as 612'-9". This would cause an overlap in which the operator is getting an alarm to trip the AFW pump before he gets a Lo Lo Level alarm.

The Lo Lo Level switch could activate as low as 612'-9", while the minimum NPSH switch could activate correctly at 612'-0". This would provide the operator with a warning of 6.6 minutes instead of 20 minutes. He would have very little time to switch water sources to the auxiliary feed pumps before he must trip them.

2. <u>REFUELING WATER STORAGE TANK LEVEL</u>

AEP advised that CST level setpoint accuracies are not too important, but that setpoints important to safety have errors of instruments included in their calculations. The RWST level setpoint calculations were reviewed to check this. The instrument errors are not considered in these setpoint calculations, which were adjusted in July 1987. The instrument errors were not significant regarding the minimum volume setpoint of 350,000 gallons, which is a technical specification requirement. The actual volume available is 364, 355 gallons. The instrument error reduces this by 3,197 gallons to 361,158 gallons.

However, these calculations did not consider instrument error.

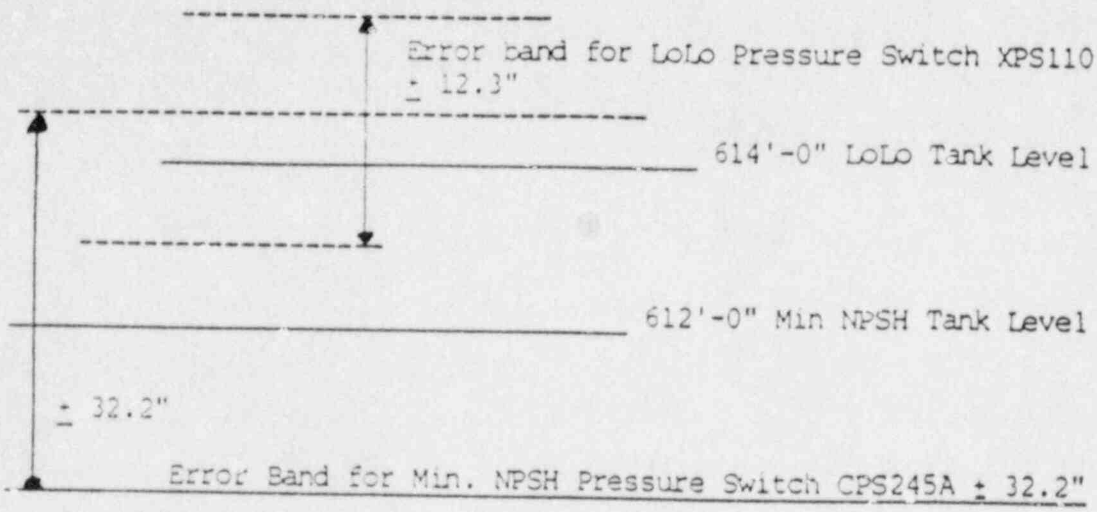
COMMENT AS TO SAFETY SIGNIFICANCE:

If the minimum NPSH activates at 609'-3.8", the 3 auxiliary feed pumps could run dry and be damaged. They would not be available to provide auxiliary feed water.

SKETCH 1

CONDENSATE STORAGE TANK

ERROR BAND BETWEEN LOW-LOW TANK LEVEL AND MIN. NPSH



NUMBER: RBP-2
REVISION: 1
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Instrumentation and Control

INSPECTOR: R. P. Porter

ISSUE: The Tech Spec requirement to have a minimum contained volume of 175,000 gallons of water is not in addition to the amount of water available at the CST Lo Lo Level alarm.

REQUIREMENT: The system description requires that the CST have 175,000 gallons for 9 hours at hot shutdown conditions. This is above the requirement (commitment to the NRC) to have 20 minutes available following the Lo Lo Level alarm to find an alternate source of water before tripping the pump. The operator is required to trip the pump at the minimum NPSH alarm point.

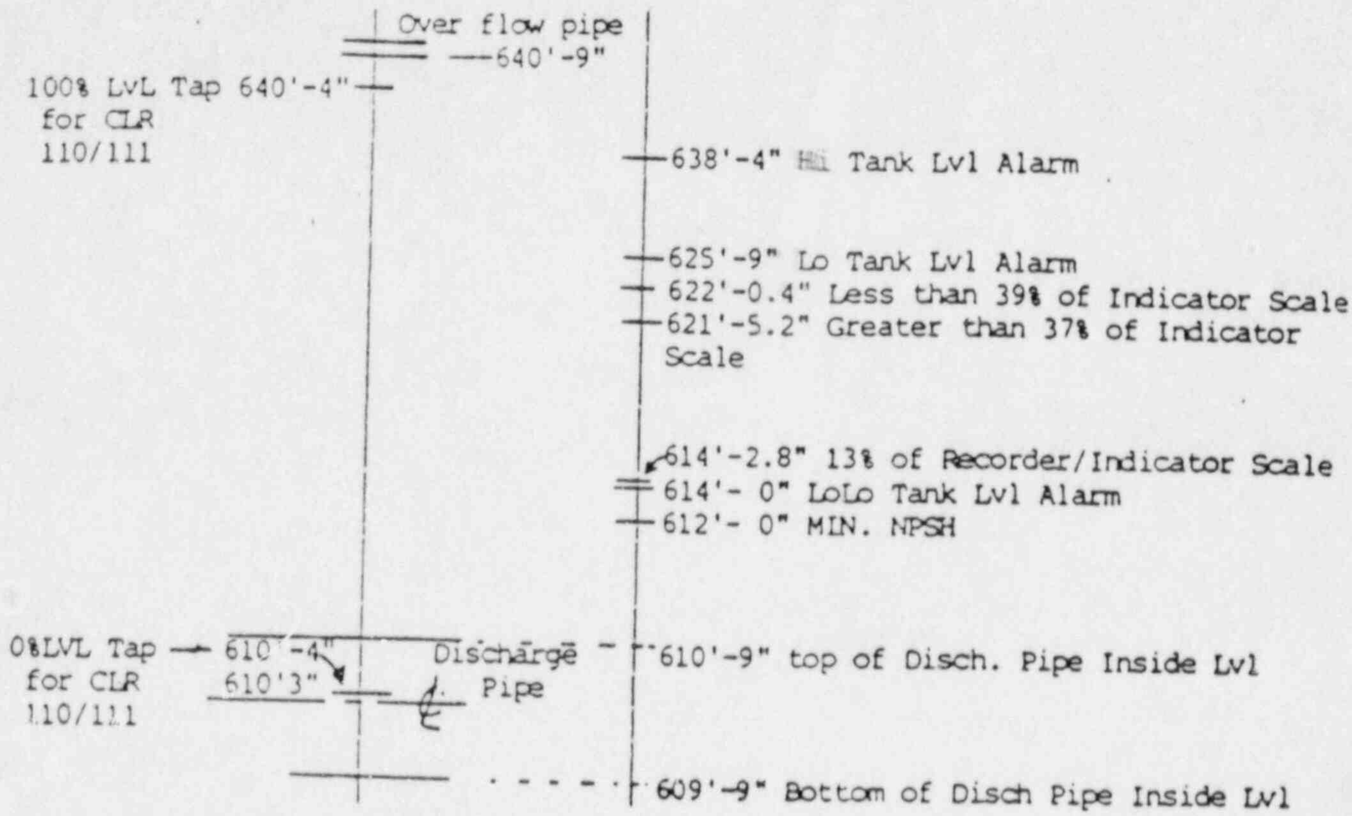
DISCUSSION: Procedure 1-OHP 4030.STP.030 Operation Daily and Shift Surveillance Checks Data/Signoff Sheet 6.3 page 13, Item 33 indicates that the CST Level requirement for the Tech Spec is greater than 37%. This is a total volume of 196,365 gallons. The amount of water actually available between CST Level of 37% and CST Low Low Level alarm is 131,440 gallons. This is 43,560 gallons less than required. Even allowing for the volume between CST level of 37% and the minimum NPSH alarm, which is 166,820 gallons, this is 8,180 gallons less than required. These discussions excluded potential instrument errors.

EXAMPLES: NA

COMMENT AS TO SAFETY SIGNIFICANCE:

The CST does not hold 175,000 gallons of water at hot shutdown conditions above the requirement for 20 minutes available following the Lo Lo Level alarm. There is only 131,440 gallons. This is a violation of the tech specs as they are written. Ambiguous and inconsistent information is presented to the operator in his procedures, on the actual alarm points and contrl board indications. Calculation TH-87-03 (dated 5/12/87) indicates the minimum requirement for water is less than 175,000 gallons of water to ensure 9 hours supply of water for the CST at hot shutdown conditions. The requirements of the CST Level should be reviewed and revised. All documents related to the CST Level should be changed to agree with the actual needs.

SKETCH 1
CONDENSATE STORAGE TANK
LEVEL MONITORING



NUMBER: RBP-3
REVISION: 0
DATE: 8/6/87

INSPECTION OBSERVATION

AREA: Instrumentation and Control

INSPECTOR: R. B. Porter

ISSUE: The design control process for preparation, checking and verification of design calculations needs to be improved.

REQUIREMENT: Form MED-237 (ECP Form)
ANSI N45.2.11

DISCUSSION: The original design calculations for D.C. Cook are early '70 vintage with revisions in the early '80s. These are deficient by today's standards with regard to traceability of design input information back to the design basis, formal independent design verification and formal interdisciplinary review of modification packages. This situation is acceptable if the design of the system can be demonstrated to be functional. However, calculations completed in 1985, although they indicate a sensitivity to instrument errors, the errors have not been factored into the setpoints. The new calculations have been added to the originals as addenda with no coversheet control and with new page numbers starting at page 1. It is very difficult, at best, to know if one has all of a calculation and what changes to the original calculation are caused by new addenda. There is no independent or interdisciplinary review signoff sheet attached to the calculations.

EXAMPLES: 1. ECP 1-2-C1-01 condensate Storage Tank Level has sheets 1 to 15 as a basic calculation. Appendix B: Calculation pages 1 to 6 are attached. References to sheets actually changed are confusing.

2. ECP 1-2-F2-01 Aux F P Test and ELO Contr. & Aux F. P. Run Out Prot System has sheets 1 to 7 as a basic calculation. An addendum related to RFC-12-2460 is added as sheets 1 to 7 of calculation No F2-01, with ECP revisions 4 and 6 showing on a cover sheet. There is no clear reference to the addendum section on the coversheet of the overall package.

COMMENT AS TO SAFETY SIGNIFICANCE:

Aside from potential setpoint errors due to instrumentation errors described in other observations, no safety significance can be identified as related to the examples. However, the generic issue of the design control process is significant in that these types of problems make tracking the design basis very difficult, if not impossible.

NUMBER: RBP-4
REVISION: 1
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Instrumentation and Control

INSPECTOR: R. B. Porter

ISSUE: Documentation of safety review evaluation procedure for 10 CFR 50.59.

REQUIREMENT: 10CFR50.59 requires that design modifications to plant system be reviewed to evaluate unreviewed safety issues, which might be introduced as a result of the change.

DISCUSSION: The safety review of RFC DC-12-2900 Subtask D.19, dated 10/2/86, identifies areas which should be considered for further evaluation and design considerations including:

1. High energy line break interaction such as pipe Whip, jet impingement, compartment pressurization, humidity effects and temperature effects.

2. Separation Criteria

The safety review states that subtask D.19 of RFC-DC-12-2900 does not constitute an unreviewed safety question as defined in 10 CFR 50.59.

The modification proceeded and has been implemented. The safety evaluation is not revised to answer the questions left open. These issues have been addressed in other memos and checksheets indicate that the modification is being installed correctly, however, a complete documentation package demonstrating completion of all these items is not included in the RFC package.

Additionally, in the EGP 3.0 Design Report Section B., questions 6, 8, 9 are marked N/A. To install the transmitter and conduit seismically, manual or computer calculations should be identified.

EXAMPLES: Safety Review of RFC DC-12-2900 Subtask D.19

COMMENT AS TO SAFETY SIGNIFICANCE:

No potential safety significance can be identified as related to the example. However, the generic issue of the safety review being completed at the beginning of the design process, is significant in that these types of issues are open ended and could be missed and not closed before implementing the modification.

NUMBER: MB-1
REVISION: 1
DATE: 8/10/87

INSPECTION OBSERVATION

AREA: Operations

INSPECTOR: M. Beers

ISSUE: A weakness was observed in some of the procedures to mitigate the potential for steam binding.

REQUIREMENT: IE Bulletin 85-01 requires the licensee to develop procedures for monitoring fluid conditions within the AFW system on a regular basis and to develop procedures for recognizing steam binding and restoring the AFW system to operable status, should steam binding occur.

DISCUSSION: In response to IE Bulletin 85-01, "Steam Binding In Auxiliary Feed Pumps", AEP took action to aid in detecting and correcting steam binding events. These actions included:

- OHP 4030.001.001 (Turbine Building Tour Guide) - Directs the auxiliary operator to check the AFP discharge lines are at ambient room temperature on a shift basis. The temperature points have been marked on the piping near the pumps and at the flow retention valves.
- OHP 4022.056.002 (Steam Binding in Auxiliary Feed Pumps) - Provides steps to be taken when steam binding is discovered and how to return the pump to operable status.
- OHP 4021.056.002 (Operation of Auxiliary Feed Pump During Plant Startup and Shutdown), OHP 4030.STP.017T,E,W (Auxilary Feed Pump Surveillance Procedures) - At approximately 30 minutes and 90 minutes after flow to the steam generators is stopped; the procedure directs the operator to verify the AFP's discharge line at the temperature test points is less than 140 degress F (i.e., Teletemp indications have not turned black).

A weakness was identified in the operating and surveillance procedures. Teletemp indicators are small red strips with an adhesive backing that are affixed to the AFW pipes. These stickers have silver viewing windows that change color to black as temperature increases in increments of 10 degrees over a range of 140 to 180 degrees F. The team inspected the temperature test points in both units and found that approximately 50% of the stickers were missing. Interviews confirmed

That these stickers are frequently missing. Additionally it was observed that the Teletemp indicator upstream of 2-FMO-211 was all black (greater than 180 degrees F). Investigation indicated that this situation had existed since early in the year. The team is concerned that the procedure may not be adhered or complied with because stickers are frequently missing and not replaced after having been exposed to high temperature.

COMMENT AS TO SAFETY SIGNIFICANCE:

This item is considered to be a minor procedural weakness. It appears that feeling the pipe to verify the AFP discharge lines are at ambient room temperature may be sufficient to confirm that the check valves leading to the steam generators have properly seated. It does appear that without a signoff on these procedures there is a lack of confidence that the temperature measuring steps of the procedure has been accomplished.

NUMBER: MB-2
REVISION: 0
DATE: 7/22/87

INSPECTION OBSERVATION

AREA: Operations

INSPECTOR: Beers

ISSUE: Information for setting the TDAFP controller to rated flow is not available at the Hot Standby Panel.

REQUIREMENT: 1-OHP 4021.056.002 Step 6.2.12-1 (operation of AFP) Reset TDAFP governor controller by running down to minimum speed setpoint (100%) then reset controller to setting from most recent 1-OHP 4030.STP.0127 performance in accordance to information tag on governor control valve controller.

DISCUSSION: The operating procedure for the TDAFP requires the operator to reset the controller to the most recent sruveillance test data as recorded on the information tag. There is no information tag (and thus no surveillance data) at the TDAFP controller on the Hot Standby Panel.

EXAMPLES: Ref: 1-OHP 4023.001.011 (Reactor Shutdown at Hot Standby Panel Due to Control Room Inaccessibility).

COMMENT AS TO SAFETY SIGNIFICANCE:

This is a minor procedural inadequacy. If the operator were required to operate the TDAFP from the Hot Standby Panel, the controller setpoint information is beneficial to determine the rated flow setting.

NUMBER: MB-4
REVISION: 0
DATE: 8/6/87

INSPECTION OBSERVATION

AREA: Operations

INSPECTOR: M. Beers

ISSUE: Procedure Inconsistency

REQUIREMENT:

DISCUSSION: There is inconsistency in various procedures n the required operator response for Condensate Storage Tank Low, Condensate Storage Tank Low-Low, and Auxiliary Feed Pump Low Suction Alarms.

Procedure 01-OHP 4023 ECA-0.0 (Loss of All AE Power) and 01-OHP 4023 ES-0.2 (Natural Circulation Cooldown) says to switch to alternate AFW supply if CST level decreases to less than 13%.

Procedure 01-OHP 4024.116.043 (CST Lo-Lo Level Annunciator alarm response), Manual Action step 3 says that SRO should consider shifting suction to the other unit CST.

Procedure 01-OHP 4024.113.016, 017, 018 (AFP Suction Low/Trip Annunciator(s)); Manual Action 2.2.2 says that SRO should consider cross-tieing Unit One and Unit Two CST's.

The concern is that the Emergency Procedures (4023) direct the operator to switch to the alternate AFW source at 13% (analogous to CST Low alarm) while the Annunciator Response for AFW low suction setpoint which is analogous to 5.7% tells the SRO to

COMMENT AS TO SAFETY SIGNIFICANCE:

Recommend that the inconsistencies be resolved and that guidance is provided in the procedures as to the time available during AFW operation from CST Low alarm (13%) to AFW low suction (5.7%) alarm.

NUMBER: MB-5
REVISION: 0
DATE: 8/11/87

INSPECTION OBSERVATION

AREA: Training

INSPECTOR: M. Beers

ISSUE: Training material used in operator requalification training contains some conflicting and incorrect information.

REQUIREMENT: Training material promulgated to licensed operators shall be accurate and up to date.

DISCUSSION: Licensed operator requalification lesson plan RQ-C-1241, "Turbine Driven Auxiliary Feed Pump", contains some conflicting and incorrect information. On page 7, the description of FRV-258 states with this valve open the minimum recirc flow of 100 gpm is ensured. On page 11, under Procedures it states that the minimum recirc flow required is 50 gpm. The team could not substantiate the source of either one of these numbers.

On page 9, the electronic and mechanical overspeed trips for the Turbine Driven Auxiliary Feedpump are listed as 110% and 125% respectively. The team has determined from surveillance testing data and other documentation that the overspeed trips are currently set at 108% and 111% respectively.

COMMENT AS TO SAFETY SIGNIFICANCE:

This item is considered to be a minor weakness. It does point out the fact that all information contained in training lesson plans must be verified to be accurate and current.

NUMBER: MB-6
REVISION: 0
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Operations

INSPECTOR: M. L. Beers

ISSUE: Inconsistency on engineering units stated in various procedures for Condensate Storage Tank Level.

REQUIREMENT: Tech spec 3.7.1.3 (Modes 1, 2, and 3).
The Condensate Storage Tank (CST) shall be OPERABLE with a minimum contained volume of 175,000 gallons of water.

DISCUSSION: Procedure 1-OHP 4030.STP.030 Operation Daily and Shift Surveillance Checks Data/Signoff Sheet 6.3 page 13. Item 33. CST Level requirement: T.S. greater than 37%, N.L. greater than 39%.

1-OHP-4024.116.042 Rev. 2 4/27/82 Annunciator Proc. CST Low Level - set point 625 feet, 9 inches
1-OHP-4024.116.043 Rev. 1 4/27/82 Annunciator Proc. CST Lo-Lo-Level-set point 614 feet 0 inches.
1-OHP-4022.055.003 Loss of Condensate to AFW step 3.1 Condensate Storage Tank Low-Low Alarm (614')
1-OHP-4023.ES-0.2 Natural Circulation Cooldown Foldout for Procedure Page 1
Step 4. AFW Supply Switch over criterion switch to alternate AFW water supply if CST level decreases to less than 13%.
CLI-113 is the indicator specified as T.S. (STP.030.6.3)
The indicator reads out in % (0-100)

It would be advantageous to the operator from a human factors standpoint to have all references to CST level expressed in the same engineering units. Operators interviewed recommended the CST level expressed in %.

NUMBER: WL-1
REVISION: 2
DATE: 8/12/87

INSPECTION OBSERVATION

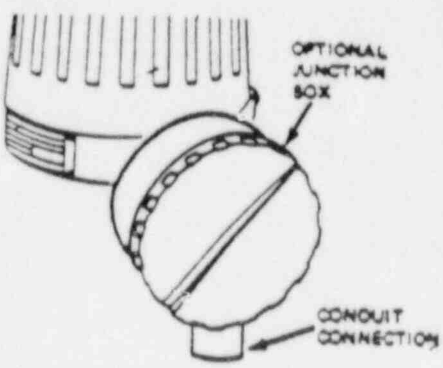
AREA: Maintenance

INSPECTOR: Levis

ISSUE: An environmentally qualified instrument is not installed in accordance with the manufacturer's requirements to maintain qualification.

REQUIREMENT: Step 3.2.4 of PMI5025 Rev. 2 of 4/23/87 requires that configuration controls be established to ensure the installed configuration remains consistent with the qualified configuration (and that) documentation shall be provided (i.e., within the Job Order and/or RFC Package etc.) to demonstrate that the configuration has been controlled.

DISCUSSION: Optional flow transmitter junction boxes for flow indicators FFI 220 and FFI 230 are not installed in accordance with Foxboro requirements to maintain qualification. The flow transmitters are Foxboro Series NE13 DM MI H1. The vendor instruction manual (Vendor Information Control No. P-0585-023-N dated 6/17/85) for N-E11 and N-E13 series transmitters states that these devices can be equipped with an optional junction box which must be mounted with the conduit connection facing downward. Contrary to this installation requirement the optional junction boxes are installed with the conduit connection facing upward for FFI 220 and FFI 230. The correct configuration is shown below.



COMMENTS TO SAFETY SIGNIFICANCE:

The current installation invalidates the equipment qualification of the flow transmitters. The concern is water egress into the internals of the transmitter. This observation suggests a potential weakness in the installation procedures used to install safety related environmentally qualified equipment.

NUMBER: WL-2
REVISION: 1
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Maintenance

INSPECTOR: Levis

ISSUE: A weakness exists in the control of greases used in Limitorque motor operated valves. In addition, several lubrication inspections of motor operated valves have documented greases characteristic typical of adverse chemical reaction caused by mixing greases with different soap bases.

REQUIREMENT: Limitorque Vendor manual SMBI-8d, p 12, prohibits adding greases with different soap bases without the lubricant manufacturer's permission.

DISCUSSION: The mixing of greases with different soap bases in the main gear box of a Limitorque motor operated valve could render the operation and its associated valve inoperable. This specific problem was detailed in INPO SER 7-84 which described the specific concerns of mixing greases. When mixed together the greases react chemically which may result in any of the following:

o Breakdown into mud-like substance

o Breakdown into watery liquid or

o Separation into hard cake-like substance and watery liquid

Limitorque also cautions against the mixing of greases with different soap bases on page 12 of their Maintenance and Instruction Manual SMBI-82C.

As explained in SER 7-84 the Limitorque operators are shipped with Exxon Nebula EP-0 or EP-1, calcium based greases, in the main gear box. DC Cook uses either Mobulux EP-2 or Mobilgrease 77, both lithium based greases for this same application. Plant maintenance procedures do not require periodic addition of lubricants to Limitorque MOV's but rather for complete degreasing and regreasing whenever an actuator is rebuilt (12MHP 5021.001.006 Rev. 3 and 12 MHP5021.001.042 Rev. 1 4/25/86). However, there are no controls or precautions in place warning the maintenance personnel about problems of mixing the two different lubricants. Examples were found where lubricant was added to the main gear case without removing the old lubricant when an inspection noted that there was insufficient level (pg. 9 of 12 MHP-SP-122 Att. 1 of MOVATS test data for 1 QMO-225 of 7/10/87). In addition several other lubrication inspections of Limitorque MOV's showed that the grease exhibited some of the signs of mixing noted previously.

EXAMPLES:

- o MOVATS inspection sheet for MCM 221 dtd. 7/3/87
- o MOVATS inspection sheet for MCM 231 dtd. 7/4/87
- o MOVATS inspection sheet for QMO 225 dtd. 7/10/87
- o MOVATS inspection sheet for IMO 910 dtd. 7/9/87
- o J.O. 109041
- o J.O. 715990
- o J.O. 015939
- o J.O. 713710
- o J.O. 004662

COMMENTS AS TO SAFETY SIGNIFICANCE:

The mixing of greases reduces the lubricating properties of the greases which could lead to common cause failure of the motor operators.

NUMBER: WL-3
REVISION: 0
DATE: 7/24/87

INSPECTION OBSERVATION

AREA: Maintenance

INSPECTOR: Levis

ISSUE: An unqualified lubricant may be used in the main gear case of Limitorque motor operated valves.

REQUIREMENT: Safety related electrical equipment required to operate when subjected to harsh environment imposed by Design Basis Accident must be environmentally qualified in accordance with the provision of 10CFR50.49.

DISCUSSION: Exxon Nebula EP-0 or EP-1 is the lubricant supplied by Limitorque and qualified by Limitorque in their report B0058 for use in the main gear box of the actuator. DC Cook uses Mobil lubricants in this application and has qualified Mobil EP-2 for use in Limitorque main gear case for inside and outside containment applications. Qualification parameters are shown on page G1-1 of the DC Cook SCEW sheets. It was noted in our review of Maintenance Procedures 12 MHP 5021.001.006 Rev. 3 and 12 MHP 5021.001.042 Rev. 1 that both Mobil Mobilux EP-2 and Mobil Grease 77 were specified as acceptable lubricants for use in the main gear box of Limitorque SMB and HBC valve operators. However, Mobil Grease 77 is not listed on the DC Cook SCEW sheets as a qualified lubricant. The only information that could be discovered to support the use of this grease was a January 4, 1985 Memo from J. O. Allard to the Maintenance Supervisors stating that Mobil Grease 77 was compatible with EP2 and could be used. This documentation is insufficient to establish qualification. It should be noted that a similar item was identified by NRC Inspection Report Nos. 50-315/86015, and 50-316/86015 dated August ?, 1986.

COMMENTS AS TO SAFETY SIGNIFICANCE:

The use of unqualified lubricants in motor operated valves exposed to a harsh environment could lead to common mode failure.

NUMBER: WL-4
REVISION: 1
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Maintenance

INSPECTOR: Levis

ISSUE: Inadequate tape splices may have been installed on motor operated valves.

REQUIREMENT: 1. 10CFR50.49 c, requires that documented evidence exists in an auditable form to demonstrate that each item requiring qualification as required by 10 CFR50.49 is qualified for its application.

2. Step 5 of MHI5030APPA Revision 9 requires that replacement parts used on environmentally qualified equipment be documented on the stores Issue Ticket.

3. Step 3.2.4 of PMI5025 Rev. 2 of 4/23/87 requires that configuration controls be established to ensure the installed configuration remains consistent with the qualified configuration and that documentation shall be provided (i.e., within the Job Order and/or RFC Package, etc.) to demonstrate that the configuration has been controlled.

DISCUSSION: Work orders 109041 and 102125 required that the motor leads for MCM 231, FMO 211 and FMO 241 be retaped because the wrong tape had been used previously. However, no procedure is referenced as to how the tape is to be installed and the right tape to use is not specified. It was noted that the requirement to document the replacement parts on the Stores Issue Ticket (Step 5 of MHI 5030 APPA) was not followed for the replacement tape. This same deficiency was identified during a review of the MOVATS test data for MCM 221 and 231 which stated that the motor leads were retaped upon completion of the MOVATS testing.

Electrical design standard, 1-2-EDS-613-5 Rev. 5, shows a method of splicing 600 V motor terminations which is qualified for harsh environments. Specific tape type is identified by a generic identification number, i.e., 692 - Splicing Compound Tape which could be either Scotch 23 or Bishop W962. However, in order to check out tape from the storeroom the specific tape Material and Equipment Identification number must be known. The following electrical tapes are currently (7/24/87) in stock in the storeroom:

Scotch Fill Putty	ME 63-947550
Scotch 17	ME 63-944800
Scotch 23	ME 63-045600, ME 63-945300
Scotch 70	ME 63-946500
Scotch 77	ME 63-941050
Okonite Neoprene	ME 63-943000

In addition to not having the Bishop W962 in the stock, the insulating putty (ME 63-100 500) specified in 1-2-EDS-613-5 was not in stock.

Experience at other nuclear facilities has demonstrated that the method of application is crucial in verifying that the spliced connection will perform its design function. Since no procedural requirements are identified on the work orders, it appears that the application of tape splices is up to the "skill of the trade" to ensure that the proper tape is used and that its method of application is proper. Considering experience at other nuclear facilities, the reliance on "skill of the trade" for tape splices is a weakness that frequently results in inadequate installations. As a minimum, the current practice at DC Cook does not provide documented evidence that the tape materials are proper. In addition, there is no justification or engineering calculation which allows the Scotch Fill insulating putty to be used in environmentally qualified splices.

EXAMPLES:

- o J.O. 109041
- o J.O. 102125
- o MOVATS Inspection Sheet for MCM 221 dated 7/3/87
- o MOVATS Inspection Sheet for MCM 231 dated 7/4/87
- o J.O. 004675

COMMENTS AS TO SAFETY SIGNIFICANCE:

Improper material selection or method of application could cause common mode failure of devices where tape splice is used. The foregoing suggest that the potential for improper tape splices is high. The lack of documented evidence and reliance on skill of the trade practices are considered to be a significant weakness.

NUMBER: WL-5
REVISION: 1
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Maintenance

INSPECTOR: Levis

ISSUE: Actual torque switch settings different than design values

REQUIREMENT: Torque switch settings must be between the minimum and design values to ensure that valve will operate upon demand.

DISCUSSION: The Limitorque Valve Data Book is used by Maintenance Department personnel to establish the normal and maximum torque switch settings required by Maintenance Procedure 12MHP 5021.001.037 Rev. 2, step 3.6, whenever torque switch or limit switch adjustments on Limitorque MOV's are required. The Limitorque Valve Data Book also lists the actual open and close torque switch settings as determined by maintenance personnel. We noted on our review of this book the actual close torque switch setting for FMO-241 (2.75) was set lower than the minimum specified (3.0). One possible area of confusion for the maintenance personnel is that the maintenance instruction lists normal and maximum for the torque switch settings whereas the valve data book lists minimum and maximum torque switch settings. In our review it appeared that the normal value corresponded to the minimum value.

Further review of the Limitorque Valve Data Book, dated April 5, 1987, revealed many discrepancies between required and actual torque switch settings. The following is a sampling:

Valve No.	
IMO-210	Open and closed T.S.S. less than minimum specified
IMO-211	" " " " "
IMO-215	" " " " "
IMO-220	" " " " "
IMO-225	" " " " "
IMO-221	" " " " "
ICM-265	" " " " "
CCM-430	Open T.S.S. less than minimum specified
CMO-416	" " " " "
CMO-419	" " " " "
CMO-420	" " " " "

IMO-120	Open T.S.S. greater than the maximum specified
IMO-255	" " " " "
IMO-256	" " " " "
IMO-251	" " " " "
ICM-129	Closed T.S.S. less than the minimum specified

COMMENTS AS TO SAFETY SIGNIFICANCE:

Improper torque switch settings could prevent a motor operated valve from operating when required.

NUMBER: WL-7
REVISION: 1
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Maintenance

INSPECTOR: Levis

ISSUE: Non-performance of vendor required preventative maintenance.

REQUIREMENT: Limitorque Instruction Manual SMBI-82C p 6 step 13 requires that motors be meggered (> 1 Mohm required) for both AC and DC motors and Step 19 p 3 requires that brushes be inspected (for DC motors) on a periodic basis. In addition an 18 month inspection of the main gear case lubricant and 36 month inspection of the limit switch compartment lubricant for quality, quantity, and consistency is required.

DISCUSSION: Limitorque Maintenance and Instruction Manual SMBI-82C defines the periodic preventative maintenance requirements for Limitorque Motor Operated Valves. Plant Maintenance Instructions MHI 5030 Att.12 defines the preventative maintenance actions to be performed an environmentally qualified operators. We noted that MHI 5030 Att.12 does not address the vendor requirement to megger motors or the requirement to inspect brushes for proper contact and wear when DC motors are employed. In addition the 18 month main gear box and 36 month limit switch lubrication checks are only being performed on 20% of the EQ operators every outage. There is no engineering justification for not performing motor meggering or brush inspection and why the selection of only 20% of the EQ operators is a sufficient number. Also no justification is provided on why the inspection on MHI 5030 Att. 12 are not being performed on all safety-related Limitorque Motors Operated Valves as required by the vendor.

EXAMPLES:
J.O. 109041
J.O. 715990
J.O. 004662
J.O. 002642
J.O. 74488x1
J.O. 004657

COMMENT AS TO SAFETY SIGNIFICANCE:

The performance of the vendor recommended maintenance will allow the detection of adverse trends and the correction of discrepancies prior to MOV failure.

NUMBER: WL-8
REVISION: 1
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Maintenance

INSPECTOR: Levis

ISSUE: Nonconformance with plant directives and NRC requirements regarding potential deficiencies in the environmental qualification of equipment

REQUIREMENT: 1. Step 4.4 of PMI5028, Rev. 2 of 4/23/87 and step 4.2.4 of MHI5030, Rev. 9 of 10/23/80 require that "Whenever any conditions adverse to maintaining the environmental qualification of applicable safety related electrical equipment are identified: such as failures, malfunction deficiencies, material defects, deviations, or nonconformances, a Condition Report shall be generated as per PMI-/030."

2. NRC Generic Letter 86-15 requires that "When a licensee discovers a potential deficiency in the environmental qualification of equipment. . . the licensee shall make a prompt determination of operability, shall take immediate steps to establish a plan with a reasonable schedule to correct the deficiency and shall have written justification for continued operation.

DISCUSSION: During our review of maintenance work orders the team noted several examples of where potential deficiencies existed in the environmental qualification yet no condition report was generated nor was written justification for continued operation provided prior to plant startup. Specific examples include the following:

J.O. 4662 - This work order was written on 9/27/86 to correct deficiencies noted during a June 1986 EQ inspection of motor operated valve 1-NMO-153. The deficiencies included cut watertight conduit and grease breaking down. The work order had not been completed as of 8/4/87.

J.O. 4675 - This work order was written on 9/29/86 to corrrect deficiencies noted during a June 1986 EQ inspection of 1-ICM-305. The inspection noted that the motor leads were wrapped with friction tape, which is not a qualified splicing tape. The work order, which was closed out 7/24/87, removed the friction tape and retaped the leads with Scotch #23 and Okonite Neoprene which are shown as qualified tapes in Electrical Design Standard 1-2-EOS-613-5.

The EQ walkdown sheets which noted these deficiencies were transmitted to AEP via a 22 Sept. 86 memorandum N.L. Daavettila to C.F. Caso for evaluation. To date no formal response to the concerns raised during the walkdown was found.

EXAMPLES: J.O. 004675
J.O. 004662

COMMENT AS TO SAFETY SIGNIFICANCE:

A deficiency in the environmental qualification of a device requiring qualification could prevent its operation during harsh environments imposed by Design Basis Accidents. This deficiency demonstrates a weakness in the adherence to the procedural requirements of MHI5030 and PMI5025 concerning Condition Reports.

NUMBER: WL-9
REVISION: 1
DATE: 8/12/87

INSPECTION OBSERVATION

AREA: Maintenance

INSPECTOR: Levis

ISSUE: Material Deficiencies

REQUIREMENT:

DISCUSSION: While performing a plant inspection the team noted that the covers were missing from ASCO solenoid valves 1XSO 901, XSO 909, XSO 911 and XSO 927. A similar deficiency, a cover missing from an ASCO solenoid valve, was noted during the team's walkdown conducted on 10 July 1987. Also, while observing the performance of surveillance testing for the Unit 2 (MDAFW pump-east) the bearings for the inboard and outboard pump bearings had no level indication.

EXAMPLES: See Above

COMMENT AS TO SAFETY SIGNIFICANCE:

These valves were located at two different remote shutdown stations. Their failure could impede the ability of the operator's to shut down the unit in the event that remote shutdown was required. Insufficient oil level for the MDAFW pump bearings could lead to failure of the pump.

NUMBER: WL-10
REVISION: 0
DATE: 8/6/87

INSPECTION OBSERVATION

AREA: Maintenance

INSPECTOR: Levis

ISSUE: Deficiency in 12 MHP 5021 0001.037 Rev. 2 "Maitenance Procedure for Rotor and Torque Type Limit Switches On Limitorque Motor Operated Valves"

REQUIREMENT: Limit switches and torque switches for Limitorque Motor Operated Valves must be set and adjusted such that the MOV will perform its design function under design conditions.

DISCUSSION: Condition Report 1-5-87-700 details problems encountered with valve 1 QMO-410, the emergency boration to charging pump suction valve. Specifically, it describes how the valve failed to cycle open during the performance of 1OHP 4030-STP.002V for 3 successive weeks on 5/5/87, 5/11/87, and 5/18/87. Job Order 714313 was issued on 5/18/87 to investigate the failure and make necessary repairs. During the conduct of the work a packing leak and incorrect torque switch settings were discovered. The minimum open torque switch setting was 1.5 and the actual open setting was 1.0 as shown on pages 8 and 11 respectively on the work order. To correct the problems noted, the packing was tightened, the open torque switch setting was adjusted to 2.10 and the limits were readjusted. Adjustment of the torque and limit switches was performed in accordance with maintenance Procedure 12 MHP 5021.001.037 Rev. 2. The Job Order was closed out 5/26/87.

Since this valve had encountered previous problems when opening (CIR's 1-10-85-2030, 1-10-85-2143 and 1-10-85-2183) it was identified as a valve to be MOVATS tested during the current Unit 1 outage. The MOVATS testing for 1-QMO-410 was completed on 7/28/87 and revealed the following:

- o Valve had excessive backseat thrust which required readjustment of limit switches
- o Packing was too tight which required the valve to be repacked.

Excessive backseat thrust can be caused by setting the close limit switch too close to the actual closed position. In this case there is insufficient allowance for coast of the valve and the valve is forced against the backseat. The team then reviewed 12 MHP 5021.001.037 Rev. 2 to determine if this coast was accounted for in the setting of the switches. The team concluded that although coast is mentioned in step 7.1.6 for setting the switches there is insufficient allowance to allow for coast in the setting of the switch and no requirement to check to see if the valve is backseated. This is a particular concern for those valves which are fast acting.

The team did note that Revision 3 of this procedure which was written to resolve IE Bulletin 85-03 concerns does address this concern. This procedure, however, is currently in draft form and is not expected to be approved until the end of the Unit 1 refueling outage. The team is concerned that Rev. 2 of the procedure which is currently being used, may result in incorrect limit switch settings for those valves adjusted previous and during this outage.

EXAMPLES:

PR-87-0528 CIR 1-10-85-2185
PR-87-0355 CIR 1-10-85-2143
PR-87-0338 CIR 1-10-85-2030
MOVATS inspection sheet for QMO-410, dated 7/23/87

COMMENT AS TO SAFETY SIGNIFICANCE:

Incorrect limit switch setting could result in excessive backseating of valves and resultant failure to operate.

NUMBER: RB-1
REVISION: 0
DATE: 8/4/87

INSPECTION OBSERVATION

AREA: Surveillance Testing

INSPECTOR: Boyd

ISSUE: The response time of AR Time Delays in the RCP bus undervoltage circuit for the turbine-driven auxiliary feedwater pump auto start are not included in total channel response time.

REQUIREMENT: Technical Specification 4.3.2.1.3 (Table 3.3-15, 12.a) requires time response testing of the turbine-driven auxiliary feedwater pump on an RCP bus undervoltage signal. Technical Specification 1.23 defines Engineered Safety Feature response time as the time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.).

DISCUSSION: Technical specification bases allow for sequential tests provided the total channel repsonse time is tested. Test procedures **1THP4030 STP.100A(B), **12THP4030 STP.218, **1-OHP4030 STP.017R and **12THP4030 STP.205A(B) are procedures used to arrive at the total channel response time for the RCP bus undervoltage function; however, the procedures do not include response time testing of the AR Time Delays. Also, this time delay does not appear to be included in any procedure for calibration.

COMMENTS AS TO SAFETY SIGNIFICANCE:

At present the best indication of the response time for the AR Time Delay is 3 to 15 seconds. This information comes from function diagram OP-1-98502-5 (J-1), "Primary Coolant Flow System Functional Diagram," Rev.5. A total response time of less than or equal to 60 seconds is given in the Technical Specifications. The last total response time results from 11/4/85 for Unit 1 indicate a response time of 19.88 seconds; therefore, if the maximum value of 15 seconds is used for the response time of the AR Time Delays then the total response time would be 34.88 seconds.

In general, the response time testing was found to be recently revised and the procedures correct. However, four different STPs are being used to determine the total channel response time of the TDAFP on RCP bus undervoltage. Three different groups (I&C, Performance and

Production) are responsible for different sections of the total test. Review of these tests with these gorups reveals that one group is not tasked responsibility for assessing the "whole picture". If a single group had responsibility for ensuring total channel testing, then the likelihood of missing a portion of that system or component can be reduced. In general, errors are found at the interfaces between different organizations.

NUMBER: RB-2
REVISION: 0
DATE: 8/4/87

INSPECTION OBSERVATION

AREA: Surveillance Testing

INSPECTOR: Boyd

ISSUE: The response time of the west Main FPT stop valve closure relays for the motor-driven auxiliary feedwater pumps auto start are not included in surveillance testing for loss of main feedwater pumps initiation.

REQUIREMENT: Technical Specification 4.3.2.1.3 (Table 3.3-5, 11.a) requires time response testing of the motor-driven auxiliary feedwater pump on a loss of main feedwater pumps. In accordance with 4.3.2.1.3 and 3/4.3.2 (ESF instrumentation bases), the measurement of response time is to provide assurance that the function associated with each channel is completed within the time limit assumed in the accident analyses. This requires time response testing of both the East and West Main FPT Stop Valve closure relays.

DISCUSSION: The logic to start the motor-diven auxiliary feedwater pump on loss of main feedwater pump turbines, requires main feedwater pump turbine stop valves to close. **12THP4030 STP.218 simulates west main FPT stop valve closure and then times actuation of east main FPT stop valve closure relays to shutting the motor-driven auxiliary feedwater pump breakers. It does not simulate east main FPT stop valve closure and then time actuation of west main FPT stop valve closure relays to shutting the motor-driven auxiliary feedwater pump breakers.

COMMENTS AS TO SAFETY SIGNIFICANCE:

**12THP4030 STP.218 cannnot verify that the motor-driven auxiliary feedwater pump can respond within the Technical Specification time limit. Time response testing of the west main FPT stop valve closure relays must be included to ensure that this channel can respond within the time limit assumed in the accident analysis.

NUMBER: RB-3
REVISION: 1
DATE: 8/21/87

INSPECTION OBSERVATION

AREA: Surveillance Testing

INSPECTOR: Boyd

ISSUE: The response time from when the 4160 Volt Emergency Bus Loss of Voltage relays sense a loss of voltage to the auto start initiation of the diesel generator is not being included in verifying that the Technical Specification Time Response limit is not being exceeded for the Motor Driven Auxiliary Feedwater Pumps.

REQUIREMENT: Technical Specification 4.3.2.1.3 (Table 3.3-5,10 a) requires time response testing of the motor driven auxiliary feedwater pumps on a 4160 Volt Emergency Bus Loss of Voltage. In accordance with Technical Specification Definitions 1.23 (Engineered Safety Feature Response Time), the response time "shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function". This requires including the time from when the loss of voltage relays reach their setpoint to the initiation of a diesel generator start.

DISCUSSION: **1THP4030STP.217A(B) response time tests from the tripping of the 4160V busses through diesel generator start and sequencing on the motor driven auxiliary feedwater pumps. **12THP4030STP.205A(B) sums the response times for the diesel generator from diesel start to energizing the busses, sequencing on of the motor driven auxiliary feedwater pumps and for the pumps to reach required pressure from **1THP4030 StP.217A(B) and *10HP4030STP.017R. It does not include the time interval from when the bus voltage exceeds the setpoint of the undervoltage relays to the diesel generator auto start signal. The test method used to actuate the undervoltage relays and to ensure that the slowest relay times are accounted for was evaluated in LER 86-013 but failed to evaluate whether this time was being included for Tech Spec compliance.

COMMENTS AS TO SAFETY SIGNIFICANCE:
**12THP4030 STP.205A(B) does not verify that the <u>entire channel</u> from when the 4160 Volt Loss of Voltage is sensed by the relays to the motor driven auxiliary feedwater pumps

reach required pressure does not exceed the Technical Specification Time Response limit. The part not being included contains 3 relays per bus and a 2 second time delay relay before the diesel generator auto start signal is initiated. The time associated with these relays to respond to a loss of voltage must be included to ensure that this function can respond within the time limit assumed in the accident analyses.

NUMBER: RB-4
REVISION:
DATE: 8/11/87

INSPECTION OBSERVATION

AREA: Surveillance Testing

INSPECTOR: Boyd

ISSUE: Functional and calibration tests allow instrument setpoints to be set inconsistent with the Technical Specification Trip Setpoints for Steam Generator Water Level Low-Low and High-High.

REQUIREMENT: Technical Specification Limiting condition for Operation 3.3.2.1 requires the Engineered Safety Feature Actuation System instrumentation channel to be OPERABLE with their trip setpoints set consistent with the values shown in the Trip Setpoint column of Table 3.3-4. Table 3.3-4 (ESF Actuation System Instrumentation Trip Setpoints), items 5.a, 6.a and 7.a provide trip setpoints of $\leq$ 67% of narrow-range instrument span for high-high level and $\geq$ 17% for low-low level.

DISCUSSION: Calibration procedures *1THP6030IMP.104-107 and functional procedures *1THP4030STP.015-018 provide for steam generator narrow range water level instrument high-high setpoints of $\leq$ 17 $\pm$ .5% of instrument span. This allows for setting the instrument setpoints inconsistent with Technical Specifications.

COMMENT AS TO SAFETY SIGNIFICANCE:

This allows for the possibility of operating with steam generator level instrument setpoints set nonconservative with Technical Specification Trip Setpoints.

NUMBER: RB-5
REVISION: 0
DATE: 8/17/87

INSPECTION OBSERVATION

AREA: Surveillance/Testing

INSPECTOR: Boyd

ISSUE: Response Time Testing of Auxiliary Feedwater (AFW) Pumps (pump to pressure) to final discharge pressures that can be in noncompliance with Technical Specification Definition 1.23.

REQUIREMENT: Technical Specification Surveillance Requirement 4.3.2.1.3 (Table 3.3-5, 9.a, 9.b, 10.a, 11.a and 12.a) requires response time testing of the Emergency Safety Feature Actuation System functions for the AFW system. Technical Specification Definition 1.2? requires response time testing from channel sensor until the ESF equipment is capable of performing its safety function (i.e., pumps reach required pressures).

DISCUSSION: The Technical Specification required response time is based upon the AFW pumps responding to a given pressure/flow within the times assumed in the FSAR Accident Analyses. This time begins from when the channel sensor reaches its setpoint (initiating signal) until the pump reaches its required pressure/flow. **1-OHP4030.STP.017R (AFW Pump Response Time) only measures the pump response time from pump start to existing steam generator pressure or greater (initial conditions require SG pressure > 310 psig). This allows for the AFW pumps to be response time tested to inconsistent discharge pressures each time and does not ensure that the pumps are tested until they reach the parameters assumed in the accident analyses. The lack of any response time testing of the Turbine Driven Auxiliary Feedwater Pump was addressed in IE Inspection Report Nos. 50-315/84-13-03 (DRS) and 50-316/84-15-03 (DRS). The Technical Engineering Response (July 30, 1985, Bradley to Stietzel) stated that the procedure would test from throttle valve actuation <u>to required flow.</u>

COMMENT AS TO SAFETY SIGNIFICANCE:

Surveillance testing does not verify that the AFW system can respond within the time limits established in the Technical Specification and assumed time in the accident analyses.

NUMBER: RB-6
REVISION: 0
DATE: 8/17/87

INSPECTION OBSERVATION

AREA: Surveillance/Testing

INSPECTOR: Boyd

ISSUE: Discrepancies in valve lineups and numbering.

REQUIREMENT: The normal valve lineup for valves in the Auxiliary Feedwater (AFW) system should be consistent in each controlled document that includes any of the AFW valves.

DISCUSSION: Procedures 1-OHP4021.056.001 (Filling and Venting AFW system), **1-OHP4030.STP.017T (Turbine Driven AFW System Test), 1-OHP4030.STP.035 (Controlled Valve Position Logging) and Drawing OP 1-5106A (Flow Diagram, Aux-Feedwater) provide valve positions for the AFW System. The valve positions for the normal valve lineup provided in the procedures should agree, but in several instances do not. As witnessed on the flow diagram, valve positions can be shown as open, closed, locked open and locked closed. This implies there is a purpose behind showing valve positions on the diagram. This purpose should be applied consistently to all valves throughout the flow diagram for the AFW system. The flow diagram is inconsistent with the valve positions provided in the procedures in many instances.

EXAMPLES: A. 1-OHP4021.056.001, Data/Signoff Sheet 5.1

1. Page 1

a. Valve numbers for E MDAFP Suction Strainer Vents are 1-FW-241-1 and 1-FW-241-2, not 1-FW-240-1 and 1-FW-240-2.

b. Valve 1-FW-129 should not be shown as locked closed (LCL) but as sealed closed (SCL).

2. Page 7

The valve positions of valves 1-FMO-211 through 241 and 1-FMO-212 through 242 are shown with asterisk (*). The meaning of the asterisk is not indicated.

3. Page 10

Valve numbers for W MDAFP Suction Strainer Vents are 1-FW-240-1 and 1-FW-240-2, not 1-FW-241-1 and 1-FW-241-2.

B. **1-OHP4030.STP.017T, page 2 of Valve Lineup Sheet 1, shows valve 1-FW-146 (TDAFP Cooling Water Supply) as open. This should be shown as locked open (LOP) in accordance with 1-OHP4021.056.001.

C. 1-OHP4030.STP.035, Administratively Controlled Valve Lineup Sheet 3, does not include valves 1-FW-146 (TDAFP Cooling Water Supply) and 1-C-260 (Condensate Storage Tank Level Indicator Heater Supply). These valves are normally locked open in accordance with the valve lineup in 1-OHP4021.056.001.

D. Flow Diagram OP 1-5106A for the Auxiliary Feedwater System does not agree in many instances with the valve positions identified in 1-OHP4021.056.001 and **1-OHP4030.STP.035. Valve positions can be shown as open, closed, locked open, or locked closed as witnessed on the flow diagram. The following are examples of discrepancies found in valve positions.

Valve #	Flow Diagram 1-5106A	10OHP4021. 056.001	**1-OHP4030. STP.035
12-CRV51	Open (M-9)	Closed	--
1-FW242-1	Open (M-9)	Closed	--
1-FW123	Locked Open (J-7)	Sealed Open	Sealed Open
1-FRV-256	Open (J-8)	Closed	--
1-ESW-115	Closed (L-8)	Locked Closed	Locked Closed
1-FW175	Open (E-8)	Locked Open	Locked Open
1-FW146	Closed (K-2)	Locked Open	--
1-C260	Open (B-3)	Locked Open	--

COMMENT AS TO SAFETY SIGNIFICANCE:

AFW System Flow Diagram OP 1-5106A is a document widely used for indicating the major components and flow paths of the system. With this in mind, the flow diagram should represent, as closely as possible, the actual conditions of the normal system lineup. This would help prevent any misinterpretation of system operation or design.

NUMBER: RB-7
REVISION: 0
DATE: 8/17/87

INSPECTION OBSERVATION

AREA: Surveillance/Testing

INSPECTOR: Boyd

ISSUE: Drawing Errors

REQUIREMENT: Information on controlled documents should be correct and as built to reflect modifications to the system.

DISCUSSION: During the review of the elementary diagrams for the Auxiliary Feedwater System (AFW), several drawing errors were found.

EXAMPLES:

1. East and West Motor Driven AFW Supply System Elementary Diagrams OP1-98214 and 1-98218 show Steam Generator <u>Low Low</u> Level contacts K633 3-8 as Steam Generator <u>Low</u> Level.

2. Motor Driven Auxiliary Feedwater Supply System Elementary Diagram OP 1-98217 and 1-98215 show flow retention valve position contacts 13-14 for FMOs-212, 222, 232, 242, 211, 221, 231 and 241 as opening at 3/8" of valve closure. These have been changed as a result of completing **1THPSP.104 (AFW Flow Retention Test), which adjusted valve flow retention settings.

3. Primary Coolant Flow System Functional Diagram OP 1-98502, Note 1, states that the maximum allowable time delay between reaching the setpoint value and passing on the signal to the reactor trip circuitry should not exceed 0.2 seconds for the Reactor coolant Pump undervoltage relay response requirement. This Note is referred to at a point in the circuitry which would include actuation of the RCP bus undervoltage relays and the solid State Reactor Protection and Safeguard System (SSPS) relays. The SSPS relays have time delays of 0.5 +/- .05 seconds. This part of the Note should be corrected to show an allowable relay response time in accordance with AEPSC's response to AEP-77-510 (August 11, 1977; Subject D.C. Cook Unit 1 (AEP) Reactor Trip on Undervoltage; From J.D. Woodward to Mr. J.G. Feinstein).

NUMBER: RB-8
REVISION: 0
DATE: 8/19/87

INSPECTION OBSERVATION

AREA: Surveillance/Testing

INSPECTOR: Boyd

ISSUE: Extrapolating acceptance criteria for the separate response time testing of the individual pumps (pump start to reaching required pressure) is incomplete and inappropriate in **1-OHP4030.STP.017R, Auxiliary Feedwater Pump Response Time.

REQUIREMENT: The AFW pumps are required to be response time tested from pump start to reaching required discharge pressure as a portion of Technical Specification Surveillance Requirement 4.3.2.1.3 (Table 3.3-5, 9.a, 9.b, 10.a, 11.a, and 12.a) and Technical Specification Definition 1.23.

DISCUSSION: The response time allowable limits provided in Technical Specifications include the time from when the monitored parameter exceeds the setpoint of the sensor to when the pumps reach the required pressure. Any acceptance criteria extrapolated from these limits should be accurate and meaningful. Errors have been found in the process of extrapolating an acceptance criteria for each AFW pump in the test procedure. This extrapolated acceptance criteria is not a Technical Specification value and could easily be misinterpreted as such. The Tech Spec response time limits are used as acceptance criteria for the total system in another surveillance test procedure. Therefore, the extrapolated acceptance criteria is inappropriate for the individual pump times.

EXAMPLES: **1-OHP4030.STP.017R

1. Step 3.6.1 does not specify which time to obtain from the referenced procedure. This could be Train A or B for SG Low Low Level, or RCP Bus Undervoltage. Step 7.1 of the acceptance criteria utilizes this value.

2. The information requested in Step 3.6.2 is not in the referenced document, nor does it specify which time to retrieve from the referenced document. Step 7.1 of the acceptance criteria utilizes this value.

3. Step 7.2 does not account for the transmitter/bistable response time, nor the logic to pump breaker closure time.

NUMBER: RB-9
REVISION: 0
DATE: 8/19/87

INSPECTION OBSERVATION

AREA: Surveillance/Testing

INSPECTOR: Boyd

ISSUE: Procedural deficiencies that can lead to errors in performance.

REQUIREMENT: Plant procedures should be written so as to eliminate the possibility of personnel errors when conducting the procedure. The procedure should provide direction specific enough to ensure that the procedures are performed consistently the same way each time. Human factors must be considered throughout the development and use of procedures.

DISCUSSION: NRC and INPO have developed documents (NUREG/CR-1369 and INPO 85-026) for evaluating and providing guidance for applying human factors principles to the writing of maintenance, test, and calibration procedures. Several items were found that indicate procedures have not been thoroughly evaluated with the NUREG or INPO guide. The weakness provided below as examples are indicative of most all the procedures reviewed.

EXAMPLES:

1. When specifying test equipment, the phrase "or equivalent" is frequently used (**12THP6030 IMP.250, Section 3.0). This can lead to using test equipment with accuracies less than that of the equipment being tested. The phrase "or equivalent" should only be used when equivalency checks are stated.

2. When referencing from one document to another, the exact section, paragraph, page, step or specific data to be retrieved is not being specified (**12THP4030STP.205A, Attachment #5, 6.5 Steam Generator Water Level - Low Low; **1THP6030IMP.165, Step 7.2.9). Relying on personnel performing the procedures to find the correct sections or steps of the referenced document can lead to personnel attempting the task without the document or with the inappropriate sections, steps, or data.

3. The level of detail does not ensure that a procedure will be performed without variation each time (**1-OHP4030STP.017R, Step 3.8). When relying upon another department for assistance, specific instructions for their activities should be provided or referenced to another document.

4. More than one action or three functionally related actions are being directed by one step (**1-OHP4030.STP.017T, Step 8.40). Too many actions in a step can lead to oversight of instructions and errors in misinterpretation.

5. Items requiring alignment/restoration are not being individually specified, verified and checked off or signed off (**12THP4030.STP.218, Steps 6.3 and 6.4). Two primary factors associated with misalignment are lack of specificity of instructions and lack of physical verification of position.

6. Calibration data or setpoints in procedures should be traceable to an engineering document (**1THP6030.IMP.043, Section 2.0). The document that controls the calibration data and setpoints should be included as a reference to decrease the possibility of changing the procedure without consulting the associated engineering document.

COMMENT AS TO SAFETY SIGNIFICANCE:

The use of a procedure that is deficient with respect to the above and the criteria established in NUREQ/CR-1369 and INPO Guide 85-026 can lead to errors in performance.

NUMBER: RB-10
REVISION: 0
DATE: 8/19/87

INSPECTION OBSERVATION

AREA: Surveillance/Testing

INSPECTOR: Boyd

ISSUE: Minimum flow requirements and testing for the Auxiliary Feedwater Pumps.

REQUIREMENT: Procedures requiring operation of any AFW pump have a minimum flow limitation of greater than or equal to 50 gpm.

DISCUSSION: Throughout review of the surveillance test procedures and any procedure requiring operation of a AFW pump, this minimum flow limitation has appeared. There are no instruments available that give indication of flow through the emergency leakoff lines. These ELO lines are used at times as the only path for pump discharge. This limitation also appeared in the preoperational tests of the AFW pumps, but was not verified.

COMMENT AS TO SAFETY SIGNIFICANCE:

Without indication of actual ELO flow, the minimum flow requirement for each pump can not be assured.

NUMBER: GJO-1
REVISION: 0
DATE: 7/22/87

INSPECTION OBSERVATION

AREA: Training

INSPECTOR: Overbeck

ISSUE: A systems' manual is not controlled and may lead to errors or misinformation.

REQUIREMENT: (LATER)

DISCUSSION: A Systems Training Manual (D. C. Cook) exists at the site and at corporate engineering that is not controlled and is not revised as systems are modified. This manual contains descriptions of the various safety and non safety related systems and are formatted as lesson plans with various training objectives. The description of the systems is incorrect in many instances. For example, Chapter AS-11, the auxiliary feedwater system training article describes the system as a two pump system and has not been revised to reflect the addition of a second motor driven auxiliary feedwater pump. The team was informed that these manuals are unofficial and are not used by the training department. However, these manuals are commonly found in the possession of plant and enigneering personnel. Apparently these manuals were used as orientation/initial training sources for new employees and have been retained. The team is concerned that this superceded, uncontrolled source of information could be used to perform safety related activities.

COMMENTS AS TO SAFETY SIGNIFICANCE:

The team found no instances where use of these documents caused inadequate safety related activity. However, their uncontrolled preserce could lead to potentially safety significant errors.

NUMBER: CW 1
REVISION: 0
DATE: 8/17/87

INSPECTION OBSERVATION

AREA: Training

INSPECTOR: Craig G. Walenga

ISSUE: Skill of the Trade

REQUIREMENT: 10 CFR Part 50, Appendix B, Criterion II, "The program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained."

DISCUSSION: The electrical maintenance group has placed a high degree of reliance on skill of the trade for environmentally qualified (EQ) splices and maintenance of Limitorque motor-operated valves (MOV). The important details involved in the proper completion of maintenance tasks appear to have been overlooked in several instances of splicing and maintenance of MOVs. The training/qualification/requalification program has only been recently upgraded as a result of the INPO training accreditation program. While the upgraded training and qualiflication program represents a significant improvement over past practices, the electrical maintenance group has not aggressively pursued the potential benefits of the program in the areas of Limitoruqe MOVs and splicing.

EXAMPLES: A review of the Task Qualification Matrix-Electrical Module Cards for the fifteen-person electrical maintenance staff revealed that no staff member had completed the qualification card requirements for EM-0-B402 "Prepare/Make Low Voltage Terminations (600V)" and any of the Limitorque MOV qualification cards EM-0-B107 to B118. However, 8 persons were waived of the requirements of EM-0-B402 and 6 persons were waived of the requirements of EM-0-B107 to B118. All but one of these persons were A-level electricians. It was noted that in the last half of 1986, the electrical maintenance staff did attend an 8-hour course on Limitorque MOVs where each person had an opportunity to disassemble and reassemble an operator that was available for a training aid.

In reviewing past B-level and A-level qualification cards for qualification on high or low voltage splicing, it was found that three persons received the sign-off between 1974-1977, three between 1981 and 1982, one in 1984 and one who never had to complete the A- or B-level qualification cards as he was hired at the A-level.

Since EQ splicing is accomplished relatively infrequently, the technical details are easily forgotten and the completion of a requalification card may be in order for each electrical maintenance staff member.

A similar situation exists for Limitorque MOVs. Eleven qualification cards now exist for MOVS which apparently have replaced the one item listed on the old D.C. Cook Nuclear Plant Maintenance Man A (Electrical) Job Demonstration Check Sheet. That item was number 12 "Demonstrate how to set and adjust torque limits on Limitorque Operators."

It was noted that each staff member had attended an eight-hour Limitorque training course in late 1986 where each person disassembled a Limitorque training courses and reassembled it. This eight-hour course covered material from four lesson plans dealing with MOV operations, design, limit switch and torque switch settings, testing and troubleshooting, and assembly and disassembly. MOVATs training was also given to the maintenance staff early in the second quarter of 1987, although attendance records and the course lesson plans were not available and may not exist.

With the problems being identified with MOV maintenance throughout the industry and at D.C. Cook, the waiving of the Limitorque qualification card requirements for any member of the electrical maintenance group because of "skill of trade" should be reconsidered.

The generic implication of this observation is that there exists a need of requalification training on a periodic basis because there is a proficiency half-life to all human activities. While the period between retraining or requalification will vary from person to person, "skill of the trade" cannot be an assumption in any activity.

COMMENT AS TO SAFETY SIGNIFICANCE:

Personnel training is an essential ingredient to ensuring certain safety-grade equipments retain their qualification states.

NUMBER: PM-1
REVISION: 0
DATE: 8/5/87

INSPECTION OBSERVATION

AREA: Seismic III/Seismic I

INSPECTOR: P. Mangan

ISSUE: The design change program does not address safety concerns associated with the installation of non-seismic structures, systems or components in safety related areas.

REQUIREMENT: No licensing commitment at time of construction

DISCUSSION: Regulatory Guide 1.29 requires that those portions of structure systems, or components whose continued function is not required but whose failure could reduce the functioning of any safety related plant feature to an unacceptable safety level should be designed and constructed so that the SSE would not cause such a failure. Neither the corporate or plant procedures on design change, 6P 3.1 and PMI 5040, nor the NS&L procedure on safety reviews NS&L, require a documented analysis of the results of failure of non-seismic piping installed in safety related areas.

EXAMPLES: A review of RFC 12-1803 showed seismic class III NESW piping was installed in the AFP rooms to supply cooling water to the AFW pumps. The safety review conducted by NS&L analyzed the consequences of a loss of cooling water to the AFW pumps. However, it is not clear that potential damage to safety equipment in the AFW pump room from the failure of non-safety piping was considered, although there is some evidence that the issue may have been considered (e.g. pipe support anchor bolts were installed to safety grade requirements).

COMMENT AS TO SAFETY SIGNIFICANCE:

Seismic Class III piping installed in safety related areas may result in an unanalyzed threat to surrounding safety related equipment. RFC documentation should include a clear statement that the potential effects on safety equipment by the failure of Seismic Class III piping have been considered.

NUMBER: DK-1
REVISION: 0
DATE: 8/4/87

INSPECTION OBSERVATION

AREA: Surveillance Testing

INSPECTOR: D. Kruer

ISSUE: Incorrect information appears in the auxiliary feedwater system description concerning the signals used for automatic start of the motor-driven auxiliary feedwater pumps.

REQUIREMENT: (LATER)

DISCUSSION: Technical Specification Table 3.3-3 indicates that the motor-driven auxiliary feedwater pumps automatically start on (1) low-low steam generator level, (2) 4 kv bus loss of voltage, (3) safety injection, and (4) loss of main feedwater pumps. However, System Description No. SD-DCC-HP109, "Auxiliary Feedwater System," Rev. 5, 2/17/87 incorrectly indicates that the motor-driven pumps start on reactor coolant pump bus undervoltage. Review of the electrical elementary drawings confirmed that the motor-driven pumps start on 4 kv bus loss of voltage and not on reactor coolant pump bus undervoltage.

COMMENT AS TO SAFETY SIGNIFICANCE:

This observation has no safety significance since the system description is not used as a design document. However, it is used as reference material and, therefore, should be consistent with design documents.

Attachment 5

OBSERVATION CLASSIFICATION MATRIX

OBSERVATION CATEGORIES

Obs. No.	SFK-1	SFK-2	SFK-3	SFK-4	SFK-5	SFK-6	SFK-7	SFK-8	SFK-9	SFK-10	SFK-11	SFK-12	SFK-13	SFK-14
Design	X	X	X		X			X		X	X		X	
Design Control Process														
Design Basis			X					X		X			X	
Traceability of Design														
Design Assumptions														
Calculations								X		X				
Input														
Methodology														
Consistency of Results														
Design Verification	X	X	X		X	X		X			X			X
Documentation of Engineering Judgment														
Documentation Completeness														
Documentation Errors														
Motor Operated Valves			X				X							X
Equipment Qualification														
Interface Information		X				X						X		X
Installation														
As-Built					X									
Common Design Features (Seismic II/I; HELB; Fire Protection, etc.)														
Surveillance Testing				X										
Maintenance														
Operations														
Training														
Quality Control					X									
Procedures												X		
Safety Evaluation							X		X					
Invalid Observation														

OBSERVATION CATEGORIES

Obs. No.	SMK-1	SMK-2	SMK-3	SMK-4	SMK-5	SMK-6	SMK-7	SMK-8	SMK-9	SMK-10
Design	X			X						X
Design Control Process										
Design Basis		X	X						X	
Traceability of Design	X	X	X		X		X		X	
Design Assumptions										
Calculations	X	X		X	X					
Input					X					
Methodology	X			X	X					
Consistency of Results										
Design Verification					X					X
Documentation of Engineering Judgment					X					
Documentation Completeness			X							
Documentation Errors										
Motor Operated Valves	X									
Equipment Qualification										
Interface Information							X			
Installation										
As-Built										
Common Design Features (Seismic II/I; HELB; Fire Protection, etc.)										
Surveillance Testing										
Maintenance										
Operations										
Training										
Quality Control										
Procedures										
Safety Evaluation						X				
Invalid Observation									X	

OBSERVATION CATEGORIES

Obs. No.	TJD-1	TJD-2	TJD-3	TJD-4	TJD-5	TJD-6	RBP-1	RBP-2	RBP-3	RBP-4
Design								X		
Design Control Process										
Design Basis		X	X					X		
Traceability of Design									X	
Design Assumptions		X								
Calculations				X			X		X	
Input		X		X						
Methodology				X			X			
Consistency of Results				X						
Design Verification	X	X	X	X					X	
Documentation of Engineering Judgment						X				
Documentation Completeness										
Documentation Errors						X				
Motor Operated Valves										
Equipment Qualification										
Interface Information										
Installation										
As-Built										
Common Design Features (Seismic II/I; HELB; Fire Protection, etc.)										
Surveillance Testing										
Maintenance										
Operations										
Training										
Quality Control										
Procedures										
Safety Evaluation										
Invalid Observation					X					

OBSERVATION CATEGORIES

Obs. No.	MLB-1	MLB-2	MLB-3	MLB-4	MLB-5	MLB-6	RB-1	RB-2	RB-3	RB-4	RB-5	RB-6	RB-7	RB-8	RB-9	RB-10
Design																
Design Control Process																
Design Basis																
Traceability of Design																
Design Assumptions																
Calculations																
Input																
Methodology																
Consistency of Results																
Design Verification																
Documentation of Engineering Judgment																
Documentation Completeness																
Documentation Errors													X			
Motor Operated Valves																
Equipment Qualification																
Interface Information																
Installation																
As-Built																
Common Design Features																
(Seismic II/I; HELB; Fire Protection, etc.)																
Surveillance Testing							X	X	X		X			X		X
Maintenance										X						
Operations	X			X	X											
Training														X		
Quality Control																
Procedures	X	X		X	X	X				X		X			X	X
Safety Evaluation																
Invalid Observation			X													

OBSERVATION CATEGORIES

Obs. No.	WL-1	WL-2	WL-3	WL-4	WL-5	WL-6	WL-7	WL-8	WL-9	WL-10	GJO-1	CW-1	PM-1	DK-1
Design														
Design Control Process														
Design Basis					X									
Traceability of Design					X									
Design Assumptions														
Calculations														
Input														
Methodology														
Consistency of Results														
Design Verification														
Documentation of Engineering Judgment														
Documentation Completeness														
Documentation Errors														X
Motor Operated Valves		X	X	X	X	X	X			X				
Equipment Qualification	X	X	X	X		X	X	X						
Interface Information	X				X									
Installation	X			X		X								
As-Built														
Common Design Features														
(Seismic II/I; HELB; Fire Protection, etc.)													X	
Surveillance Testing														
Maintenance		X	X	X	X		X		X					
Operations														
Training											X	X		
Quality Control		X	X											
Procedures	X			X	X			X		X				
Safety Evaluation														
Invalid Observation														

Attachment 4 to AEP:NRC:1060A

American Electric Power Response to the

WESTEC Safety System Functional Inspection Report

American Electric Power
Service Corporation
1 Riverside Plaza
Columbus, OH 43215
614 223 1000

AMERICAN ELECTRIC POWER

T. J. DelGaizo
WESTEC Services, Inc.
Plymouth Meeting, PA 19462-1412

November 18, 1987

Dear Mr. DelGaizo:

Thank you for your Safety System Functional Inspection (SSFI) Report on the D. C. Cook Plant Unit 1 Auxiliary Feedwater (AFW) System.

WESTEC personnel are to be commended for their effort in reviewing and evaluating a large quantity of information. We were very impressed by the competence of the WESTEC team members and the thoroughness of their review. Further, we are reassured by the team's conclusion that the AFW is capable of functioning in accordance with its design requirements.

While we have had the final WESTEC report in house for a relatively short period of time, our corporate and plant engineers have been carefully evaluating the key findings of the inspection team as they have evolved. These were summarized in the report as:

- Section 5.0 General Conclusions
- Section 6.0 Specific Technical Area Summaries
- Attachment 4 Specific Observations

Attachments 1, 2 and 3 to this letter contain our corresponding evaluations and responses to the WESTEC findings. These are being transmitted for your information. While you will note that we have taken exception to some of the specific observations, we trust that you will find that our evaluations and planned actions address the root issues identified by the team. Additionally, AEPSC Management continues to deliberate on how we can best utilize the WESTEC findings to enhance our activities in support of the Cook Nuclear Plant. Therefore, additional evaluations will likely be undertaken and further actions identified to improve the plant operations and supporting activities.

Sincerely,

M. P. Alexich
Vice President

cm

Attachments

Attachment 1 - Response to Section 5.0 of the WESTEC Report - General Conclusions

A key aspect of the SSFI inspection methodology is the categorization of specific observations into generic categories such as design related, design process related and equipment related. As noted in Section 5.0 of the WESTEC Report, the results of this categorization process were presented in the Observation Classification Matrix (Attachment 5 of the WESTEC Report). Based on both the individual inspection observations and the Classification Matrix, three general conclusions were provided by the inspection team. These three conclusions are repeated and responded to individually as follows:

Conclusion 5.1

"In spite of a number of weaknesses identified, as enumerated in this report, the AFW system was demonstrated to be capable of functioning in accordance with its design requirements. In certain instances, design margins were reduced or failure-modes-and-effects analyses were required to demonstrate functionality. Nevertheless, functionality was demonstrated."

Response

Specific weaknesses identified by the inspection team have been reviewed and evaluated in Attachment 3*, which contains responses to the individual inspection observations. We are pleased with the overall finding that functionality of the AFW system was demonstrated. You will also note that when weaknesses of potential safety significance were identified, corrective actions were promptly initiated and implemented. For other items perceived as weaknesses, longer term corrective actions are planned, as outlined in our responses. We are confident that both these near term and longer term actions will enhance the overall reliability of the plant.

Conclusion 5.2

"Generic weaknesses were identified which, when corrected, will improve plant reliability. These areas include (1) the lack of a well documented plant design basis, (2) weaknesses in the formal documentation of interface information (both interdiscipline interfaces and engineering/site interfaces), and (3) weaknesses in the design control and verification process."

* Observations SMK-8, TDG-5, MB-3 and WL-6 are listed as "INVALID" in the WESTEC Report. Please submit copies for our records.

Response

(1) We have adopted the following formal definition of "Design Basis."

"Design Basis" is "that information which identifies the specific function to be performed by a structure, system or component of a facility, and the specific values or range of values chosen for controlling parameters as reference bounds for design. These values may be (1) restraints derived from generally accepted "state of the art" practices for achieving functional goals or (2) requirements derived from analysis (based on calculations and/or experiments) of the effects of a postulated accident for which a structure, system or component must meet its functional goal."

The following documentation contains our design basis:

- Accident analysis, general design criteria as defined in the FSAR, and relevant portions of the FSAR.

- Applicable Technical Specifications, license conditions, explicit design basis information transmitted to the NRC and intended to be incorporated in the FSAR, regulations, NRC directives and safety evaluation reports.

Working documents that control the design process do not form part of the design basis and therefore changes made to them (after appropriate review) do not constitute a change in design basis. These documents include:

- System descriptions, nuclear safeguards design memoranda, appropriate licensing review memoranda, pertinent AEP and industry guides, codes and standards, specifications, drawings, procedures, vendor furnished requirements, and other detailed design documentation.

Although we feel the design change process is adequate, we recognize the WESTEC finding that "the design basis is distributed over several documents and is difficult to identify without recourse to personnel." We will issue a revision to AEPSC General Procedure 3.1, "Design Changes," providing a definition of what constitutes the design basis of the Donald C. Cook Nuclear Plant. This procedure change will instruct our engineers to: (1) consider on future RFCs the impact of the design change on the design basis associated with their respective disciplines, and (2) document in the design change package the design basis documents that were viewed during the design change process. Additionally, we intend to enhance our System Descriptions and/or supporting documents in a manner which would make the design basis more explicit and useable to the engineer(s) faced with making design changes. The above program is a major undertaking which will span about 5 years. We intend to start early next year.

(2) Although we do not perceive that an interface problem exists, we recognize the importance of continued control of interface information. Therefore, the Vice President of Nuclear Operations will issue a policy statement emphasizing the need for continued communication in this area between the engineering and design divisions and the plant.

(3) WESTEC also identified concerns in the area of design verification and traceability of design input. We instituted a Formal Design Verification Upgrade Program in 1983 as part of our Regulatory Performance Improvement Program (RPIP). Formal independent design verification was adopted in our corporate design procedures. We also conducted a historical review of a large sample of design changes implemented between 1975 and 1983, to assure ourselves that we had not overlooked items important to safety and to demonstrate that design control was adequate. Our program and findings were documented and sent to the NRC. In order to ensure continued control in this area, we will issue directives emphasizing existing programmatic controls governing the methods, extent, and documentation of design verification, as well as emphasizing existing programmatic controls governing documentation and traceability of design inputs and design analyses.

Conclusion 5.3

"In view of the nature and technical depth of the inspection, a similar inspection of another safety system may reveal a comparable number of deficiencies, but it can not be concluded that such concerns would be of greater safety significance or that the functionality of the system would be in doubt. Nevertheless, an on-going program of such inspections would (1) provide confirmation of functionality of other safety systems (2) verify the effectiveness of corrective actions from this inspection and (3) might reveal the existence of concerns upon which further improvements can be based."

Response

We are currently following up on the issues raised in the AFW SSFI. We anticipate that several of the long term actions identified will take several years to complete. When these activities are completed, we will consider performing an SSFI on another system as an additional long term action.

Attachment 2 - Response to Section 6.0 of the WESTEC Report Specific Technical Area Summaries

Section 6.0 of the WESTEC report summarized the observations, findings, and conclusions of several contractor inspectors discovered during the review of their respective technical areas. The specific areas addressed were as follows:

- 6.1 Electrical Design
- 6.2 Mechanical Design
- 6.3 Instrumentation & Control Design
- 6.4 Operations
- 6.5 Maintenance
- 6.6 Surveillance Testing
- 6.7 Training

For each of these seven areas, the review and approach of the inspection was stated, significant findings were summarized, and conclusions were drawn. Table 1 identifies the specific inspection observations which formed the basis of the technical area summaries. Problem Reports or LERs (Licensee Event Reports) were generated to evaluate and document the resolution of significant deficiencies. Table 2 ties these Problem Reports or LERs to the corresponding WESTEC observations.

Since the objective of this effort was the identification of potential improvements in each area, our responses focus on the conclusion of the inspection team in each area. The seven area conclusions and our corresponding responses are detailed as follows:

6.1 Electrical Design

In paragraph one, WESTEC raises a generic observation that, "improvements in plant design can be directly or indirectly realized as a result of strengthening the observed weakness in the design basis documentation."

The example provided in the report was that the Heinemann breaker problem (ref. WESTEC Observations SFK-8 and SFK-11) would have been realized during the implementation of RFC-01-2764 (station battery changeouts) if the associated 250VDC short circuit calculations had been updated. WESTEC concludes that the subsequent design verification of the increased short circuit level would have identified the inadequacy in the circuit breaker interrupting capability.

We agree with the above observation. However, the following clarification must be made: the example used by WESTEC exaggerates the claim that the design change review for RFC-01-2764 should have led to the discovery of the Heinemann breaker problem. The true weakness was a deficiency in the documentation of the 250VDC fault calculation and coordination studies needed to support the design change process. The interrupting capability of protective devices with the replacement batteries was judged to be negligible during the initial review of RFC-01-2764. The main 250VDC distribution panels utilize current limiting fuses that have an interrupting capability of 200,000 amperes, almost 10 times the available fault current at the first fuse nearest the battery. The interrupting capability of the Heinemann breakers was poorly documented and was therefore overlooked.

Our resolution of this generic concern is to develop electrical system descriptions and/or supporting documentation. The upgraded design basis documentation would better support the design change review process as mentioned in the WESTEC general conclusion.

In paragraph two, WESTEC states that design verification activity can also be improved. This can be achieved by the, "incorporation of a review of equipment nameplate data in the RFC closeout process."

We agree with this WESTEC finding regarding electrical nameplate information. Our resolution is to incorporate the above WESTEC recommendation into the design change process. The electrical equipment nameplate information is to be transmitted to Columbus upon the receipt of the equipment at the plant. We have agreed to make this change as noted in the "Future Actions Required" for the WESTEC Inspection Observation SFK-1.

We have a comprehensive Electrical Engineering Design Verification Program that includes formal procedures to ensure independent verification. Our decision to proceed with Enhanced System Descriptions and/or supporting documentation will further strengthen the process.

The third item concludes that the "technical evaluation as part of the Unreviewed Safety Question Evaluation, 10 CFR 50.59 reporting requirements, should be strengthened as evidenced by observations of inaccurate technical information in a safety evaluation, and an incomplete evaluation in the partial completion of a design change (RFC)."

The conclusion is based on a single RFC safety review memorandum and a letter recommending a "temporary fix" to the plant design. Since we decided not to implement the temporary fix, no safety review was necessary. The particular safety review in question has been redone and the conclusion remains the same: there are no unreviewed safety questions. It is felt that this is an isolated instance and not a generic problem. We believe we have an adequate safety review process.

6.2 Mechanical Design

The first concern is that the design of the AFW system was not adequately documented to assure that future modifications to the system are consistent with the design basis intent. Future revisions to the AFW system will consider design basis as discussed in the Section 5.2 response. The AFW system description will also be revised to include a listing of applicable design basis documents. These actions will help ensure that future changes to the AFW system are consistent with the design intent.

The second area of generic concern is that existing design analyses are not documented in a form which is traceable and auditable. Since the audit the Mechanical Engineering Division has conducted division-wide training for engineering personnel on MED Procedure 8, "Calculations". This training included a review of the SSFI findings related to calculations and design analyses, and emphasized existing programmatic controls covering documentation and traceability. Additionally, in response to Findings SMK-1, SMK-2, SMK-3, SMK-4, SMK-5, SMK-9, TDG-1 and TDG-2, we have either performed additional engineering analyses or redone calculations to improve the documentation and traceability of the design basis of the AFW system.

The third conclusion states that design efforts are not being consistently coordinated and documented to assure that essential design information is accurately communicated across interdisciplinary boundaries. The Mechanical Engineering Division has recently conducted division-wide training for engineering personnel on MED Procedure 10, "Design Control". This training included a review of the SSFI findings related to interface control in the design change process, and emphasizing existing programmatic controls covering documentation of design information communicated across interdisciplinary boundaries. Additionally, in response to Finding SMK-7, we will revise the valve procurement data sheet to include current requirements and informational needs.

The fourth conclusion cites that inadequacies in design verification have resulted in incorrect engineering evaluations and analyses. The aforementioned Mechanical Engineering Division training on MED 10 "Design Changes," emphasized existing corporate and division requirements for design verifications. In response to Findings SMK-5, SMK-10, TDG-1, TDG-2, and TDG-3, we have either committed to redo calculations in accordance with current standards, or we have performed additional engineering analyses to verify system functionality when documentation is incomplete.

The final area of generic concern relating to mechanical design was that design and modification of safety-related motor-operated valves has largely been performed on a component basis without adequate systems engineering input. Mechanical Engineering Division performs its engineering functions utilizing both system engineers and equipment engineers. The system engineer is responsible for the overall system design, and for integrating the aspects of components, equipment, and controls to assure that the system will function as desired. The equipment engineer furnishes information regarding the major and minor components required to make up the system. The major equipment engineer for a system is usually the system engineer. For those cases in which the responsibilities of the system engineer and equipment engineer reside in different disciplines, Mechanical Engineering Division training has emphasized existing programmatic controls covering documentation of design information communicated across interdisciplinary boundaries. The responses for findings SMK-1, SMK-4, SMK-6, SMK-7, SMK-10, TDG-6, WL-5, and WL-10 support our belief that the existing division of responsibility between the system engineer and the equipment engineer has resulted in an adequate design for the safety-related motor-operated valves.

6.3 Instrumentation and Control Design

Two areas of generic concern relating to instrumentation and control design were identified. The following actions are proposed to address these concerns. These actions are in addition to the corporate effort to address the generic concerns on design basis, interface information and the design control process.

The SSFI team recommended incorporating instrument errors into setpoint calculations. In the past, instrument error analysis has been an inherent part of the design process, although not formally documented. As a part of future design changes, the Instrumentation & Control Section will formally document the engineering evaluation involved in establishing a setpoint. The documentation will take the form of instrument error sensitivity studies, and will be done through the normal Engineering Control Procedure (ECP) revision process. Additionally, we have completed a "horizontal slice" of tank instrument setpoints. This review included approximately 70 devices on all potentially safety-interface tanks. Instrument overlap, instrument error, alarm points, and design margin were considered. This review concluded that the instrument error analysis method used in the past was appropriate.

The second generic concern regarding instrumentation and control design is that setpoint calculations should be presented in a form which is useful to plant operations. The ECP calibration data sheet will be revised to transmit information in a form useable by plant operators. Consistency of units of measure has been previously committed to as part of the Detailed Control Room Design Review. This effort will result in units of measure which are meaningful to both I&C personnel performing instrument calibration, and operations personnel interpreting the output.

6.4 Operations

The WESTEC review in this area concluded that, "A substantial review of plant operations associated with the AFW System revealed some minor inconsistencies which should be rectified. In general, however, the system is being operated satisfactorily and no major weaknesses were noted."

The minor inconsistencies mentioned are being addressed as noted in the individual observation responses contained in Attachment 3. No further actions of a generic nature are required.

6.5 Maintenance

The WESTEC team concluded that the maintenance program for MOVs is weak. Specifically, maintenance activities were noted to be corrective in nature as opposed to preventive. Further, weaknesses were noted in the control of MOV lubricants.

It should be noted that the WESTEC team conclusion was based on the observation of two MOVs (MCM-221, -231) that are located in one of the most severe normal operating environments in the plant. While the valve operator inspection reports indicated signs of grease distress, the valves tested successfully against their design differential pressures (with significant margin) using MOVATs. Currently, the Cook Nuclear Plant Preventive Maintenance Program for MOVs includes:

(1) A detailed inspection of the actuators including the main gear case lubricant, limit switch lubricant, electrical controls and contacts, and lubrication of the valve stem. This is performed each refueling outage on 20% of the MOVs in the Environmental Qualification Program.

(2) Every refueling cycle, the exposed stems of 33% of the safety-related MOVs are cleaned and lubricated.

A Motor-Operated Valve (MOV) Task Force was formed in June 1987 to assess and address the industry concerns regarding maintenance and testing of motor-operated valves. While the operating and maintenance history of our safety-related MOVs does not indicate that a significant problem exists, one of the objectives of the task force is to review the current preventive maintenance program and compare it with the manufacturer's recommendations and our operating experience. Additionally, the MOV Task Force is assessing the use of the MOVATs device as a predictive tool for maintenance.

Another issue identified was inadequate control of MOV lubricants. In response to Observation WL-2, we have committed to provide recommendations to the Plant Maintenance Department regarding the use of greases in safety-related motor-operated valve Limitorque operators. These recommendations will include identification of safety-related valve motor operators, lubrication requirements including identification of acceptable lubricants, and stipulation of inspection requirements. Vendor recommendations will be reviewed and factored into these recommendations as appropriate.

6.6 Surveillance and Testing

Several deficiencies were noted in the area of time response testing. Specifically, instances of incomplete testing were identified. In response, it should be noted that the time response test procedures/program were reviewed in late 1985 through 1986. The plant nevertheless is embarking on a more comprehensive revalidation of the program, possibly utilizing the services of a contractor. This review will further strengthen the surveillance testing programs.

6.7 Training

This section concluded that recent changes have enhanced the training program. We continue to consider training a key aspect to our operations and will strive to maintain our performance in this area.

Table 1

Cross Reference For Observation Numbers and the Report Paragraph

Report Paragraph	Issue	Observation Number(s)
6.1.B.I	Potential for Common Mode Failure of Safety-Related 250 VDC Circuit Breaker Distribution Panels	SFK-8 SFK-11
6.1.B.II	Lack of Motor Operated Valve Overload Protection	SFK-3 SFK-10
6.1.B.III	Inadequate Battery Capacity at Minimum Design Ambient Temperature	SFK-2
6.1.B.IV	Incorrect East Auxiliary Feedwater Pump Motor Voltage Rating	SFK-5
6.1.B.V	Insufficient Control of Motor Overload Relay Heater Coil Selection Data	SFK-3 SFK-10 SFK-13 SFK-14
6.1.B.VI	Discrepancy in Instantaneous Relay Setting for West Motor Driven Auxiliary Feedwater Pump Motor	SFK-1 SFK-12
6.2.B.I	Errors in Motor Operated Valve Design Bases Documentation	SMK-1 SMK-4 SMK-10
6.2.B.II	Inconsistent Piping Design Pressures	SMK-3
6.2.B.III	Lack of HVAC Design Basis Documentation	SMK-9
6.2.B.IV	Deficiencies in Various Design Analyses	SMK-5
6.3.B.I	Instrument Errors Not Considered in Setpoint Calculations	RBP-1
6.3.B.II	Inconsistent Units of Measure	MB-6

Report Paragraph	Issue	Observation Number(s)
6.3.B.III	Inconsistent Calibration Procedures	RB-4
6.3.B.IV	Failure to Meet FSAR Required Water Volume	RBP-2
6.3.B.V	Design Control Process Weakness	
6.4.B.I	Apparent Weaknesses in Detecting AFW Steam Binding	MB-1
6.4.B.II	..ous Procedural Inconsistencies	MB-4
6.5.B.I	..ck of Control of MOV Lubricants	WL-2 WL-3
6.5.B.II	Weaknesses in Control of Electrical Tape Splices	WL-4
6.5.B.III	Weaknesses in Control of MOV Torque Switch Settings	WL-5
6.5.B.IV	Non Performance of Vendor Recommended Maintenance	WL-7
6.5.B.V	Weaknesses in Installation Practices	WL-1
6.6.B.I	Response Time Testing Deficiencies	RB-1 RB-2 RB-3
6.6.B.II	Non Compliance with Technical Specifications Surveillance Requirements	RB-1 RB-2 RB-3 RB-4 RB-5
6.6.B.III	Special Test Instrumentation	RB-10
6.6.B.IV	Human Factors	RB-9
6.7.B.I	Excessive Reliance on "Skill of the Trade"	CW-1

Table 2

Observations for Which Problem Reports or LERs Were Generated

Observation Number	LER Number	Problem Report Number
SFK-2		87-705
SFK-4		87-709
SFK-5		87-716
SFK-8	50-315-87-20	87-660
SFK-11	50-315-87-20	87-660
SMK-1		87-714
SMK-4		87-714
SMK-10		87-707
RBP-1		87-715
RBP-2		87-706
WL-1		87-713
WL-2		87-710
WL-3		87-710
WL-4		87-708
WL-5		87-736
WL-8		87-672, 87-673
WL-10		87-734
RB-1	50-315-87-014	87-717
RB-2	50-315-87-014	87-717
RB-3	50-315-87-014	87-717
TDG-1		87-711
PM-1		87-712

Attachment 3

AEPSC Response to WESTEC SSFI Inspection Observations

Observation Number: SFK-1

Issues:

a) Motor rated at 4160V (rated 62a), Specification DCCEE-101-QCN requires 4000V motor, (rated 66a).

b) Design setpoint assumed nameplates were identical for all similar ESS motors. Setpoint calculation used 62a from East Motor Driven AFWP for the West MDAFP rated at 66a.

Evaluation: In general the impact on functionality of equipment is not viewed as being significant. In the specific, there is no significant safety impact due to margin in the relay setting even with assumed nameplate FLA of 62a. The relay was set using a 10 X FLA factor which contains sufficient margin to compensate for the 6% (66a/62a) difference in rated current full load amps (FLA).

Future Actions Required:

1) Revise Relay Setting Documentation such that actual nameplate data is used in the design for ESS setpoints, or at least used to verify setpoint. (Target Completion by EGS-N - 6/88)

2) Revise Site Receipt Inspection and/or Installation Checkout Procedure to ensure review of electrical nameplate data and transmittal to Columbus for relay design setpoints to be finalized. (Target Completion by Plant - 9/88)

Observation Number: SFK-2

Issues: a) Low temperatures in battery rooms. Capacity based on 70°F. HVAC design basis is 60°F. Actual experiences in 45°F range.

b) Actual worse-case load data should be used in capacity calculation to ascertain available margin and verify load surveillance testing.

Evaluation: The reference WESTEC SSFI inspection observation states that the 1-AB battery is undersized by 7% at the HVAC design ambient temperature of 60°F. This observation is technically correct for the battery at its end of design life condition. At present, the concern does not exist because of an additional 25% margin added to the battery capacity as the aging factor.

With this in mind, we believe that the batteries have sufficient capacity at 60°F for a good portion of the rated 20-year battery life. Since the D. C. Cook batteries were installed approximately two years ago, a considerable time (greater than several years) of battery service at 60°F is allowable. Also, it is our practice to change these batteries out well before the end of life, approximately at 10 years.

The above estimation is based on the battery design load which was calculated using the full-load nameplate data of the equipment connected to the battery. Additional temperature/life margin may be determined by further analyzing the actual worst-case battery load. We have committed to performing this analysis in response to an INPO audit involving a related issue, battery surveillance test requirements. When completed, the new battery load calculation will enable a more accurate determination of battery capacity, battery life and the minimum battery room ambient temperature. Any new requirements involving battery room ambient temperature will then be conveyed to HVAC.

Meanwhile, we have arranged with the plant to monitor all D. C. Cook battery room ambient temperatures (Unit 1 and 2, A, B and N-Trains) through the use of temperature data loggers. These data loggers, already in-service at the plant, will be relocated to all battery rooms. They can be used to provide daily high, low average ambient room temperatures whenever this information is required.

In summary, we believe there is no immediate or near term battery capacity concern with the present HVAC design battery room temperature of 60°F. A pending worst-case load analysis by EGS-N will show whether 60°F or a higher temperature is adequate for needed capacity of an aging battery. EGS-N will use this information to confirm that our practice of changing out station batteries at approximately 10 year intervals is conservative.

Future Actions <u>Required</u>:

1) Revise battery capacity calcs. to establish worst-case loading so that actual margin available can be determined. Investigate temperature and aging long term effects on battery. (Target Completion by EGS-N with Plant support - 9/88)

2) Monitor Battery Room temperatures (Target Completion by Plant - Winter Months)

Observation Number: SFK-3

Issues:

a) DCCEE-182-QCN (Associated with RFC-2222) requested vendor to supply heaters sized at 200% x FLA. Vendor supplied 200% x (FLA x 1.25) due to heater look-up tables.

b) According to WESTEC, the heaters selected for the actuators in this RFC could cause motor damage without total failure until needed under emergency conditions.

c) The 200% heater overload setting criteria protects bus only against locked-up motors. This setting will not protect motors from damage caused by long-term overload conditions.

Evaluation: The 200% overload setpoint is an arbitrary setting that, within moderate percentage range, has no technical significance. This was an NRC mandated Unit 2 license condition. The design intent was to protect the bus from locked actuator motors and to raise the overload setting above any possible spurious tripping. (See RG 1.106)

Future Actions Required: No Future Action Required.

Observation Number: SFK-4

Issue: Tech. Spec. 4.8.3.2.d table for surveillance load test omits Diesel Inverter load.

Evaluation: Diesel Inverter is included as a control load under the T/S Table 4.8 - 1A heading of "All Control Circuits." We feel this observation is invalid.

Future Actions Required: No Future Actions Required.

Observation Number: SFK-5

Issues: a) Nameplate on Unit 1 and 2 East MDAFP is 4160V, spec. DCCEE-101-QCN required 4kV rating.

b) D. C. Cook Voltage Study requires above 90% voltage on bus at 4kV base. The 1E MDAFP motors are at 88.7% with incorrect voltage ratings.

Evaluation: As noted in the observation, the motor terminal voltage may drop to 88.7% of rated voltage under a worst-case loading condition. With the motor operating at rated load and 88.7% of rated voltage, an increase in line current of approximately 14% would be expected. Increased current will result in additional losses and a higher operating temperature compared to full voltage operation.

The specific pump load curves were reviewed. Based upon the curves, the design BHP is slightly less than 450HP, which means that these motors operate at less than 90% of rating. At 450HP and 88.7% voltage, the calculated line current is 64.2 amps, which is only 2.6% higher than the machine's rated current. it is expected that the marginal increase in stator I^2R, rotor I^2R and stray load losses will be offset by a reduction in core loss at the reduced voltage. Therefore, the temperature rise of these motors at reduced voltage (88.7%) and reduced load (90%) will essentially be the same as the temperature rise corresponding to full load, full voltage operation. Since the machines will operate at their "normal" temperatures, no accelerated degradation is expected.

Future Actions Required: No Future Actions Required.

Observation Number: SFK-6

Issue: There are no Low Temp. Alarms in Battery Rooms. RFC-01-2764 design packet stated that low temp. alarms for the battery rooms would be provided in RFC-12-2788.

Evaluation: This issue has no direct impact on battery functionality. Since proper HVAC and room temperature monitoring will address this issue, no temperature alarms are necessary.

Future Actions Required:

1) Address this discrepancy in RFC 01-2764 with memo to RFC file. (Target Completion by EGS-N - 1/88)

2) Implement battery room temperature monitoring this winter. (Target Completion by Plant - Winter Months)

Observation Number: SFK-7

Issue: Technical Errors in Safety Review Memorandum RFC DC-12-2934

Evaluation: The safety review for the RFC has been reviewed by another engineer. It has been determined that the wording in the safety review does not accurately reflect the existing design. However, this did not alter the conclusion that no unreviewed safety question existed. Only a portion of the motor-operated valves in the D. C. Cook Plant had functioning open torque switches (those purchased from Westinghouse). The remainder of the valves did not have functioning open torque switches. Thus, deactivating the open torque switch on the Westinghouse supplied motor operators was consistent with the plant design. Furthermore, the NRC was informed by our letter of October 10, 1986 (AEP:NRC:0966B) that we were removing the open torque switches.

Future Actions Required: No further action is required.

Observation Number: SFK-8

Issues: a) Fault current interrupting capability for 250VDC circuit breakers not established. Failure to interrupt DC system faults cou'd cause upstream fuse to blow and isolate panel.

b) No short-circuit calculations were performed after installation of larger replacement batteries in RFC-2764.

Evaluation: We did not have an adequate fault calculation and 250VDC coordination studied at the time of the RFC-2764 review process.

We consider issue a) to be significant. Since the audits, design changes RFC-01-4087 and RFC-02-2981 have been installed at the plant prior to unit start-ups to eliminate the common mode problem of losing both trains of 250VDC control power at the panels of concern. We consider issue b) to be of minor significance.

Future Actions Required:

1. Replace breaker panels with fuse panels or modify breaker panels to limit fault current. Possibly test breakers to ascertain their interrupting capability. RFC-12-2980 was initiated to cover this work. (Target Completion by EGS-N - Scope RFC work by 6/88)

2. Perform battery short circuit calculations. (Target Completion by EGS-N - 6/88)

3. Perform 250VDC coordination study. (Target Completion by EGS-N - 6/88)

Observation Number: SFK-9

Issue: Failure to evaluate the consequences of a partial implementation of design change to ensure successful starting of ESS motors.

Evaluation: The temporary fix suggested in the August 30, 1985 letter (paralleling of 12 AWG wires if time did not permit installation of parallel 10 AWG wires) was judged to improve the situation that generated RFCs 01-2213 and 12-2962.

This temporary fix was not implemented. Thus, no safety review was required. Surveillance testing of the motors provided assurance that they would start if required to do so.

Procedures are in place which require a safety review of temporary modifications.

Future Actions Required: None required.

Observation Number: SFK-10

Issues: No supporting technical documentation for 200% overload setting for MOV's could be found during SSFI audit.

Evaluation: This is an NRC mandated change. This change is documented under RFC-12-2180.

Future Actions Required: No Future Actions Required.

Observation Number SFK-11

Issues: Evaluation and Future Actions Required are the same as SFK-8.

Observation Number: SFK-12

Issue: Lack of documentation on PJC setting of safety related breaker T11A2.

Evaluation: There is no direct impact on plant safety. The relay was within RFC DC-12-2862 guidelines. However, the relay setpoint is safety related and any change in a setpoint needs to be appproved by AEPSC engineers and recorded in the relay setting book. No evidence of approval could be found for the change in setting from 23 amperes to 27 amperes which was observed on 7/11/87.

The I&C Section does not change relay settings without approval or direction from AEPSC Engineering. Although the cause of the discrepancy cannot be identified, this is considered to be an isolated incident.

Future Actions Required: None required.

Observation Number: SFK-13

Issues: Overload heater manufacturer revised heater selection tables. A small difference may exist between the new and old tables.

Evaluation: The difference in overload relay heater coil selection data was noted by WESTEC during the implementation of RFC-12-2903. The table originally used to select the overload heater coils was Table ST-1 from the Cutler-Hammer Industrial Control Catalog, 86-87 edition. A slightly more accurate selection table 15412 Rev. B was obtained from Cutler-Hammer when an uncertainty of the accuracy of table ST-1 was raised.

Table 15412 was used in the final selection of overload heater coils for RFC-12-2903.

The difference between the two tables is due to a difference in how the heater coils are grouped for their NEMA size starter application. Table ST-1 provides one general range for NEMA size 00-0-1-1 1/2 applications. Table 15412 gives one specific range for a NEMA size 1 application which was required for RFC-12-2903.

The actual percentage difference between the general range (Table ST-1) and the specific range (Table 15412) for the NEMA size 1 heater coil selection in RFC-12-2903 is 3% at the high end and 3.4% at the low end of the range.

Using either overload heater coil selection tables, the same heater coil unit would have been chosen for RFC-12-2903.

The SSFI observation SFK-13 compares the new overload heater coil selection tables referenced above to an old selection table LA1113 used in RFC-12-2180. Table LA1113 was not used for RFC-12-2903. However, if a heater coil selection was made from the old table LA113, it would have given us a heater coil unit that is one range higher in size than the actual selection made for RFC-12-2903. This would have provided an overload heater set with an approximate 12% higher pick-up current. The higher unit size would not have been significant due to the conservative direction of the selection.

In summary, a comparison of all three heater coil selection tables referenced above does not indicate a significant difference in actual selected unit size. An incorrect selection of one unit size in either direction would provide a coil that differs by approximately ± 12% in overload pick-up current. This percentage error is considered to not be significant for valve actuator motor protection due to the intentional margin in our overload coil selection criteria of 200% of motor full load amperes.

Therefore, contrary to the WESTEC conclusion in SFK-13, we do not believe that, "Fan and pump motor protection should be reviewed to ensure that adequate overloads were provided in accordance with the applicable manufactures heater selection criteria."

Future selections of overload heater coils using the most accurate and updated manufacturer selected tables and criteria is assured by our design verification procedures and our Vendor Information Control System.

Future Actions <u>Required</u>: No Future Actions Required.

Observation Number: SFK-14

Issues: Limitorque sends out Certified Data Sheet with HP and FLA information with which we set overload heaters. Actual nameplates may differ - evidently Certified Data Sheet is only an estimate of design parameters. Overload heater selection is therefore incorrect.

Evaluation: This problem was noted during the implementation of RFC-12-2903 and was corrected before the replacement valve actuators were put into service.

Future Actions Required: See SFK-1 Future Actions Required items 1 and 2 which are applicable to SFK-14.

Observation Number: SMK-1

Issue: Incorrect evaluation of maximum differential pressure across auxiliary feedwater flow retention valves.

Evaluation: We agree that the maximum theoretical differential pressure across the subject valves is higher than that stated in our response to I.E. Bulletin 85-03. However, we disagree that the theoretical maximum differential pressure should be used as the maximum operating differential pressure of the valves for reasons explained below.

The maximum operating differential pressures of the subject valves, as documented in our response to I.E. Bulletin 85-03 (Reference 1), are as follows:

	Open	Close
FMO-211,221,231,241	1240 psid	1365 psid
FMO-212,222,232,242	1430 psid	1335 psid

The above differential pressure values were based on a calculation, which analyzed the accident condition of isolating a depressurized steam generator while supplying AFW to the other steam generators. During this accident scenario, the AFW source would be the condensate storage tank (CST).

WESTEC's observation stated that the essential service water system should be assumed as the source of AFW which would add 120* psia to the above differential pressure values resulting in a maximum differential pressure of 1535 psid. We disagree with that assumption. During the time the valves would be closed to isolate a faulted steam generator, the AFW source would be the CST. Such action would occur very soon following a line break accident.

*WESTEC incorrectly used 120 psia as psi. Maximum essential service water pressure is 105 psig.

Evaluation: (cont'd)

WESTEC states that the essential service water system is the alternate source of AFW if the condensate storage tanks are not available. While this is a true statement, the CST is normally in service with AFW pump suction aligned to it. ESW is used only after the water inventory in the CST is depleted. Since isolation of the faulted steam generator would be performed within minutes (not hours) of a line break accident, the AFW source will be from the CST, as sufficient water inventory would be available at that time. Postulating an event which would result in simultaneous and instantaneous loss of CST inventory with a line break accident is not credible. Therefore, it must be concluded that the suction source to the AFW pumps will be the CST when the valves are required to close to isolate a depressurized steam generator.

Moreover, before the source of AFW can be switched to ESW from CST, the AFP is shut down while several manual valves are realigned per plant procedure 1-OHP-4022.055.003. During this pump shutdown period, the subject FMO valves could be closed against essentially zero differential pressure, if required.

In summary, we conclude that the maximum differential pressure values given in Reference 1 for FMO valves are correct as they are the maximum differential pressures that the valves will have to close against. While 1535 psid is a theoretical maximum differential pressure, we can postulate no credible set of accident conditions where the valves would have to close against that differential pressure.

Additional engineering review, reference 2, of the maximum operating differential pressure of the subject valves concluded that a differential pressure of 1430 psid is correct. The subject Unit 1 valves were replaced during the 1987 refueling outage, and the new valves are designed for a differential pressure 1550 psid, and there is no problem with respect to Unit 1 valve operability.

The existing Unit 2 valves, which will also be replaced during the 1988 outage, have been stroked against differential pressures as high as 1430 psid, which we contend is the maximum operating differential pressure the valves will have to stroke against.

The auditor reviewed additional information which was given to WESTEC during the post inspection period and WESTEC generated the following additional observations:

Evaluation: (cont'd)

"The team is concerned that the inability of the FMO to open against the depressurized steam generator in an accident which might occur during surveillance testing may impose additional unnecessary burdens on the operator at this time. In addition to identifying the faulted steam generator, the operator would be required to conclude that the reason for one FMO not opening is that it is in the feedline to a depressurized steam generator. The team is concerned that this may cause further distraction to the operator. The team concludes that a system design which defeats the safety function of critical motor operated valve during a postulated accident scenario is not sound."

COMMENT: We do not understand WESTEC's logic for opening an FMO valve to a depressurized steam generator. The plant procedures all require verification of AFW flows and detail actions which must be taken to insure that AFW is supplied to the steam generators. Additionally, listed in procedure 01-OHP-4023.E-2, Faulted Steam Generator Isolation, the steam generator is isolated by closing the valve in step 4 "close AFW isolation valves as necessary," not by opening the valves.

It also appears that the auditor has misinterpreted the safety function of the FMO valves. The safety function of the FMO valves is to prevent pump runout operation while providing sufficient water to the intact steam generators. Pump runout protection can be accomplished by the valve traveling to some intermediate position or to the closed position.

Based on the above, WESTEC Finding SMK-1 does not have adverse safety significance.

Future Actions Required: The final report on I.E. Bulletin 85-03 will note that the theoretical maximum differential pressure is 1535 psid and that the new valves are capable of operating against a differential pressure of 1550 psid. This report is scheduled to be submitted to the NRC six months following the completion of the 1988 Unit 2 refueling outage.

References:

1. AEP:NRC:0966 dated May 16, 1986, response to I.E. Bulletin No. 85-03.
2. Letter from A. Felitiano to J. D. Hoffman, subject: Maximum Valve Differential Pressure for FMO-211, -212, etc., dated September 25, 1987.
3. HXP 860522AF.
4. HXP 870902AF.

Observation Number: SMK-2

Issue: No design calculations to substantiate the size of the AFW suction line pressure relief valves which were added as part of a modification to the plant design.

Evaluation: The AFW system was modified by RFC-12-2540 to add valves SV-169E and -169W to the MDAFW pump suction line. Also, included in this modification packet was the replacement of the piston check valves FW-153 and -160 in the motor driven auxiliary feedwater (MDAFW) pump emergency leak off lines with swing check valves.

The function of the valves SV-169E and -169W is to preclude a minor amount of backleakage from the downstream AFW system check valves from overpressurizing the AFW suction piping or strainer. Valves SV-169E and 169W are used as sentinel valves and not safety relief valves. They are not intended to protect the individual MDAFW pump suction line from a catastrophic check valve failure.

Design calculations and valve specification sheets have been completed for these valves. These documents show that the valves will perform their function of protecting the MDAFW pump suction strainers from overpressure. The calculation and specification sheet for SV-169E and SV-169W have been included in the RFC package.

Based on the above, the fact that there were no calculations to substantiate the size of the AFW suction relief valves does not have an adverse impact on safety.

Future Actions Required: No further action required.

References:

1. Letter from A. Feliciano to A. J. Lewandowski dated September 10, 1987.

2. Safety valve design calculations dated September 25, 1987.

Observation Number: SMK-3

Iss : Incorrect and inconsistent design pressures in AEPSC pipe material Specification DCCPV104QCS.

Evaluation: WESTEC was unable to identify what conditions the plant design reflected as related to pipe design. In addition, there was no documentation to substantiate whether appropriate piping wall thicknesses had been calculated for the AFW system suction line (or other) piping. WESTEC was concerned that system design pressures could be exceeded during instances when check valves leaked or other situations in which maximum system pressures had not been properly evaluated, thereby, compromising the integrity of the AFW system.

The maximum possible pressure and temperature (upset conditions) that the pump suction pipe will be exposed to is not listed in AEPSC Specification DCCPV104QCS. The boundaries as described in AEPSC Specification DCCPV104QCS can be confusing.

Calculations were performed to ensure that the wall thicknesses of the pipe installed in the AFW system meets the code, USAS B.31.1.0, 1967 edition, required minimum wall thickness. The maximum design pressures and temperatures used in calculating the pipe wall thicknesses were supplied by the system's cognizant engineering section. The results of the calculations showed that the pipe installed on the AFW system met the code requirements for wall thickness. Also, the fittings and valves in the AFW system were reviewed and verified to meet the code, ANSI B16.5 and ANSI B16.34 respectively, requirements for the maximum pressures and temperatures that they will be subjected to.

Based on the above, WESTEC Finding SMK-3 does not have adverse safety significance.

Future Actions Required: AEPSC Piping Material Specification will be revised to resolve the pressure and temperature discrepancies and clarify system boundaries. This will require the system engineers to reevaluate the systems pressures, temperatures, and boundaries with the PH&F Section. A new format of the specification suitable to todays needs has been developed. Expected completion for safety-related systems - December 1988, for BOP systems - December 1989.

References:

1. Letter from A. Feliciano to A. J. Lewandowski dated September 10, 1987
2. Letter from A. Feliciano to A. J. Lewandowski dated September 11, 1987.
3. Wall thickness calculations dated August 27, 1987.

Observation Number: SMK-4

Issue: Worst case maximum differential pressure not identified for MOVs MCM-221 and 231.

Evaluation: We agree that the maximum theoretical differential pressure across the subject valves is higher than that stated in our response to I.E. Bulletin 85-03; however, we disagree with the statement that the valves must close against the maximum pressure in the steam generator of 1097 psig. Our reasoning for selecting 600 psi as the maximum differential pressure is detailed below.

The two valves are 4" motor-operated globe valves in 4" lines from main steam leads 2 and 3 to the auxiliary feedpump turbine (A.F.P.T.). They are normally open. These valves are opened after they are closed for in-service testing. Since there is no flow during IST, there is no differential pressure across the valve.

Three cases can be discussed wherein the valves may need to be closed.

Case 1: Steam Generator Tube Leak

For this case, the purpose of closing the valve(s) is to contain potentially radioactive steam from getting to the A.F.P.T. In this case, the differential pressure across the valve is zero since the line is bottled up by the A.F.P.T. trip and throttle valve. If the A.F.P.T. is operating, the differential pressure across the valve would be approximately 0.6 psi at the design maximum steam flow to the A.F.P.T. The valve differential pressure will not increase during closing because the downstream pressure is maintained from the steam supply from the other steam lead.

Case 2: 30" Steam Line Break

A break in a 30" main steam line is one case where MCM-221, 231 would be closed. In this case, the valve in the 4" line connected to the broken steam lead would be closed. The differential pressure across the valve at that time would be nearly zero since the main steam line is blowing to atmospheric pressure and the steam pressure will decay very rapidly with a 30" line break. The pressure on the (normal) downstream side of the MCM valve will be equal to that on the upstream side (near zero) since a downstream check valve (MS-108) prevents backflow of steam from the other 4" line. The purpose of closing the MCM valve is to stop any small leakage that might occur across the check valve. Assuming the

Evaluation: (cont'd)

maximum permissible leakage rate specified in ASME Section XI (120 ml/hr water), no significant valve differential pressure would exist. The differential pressure across the MCM valve in the 30" steam line break case is zero.

Case 3: 4" Steam Line Break

If a 4" steam line upstream of an MCM-221, 231 breaks, closing the valve will serve the same purpose as in Case 2, and valve differential pressure will be near zero.

If a 4" line breaks downstream of an MCM valve, the valve would be closed to stop the steam leak. Should the break occur at power when the nominal steam line pressure is 713 psig (770 psig Unit 2), the pressure would drop rapidly, and the steam generator low pressure steam line isolation signal would activate at 600 psig. After determining the problem, the operator would close the appropriate MCM valve. Maximum differential pressure is 600 psi in this case. Alternatively, if the unit is in hot shutdown and the steam generator pressure is over 1000 psig, a break in the 4" steam line downstream of the MCM valve would also result in a rapid decrease in steam generator pressure since comparatively little thermal energy is going into the steam generator. Again, the low pressure steam line isolation signal (at 600 psig) would activate and the operator would close the appropriate MCM valve. In either case, the maximum differential pressure the valve would have to close against is 600 psi.

The capability of these valves to close against 1097 psig has been demonstrated by MOVATS testing and analysis. The maximum stem thrust measured during closing against 765 psig was 5200#. It is estimated that at 1097 psig the required thrust would be 7,456#. Since the operator thrust capability is above 10,500#, it can be concluded that the operator thrust capability is well in excess of that required to close the valve against 1097 psig. A subsequent test was performed on MCM-221 at a differential pressure of 975 psi and the valve successfully stroked in both directions.

Based on the above, WESTEC finding SMK-4 has no adverse safety significance. None of the postulated scenarios require MCM-221, 231 to operate against greater than the specified 600 psid. Further, it has been demonstrated that the capability of the installation far exceeds the design and can function at the hypothetical condition postulated by WESTEC.

Evaluation: (cont'd)

Future Actions Required:

1. MOVATS test the Unit 2 valves during the 1988 refueling outage at differential pressure to demonstrate the capability to close against 1097 psig. Action by Plant Maintenance.

2. Indicate in the final report for I.E. Bulletin 85-03 that the valves are capable of closing against 1097 psig. The final report is scheduled to be submitted to the NRC six months after the 1988 Unit 2 refueling outage.

Observation Number - SMK-5

Issue: Various deficiencies in the design analyses and design input for calculations related to the AFW system and attendant equipment.

Evaluation: The inspection team noted various problems with the Auxilary Feedwater System calculations and the traceability of their inputs. The maximum differential pressure for FMO valves, referenced in calculation HXP860522, has been calculated again. The new calculation was performed in accordance with the MED Calculation Procedure (MED 8) and did not use the inputs from the existing calculation.

The inspection team also reviewed a preliminary, unchecked and unapproved calculation which was being performed to verify the adequacy of installed Auxiliary Feedwater Pump Room cooling equipment. The inspection team identified some unsubstantiated input data and assumptions. The calculation has since been issued in accordance with MED 8. All inputs to the calculation were verified with the exception of the temperature of the air entering the AFW pump room from the Turbine Room. Based on recorded operational data, the temperature of the air entering from the AFW pump rooms from the Turbine Room was conservatively assumed to be 110°F. This temperature is significantly higher than the maximum outdoor design temperature of 91°F and sufficiently high enough to yield conservative results in the calculation.

There is no safety significance to these findings because the 48 hour endurance test conducted on the AFW system demonstrated functionability of the system components and the new calculation results determined that the FMO valves are capable of handling the maximum operational differential pressure. Additionally, EGS-N has reviewed the maximum calculated ambient temperature in the pump rooms and determined that the pump motor can tolerate the maximum temperature for the period required.

Future Action Required: 1. The remaining referenced calculation HXP841005AF, Rev. 1, dated 10/5/84 and HXP841026AF1, dated 10/26/87 will be reviewed by December 31, 1987.

References: Letter of September 8, 1987 from A. Feliciano to D. F. Powell.

Observation Number - SMK-6, Rev. 2, Dated 8/12/87

Issue: Motor-Operated Valve (MOV) Backseat Capability Not Considered in Safety Review of RFC-2934. The basic problem areas are:

1. Basic design philosophy regarding the use of backseats and open torque switches to preclude steam leakage during operation.

2. Safety Review Checklist for the ALARA checklist did not address that the piping systems involved in the change were systems that contained radioactive fluids. The safety review memo contained erroneous information.

Evaluation: The AEP philosophy on the use of backseats and open torque switches is in complete disagreement with the WESTEC philosophy. The reliance on valve packing rather than backseat to prevent excessive leakage is consistent with the AEPSC design philosophy. Valve packing failure is typically a gradual process. Inspection tours as well as leakage detection and monitoring systems provide an early means to detect packing leaks. The valve backseat can then be used to isolate the packing rings to allow on-line refurbishment of the upper packing rings. The use of open limit switches and not the open torque switches in MOV's is based on the premise that the benefit of ensuring reliable valve opening far outweighs the slight risk of damaging the operator should the valve "hang up" or the open limit switch fail during opening.

During the inspection, the WESTEC inspection team was advised of our philosophy regarding the use of backseats and open torque switches. They chose not to agree with our engineering experiences and issued the findings based on their engineering judgement.

The determination of the "wide open" position of MOV's using only limit switch settings is controlled by maintenance Procedure No. 12MHP5021.001.037. The procedure includes steps to ensure the valve is not driven into the backseat by the operator. This is consistent with the AEP system philosophy of not backseating valves using the motor operator. Valves in extremely harsh services that are open and remain open during power operation can be backseated manually.

For those safety related valves that are being tested in the MOVATs program, measurements are included to define how close the valve is to the backseat. This is considered relatively insignificant since the open limit switch setting is nominally 5% and maximum 10% from the point of contact with the backseat. Refer to our response to WESTEC Finding WL-10 for more information on thrust measurements from MOVAT'S testing.

Evaluation: (cont'd)

The differences in design philosophy have no safety significance. As stated above, valve packing failure is typically a gradual process. Inspection tours and leak detection and monitoring systems are in place to detect leakage. If a valve's safety function is to close, backseating has no significance in facilitating the safety function. If the valve's safety function is to open, the only function backseating can serve is to preclude insignificant loss of fluid from the system through packing leakage. EGS-N disagrees with WESTEC's interpretation of the ALARA checklist. The lead engineer states that the responses to the checklist accurately reflect the intent of the checklist; i.e., to help keep the exposure levels for plant personnel 'As Low As Reasonably Achieveable.'

A new safety review for RFC 2934 has been conducted. This review included a new checklist and concluded that neither the omissions in the original checklist nor the erroneous statement regarding the motor protection affected the conclusion of the original safety review.

There is no adverse safety significance to WESTEC Finding SMK-6 based on the results of the above evaluation.

Additional Actions Required: No further actions required.

References:

1) B. D. McLean memo to R. C. Carruth/D. G. Rogers dated October 16, 1987.

2) D. G. Rogers memo to R. A. Kadlec dated October 8, 1987.

Observation Number - SMK-7

Issue: Incorrect valve specification sheet.

Evaluation: We agree that maximum theoretical differential pressure across the auxiliary feedwater flow retention valves is higher than that stated in the original valve specification sheets and was, in fact, the value that the manufacturer provided.

Response to WESTEC inspection observation SMK-1 (Incorrect evaluation of maximum differential pressure across auxiliary feedwater flow retention valves) explains the system operating and emergency conditions under which these valves are required to open or close. It also documents that the existing Unit 2 valves (original purchase) are capable of opening or closing under the required system conditions.

Existing valve specification data sheet (generic) for motor-operated, air-operated, manual, and safety valves have been reviewed using industry standard ISA-520-1981 (Instrument Society of America) and discussions with selected valve manufacturers. These data sheets are being revised for clarification and to provide all necessary design and operating data needed for future valve procurement.

There is no adverse safety significance to this finding because the manufacturer supplied a valve that is capable of closing against the maximum theoretical differential pressure.

Future Action Required: Include the revised specification sheet for procurement of new control valves in AEPSC specifications. Action by PH&F to be completed by 12/31/87.

Observation Number - SMK-9

Issue: No design basis documentation for HVAC design

Evaluation: By today's standards, this observation is valid. There are no system descriptions or flow diagrams for the AFW Pump Rooms ventilation systems and calculations are inadequate for today's standards or non-existent. The HVAC for the AFW system was designed in two stages, the original design and via RFC 2186 (the addition of the MDAFP in each unit). While the HVAC engineers did not fully document how their decisions were made, the final design is documented via the purchase orders, vendor drawings, and HVAC system drawings.

During the inspection, the WESTEC team was advised that this situation was already identified and actions are being taken to rectify the situation. Sketches depicting a flow diagram for the ventilation systems in the AFW Pump Rooms have been developed and transmitted to the Design Division for drawing development. In addition, flow diagrams and system descriptions are presently being developed for other safety-related HVAC systems which do not already have them.

A calculation has been performed to verify the adequacy of the AFW ventilation systems. Maximum ambient temperature in the AFW Rooms was determined and has been reviewed by the system engineer (EGS-N). This review concluded that the installed electrical equipment can tolerate this temperature.

Future Action Required:

1. The Design Division will issue a flow diagram depicting ventilation systems in the AFW Pump Rooms by December 31, 1987.

2. The PH&F Section will develop and issue a system description describing the ventilation systems in the AFW Pump Rooms by March 1, 1988.

3. The PH&F Section will finish developing sketches depicting a flow diagram for the Electrical Switchgear Area by November 1, 1987. The Design Division will issue a flow diagram depicting the Electrical Switchgear Area by March 1, 1988.

4. The PH&F Section will issue a system description describing the Electrical Switchgear Area ventilation system by December 1, 1987.

5. The PH&F Section will review the adequacy of calculations for other safety-related HVAC systems and upgrade or develop new calculations. Ongoing effort performed in conjunction with system modifications.

Observation Number: SMK-10

Issue: Inadequate design differential pressure for IMO-390

Evaluation: We agree with the observation that IMO-390, under certain conditions, can have a higher differential pressure than it has been designed to meet. However, these conditions do not occur when valve operation is required for safety related actions.

Valve IMO-390 is a motor-operated gate valve located in the suction line of RHR pumps from the RWST. During normal unit operation (reactor at normal operating temperature and pressure), the RHR system is not in service, but is aligned for operational readiness as part of the Emergency Core Cooling System. During the cool down phase when reactor coolant temperature and pressure are reduced to approximately 350°F and 410 psig, approximately four hours after reactor shutdown, IMO-390 is closed prior to placing the RHR system in operation (i.e., valves ICM-129 and IMO-128 are opened). Similarly, during unit startup (heat up), when the reactor coolant system has been completely filled, vented, and pressurized to approximately 375 psig, valves IMO-128 and ICM-129 are closed, the Reactor Coolant pumps are placed in service and the RHR system is removed from service. After depressurizing the RHR system, IMO-390 is opened to align the RWST as a water source. IMO-390 is provided with redundant control power lockout switches and administratively controlled to prevent inadvertent closing of the valve.

In analyses for a Mode 4 LOCA during cooldown and heatup, the system pressure is typically about half that considered in the full power analysis, decay heat production in the core, and primary system stored energy is also substantially reduced, reducing the potential for consequences of the event in this mode. In the unlikely event of a LOCA during a cooldown, the RCS pressure (and the pressure downstream of IMO-390) would decay rapidly to containment pressure. The equalizing line (connecting space between the valve discs to a point downstream of the valve) would then allow pressure between the discs to decay. Since the pressure during such event would be significantly lower than the valve's design differential pressure (350 psi between the discs), valve operation would not be impaired.

Evaluation: (cont'd)

Check valve SI-150, installed in the equalizing line of IMO-390, prevents the backflow from the downstream connection to the valve discs. There have been several instances documenting the inability of valve IMO-390 to open due to leak-by of check valve SI-150 including those referenced in the WESTEC Finding. This situation was previously resolved when plant operating procedures 1 and 2-OHP-4021-017-003 were revised to incorporate a step for relieving pressure prior to opening IMO-390 during heat up prior to return of unit to service. Due to this change, even if SI-150 leaks by, system operation would not be jeopardized. The only consequence from adding a step to relieve pressure prior to opening IMO-390 is a slight delay in aligning the RHR system for unit power operation.

Based on the above, it can be concluded that valve is capable of opening when required and the low head injection capability under the condition described above would not be jeopardized. Therefore, there is no adverse safety significance regarding WESTEC Finding SMK-10.

Future Actions Required: Actions taken to date have resolved this issue.

Observation Number: TDG-1

Issue: Suction side of AFW pumps can be overpressurized through the 3" test line, if a single check valve leaks or sticks open.

Evaluation: We disagree that the suction side of the AFW pumps can be overpressurized through the 3" test line. Two of the three air operated test valves installed in the test line are of the balanced trim design. This design allows the pressure above the disc to be equal to the pressure (backpressure) below the disc. The balance trim design provides a downward closing force slightly greater than the upward opening force in all pressure ranges. This is due to the valve's internal configuration which has the area above the disc being greater than the area below the disc. Based on this design, the spring closing force is always available to keep the valve closed against reverse flow.

The other air operated test valve is of the unbalanced trim design. However, this valve's actuator spring can be adjusted to aid in overcoming the upward acting force. This valve's actuator spring was adjusted. The adjustment along with the packing friction force exerts enough downward force to overcome the upward force.

The application of the balanced trim design and spring adjustments precludes system backpressure from affecting valve closure.

WESTEC further postulated that with the ELO valve closed, it would be possible to overpressurize the suction piping. We disagree with the assumption that the ELO valve is closed. A closed ELO valve on an idle pump would have to be due to operator error. The closing of an idle pump's ELO valve is a violation of the plant's operating procedures. The ELO valve is a fail-open, air-operated valve which opens (or closes) automatically when the flow rate to the steam generators or through the test line is below (or above) the required minimum set point for the pump.

The pump test procedure requires verification, before the pump is started, that the ELO valve is in the open and automatic position. Upon completion of the pump test, when the pump is being secured, the ELO valve opens and remains open after the pump is removed from service.

Observation Number: TDG-1

Evaluation Continued:

The potential for overpressurizing the MDAFP suction line from backpressure through the ELO line has been addressed in the response to SMK-2. This review concludes that the MDAFP suction safety valves will perform their safety function of protecting the MDAFP suction line.

The ANSI B31.1 requirements of designing to the maximum sustained fluid pressures and installing an adequate suction safety valve were reviewed. This review concluded that the AFW piping was designed in accordance with ANSI B31.1 requirements and that the piping stresses induced by overpressurization are within the maximum allowable by the code. However, the MDAFP suction strainers are not capable of withstanding the overpressurization. Therefore, in order to protect this equipment, suction safety valves have been installed.

Based on the above, there is no safety significance since the suction side can not be pressurized through the test line.

Future Actions Required: There are no future actions required since the design of the test valve or actuator spring setting precludes the valve from opening on backpressure. Additionally, the plant operating procedures correctly address the position of the ELO valve.

References:

1) Record of telephone conversation dated August 17, 1987. PH&F File No. 4.6.3.13.43
2) Response to Problem Report No. PR-87-711 approved on 9/11/87. HE&P File No.
3) Surveillance test procedure:
   1-OHP.4030.STD.017TV
   1-OHP.4030.STD.017W
   1-OHP.4030.STD.017E
4) PH&F calculation DCCPV01AF01-N dated 8/27/87

Observation Number: TDG-2

Issue: The design pressure of the discharge side piping of the turbine driven auxiliary feedwater (TDAFW) pump does not consider the overspeed condition of the turbine. Also, the design pressure of the emergency leak off lines is less than the normal system working pressure.

Evaluation: The pipe material specification for the TDAFW pump discharge piping (pipe class L-14) indicates that the design pressure for the TDAFW pump discharge piping is 1635 psig at 102°F. The subject specification also indicates that the leak off lines from the AFW pumps (TDAFW and MDAFW) to the condensate storage tank have a design pressure of 1,000 psig. WESTEC indicates two problems:

1. At the highest possible turbine overspeed trip point (112%), maximum pump discharge pressure exceeds 2,100 psig.

2. With the leak off line isolation valve shut (e.g., FW-126 or FW-127), the leak off line is exposed to full pump head which exceeds 1,000 psig.

We agree with WESTEC's Finding. However, the temperatures and pressures listed in the AEPSC pipe material specification for the various piping systems indicate the maximum pressures and temperatures under normal operating conditions. These include pressures and temperatures expected without equipment or component malfunction. For example, the maximum pressures are determined by stacking maximum discharge pressure of the various pumps that feed the line. These values are included in stress analyses. For stress analyses of the piping systems under normal operating conditions (i.e. without failure of the Auxiliary Feedwater Turbine speed control), the temperature and pressure values should be 1666 psig and 120°F, respectively. ANSI B31.1 permits allowance for variation from normal operation and recognizes that variations in pressure and temperature occur. The maximum temperature and pressure that the discharge pipe could potentially be exposed to is 1666 psig, 120°F.

Calculations were performed to ensure that the wall thickness of the pipe, valves, and fittings installed meet the applicable codes at the pressure of 2100 psig. The results of the calculations indicated that the piping, valves, and fittings installed in the discharge of the TDAFW pump, including the ELO line, meet the code requirements.

Evaluation: (cont'd)

Specification DCCPV104QCS has been revised to correct the listing of pressure and temperature for the TDAFW pump discharge piping and Emergency Leak Off (ELO) lines to 1666 psig and 120°F.

Based on the above evaluations, WESTEC finding TDG-2 has no adverse safety significance. The piping, as specified, is in compliance with ANSI B31.1, for the normal and maximum pressure-temperature condition which could obtain. In addition, it also meets code requirements for the pressure-temperature condition postulated by WESTEC.

Future Actions Required: No further action required.

References:

1. SSFI Response to Observation Number SMK-3, dated September 25, 1987.
2. DCCPV01AF02-N.
3. HXP870902 and HXP871008.
4. USAS B.31.1.0, 1967 edition; ANSI B16.34 and ANSI B16.5

Observation Number: TDG-3

Issue: The basis for the minimum water inventory needed to sustain 9 hours in hot standby has not been provided. Further, once CST low level is reached, there are no design or operational provisions to prevent drawing down the reserved 175,000 gal. by non-AFW users (e.g. hot well make-up, feed pump seals, etc.).

Evaluation: We agree that there are no physical provisions to prevent non-AFW users from drawing down the reserved 175,000 gals. However, we disagree with the statement that there are no operational provisions to prevent draw down from occurring. In accordance with the annunciator response procedure, if a low CST level alarm (CST volume = 239,000 gals) has annunciated, make-up to the CST is started. Additionally, the cause of the low level alarm must be determined and corrected. The Technical Specifications require the CST to contain 175,000 gallons of water. This is a conservative volume on the basis that only 135,000 gallons of water is required for 9 hours of hot shutdown operations. Therefore, there is no safety significance to non-AFW users utilizing CST water, since the operational procedures instruct the plant to the actions which must be taken to prevent draw down from occurring.

Future Action Required: No future actions are required since the plant procedures and the T/S requirements adequately address the potential for drawdown.

References: Annunciator response procedure:

1-OHP.4024.116.042 CST low level
1-OHP.4024.116.043 CST low-low level

Observation Number: TDG-4

Issue: The design process for preparation, checking, and verification of design calculations needs to be improved.

Evaluation: TDG-4 discusses an NS&L calculation, TH-87-03, and notes several deficiencies, notably a mix of conservative and non-conservative calculations which are cited as being inappropriate. TDG-4 was intended to support our alternate safe shutdown calculations, not size the condensate tank. TDG-4 was prepared by AEPSC engineers, but since the personnel were relatively new to the area, a decision was made to hire an experienced outside contractor, Impell Corp., to perform the same calculation. The outside contractor provided fully quantified and verified calculations in this area. The internal calculations were approved on the basis that the conclusions of the contractor also supported the internal documentation. No effort was made to straighten out differences in assumptions between the two models since it was concluded this is not cost effective utilization of manpower. To further rectify the above situation, a completely independent calculation, TH-87-09 was performed specifically to determine the CST inventory needed to cool the RCS and time until CST Dryout. This calculation addresses the concerns cited in finding TDG-4.

As was explained to WESTEC personnel, the difficulties encountered with the use of this calculation are believed to be an isolated incident which occurred based upon the availability of a qualified outside contractor to essentially do the same thing. This does not reflect normal design control process in America Electric Power for preparation, verification, and checking of design calculations, and for this reason, we believe the WESTEC conclusion in TDG-4 to be unwarranted.

Future Actions Required: No further action is required.

Observation Number: TDG-6, Rev. 0 Date 8/5/87

Issue: Backseating Valves - The problem areas are:

1. Basic philosophy of backseats and open torque switches.

2. MCM-221, -231 have had excessive packing problems which could be eliminated by backseating valves.

Evaluation:

The AEP philosophy on the use of backseats and open torque switches is in complete disagreement with the WESTEC philosophy.

The AEP practice of not backseating (normally open) valves is a long-standing system wide design operating philosophy. Properly applied and adjusted packing is more than adequate to preclude unacceptable leakage. For normally open valves, if backseating were 100% effective, the packing would become dried out in time and thus inefficient when called upon to function when the valve is operated. The backseating capability is not defeated; it may be implemented manually for on-line packing replacement or as an emergency measure to stop a packing leak if required.

During the inspection, the WESTEC inspection team was advised of our philosophy regarding the use of backseats and open torque switches. They chose not to agree with our engineering experiences and issued the finding based on their engineering judgement.

The removal of open torque switches from Westinghouse supplied valves at the D. C. Cook Nuclear Plant was based upon the aforementioned AEP philosophy of not using torque switches in MOV's to stop valve travel to the open position. The decision to not use the open torque switch is based on the premise that the benefit of ensuring reliable valve opening far outweighs the slight risk of damaging the operator should the valve "hang up" or the open limit switch fail during opening.

Evaluation: (cont'd)

Problems with MCM-221, -231 are, in our opinion, overstated and have alreadv been addressed by AEPSC in the normal course of plant maintenance review. Packing typically fails over a protracted time period during which it may be adjusted to stop or mitigate leakage. AEP's valve maintenance tracking program at the D. C. Cook Nuclear Plant has revealed only a small percentage of valves having experienced excessive maintenance. Only some of these were attributable to packing problems, none of which were generic to valve type, model or service. Investigation of the condition of stems and stuffing boxes, as well as consideration of installing live loaded packing was recommended in the few cases of severe duty safety related valves, including MCM 221 and MCM 321.

The differences in design philosophy have no safety significance. Valve packing failure is typically a gradual process. Redundant means of early detection are in place to facilitate on-line packing replacement. If a valve's safety function is to close, backseating has no significance in facilitating the safety function. If the valve's safety function is to open, the only function backseating can serve is to preclude insignificant loss of fluid from the system through packing leakage.

Based on the above, WESTEC Finding TDG-6 does not have an adverse safety significance.

Future Action Required: No future actions required.

Observation Number: RBP-1 Revision 2

Issue: Instrument errors are not considered in calculating setpoints for alarms and controls

Evaluation: Formal documentation of the process of considering instrumentation errors is not documented. However, as shown by the following evaluation instrument errors are factored into the establishment of setpoints by the experience and judgment of the engineer. An instrument loop error analysis has been performed on the following:

CST Low Level Alarm
CST Low-Low Level Alarm
AFW Pump Low Suction Pressure Alarm
(Referred to as "minimum NPSH" in the INSPECTION OBSERVATION)

The error analysis indicates that the instrument loop maximum error is ±7.8" for the CST Low Level and Low-Low Level alarms. Instrument loop maximum error for the existing AFW Low Suction Pressure alarm is ±9.2". This maximum error will be ±14.3" subsequent to installation of design change RFC DC-12-2912. Attachment 1 illustrates setpoint elevations versus instrument loop maximum errors.

A listing of the concerns raised by INSPECTION OBSERVATION is given below, along with a response to each concern:

Concern 1.: The operator must have 20 minutes following the CST Low-Low Level alarm to find an alternate water source.
Response: If the CST Low-Low Level alarm occurs at the maximum negative error when compared to the AFW Low Suction Pressure alarm point, there is approximately 21,470 gallons remaining. The turbine-driven auxiliary feed pump (TDAFP) at maximum capacity or the two motor-driven auxiliary feed pumps (MDAFP's) at maximum capacity would run for 23.85 minutes before using 21,470 gallons of condensate.

Concern 2.: The operator may inadvertently trip the AFW pump when he needs it.
Response: Cook Plant Annunciator Response Procedures call for the operator to verify CST level before tripping an AFW pump, and the operator has three level channels by which to do this. In the unlikely event that the CST reached Low-Low level, the operator would be closely monitoring CST level and would not be inclined to trip a pump inadvertently based on actuation of an alarm.

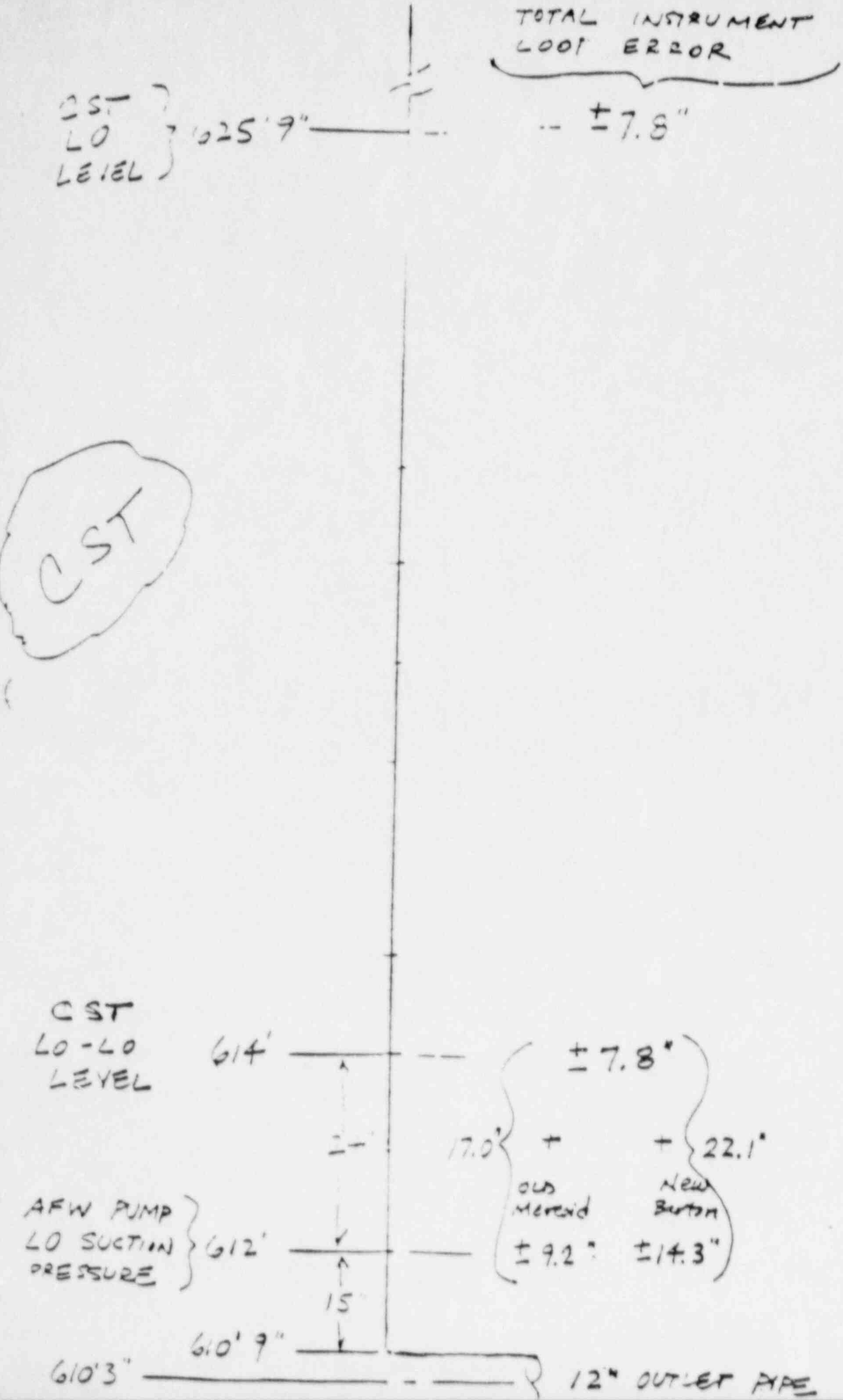
Concern 3.: Instrument errors cause a potential overlap of the CST Low-Low Level and the AFW Low Suction Pressure alarms.

Response: Our error analysis indicates that the combined error on the CST Low-Low Level alarm, and the AFW Pump Low Suction Pressure alarm totals 22.1". This total versus a setpoints difference of 24", so an overlap will not occur.

Concern 4.: The NPSH Switch (AFW Pump Low Suction Pressure Switch) may not alarm until the water level falls to 609' 3.8", potentially causing the pump to run dry without the operator knowing it.
Response: Our error analysis indicates at a maximum error on the AFW Low Suction Pressure alarm the level would still be above the top of the CST's outlet pipe. This error represents only 0.3 psig lower pressure at the AFW pump inlet. In view of this minimal pressure difference and the fact that the CST outlet pipe is not uncovered the present alarm setting provides adequate pump protection.

Due to above evaluation it was concluded that no physical corrective action was necessary and that no safety significance is evident.

Future Actions Required: The above discussion shows that our process for establishing engineering setpoints although not formally documented provides acceptable results. As part of the overall program of updating current documents, the I & C Section will formally document the engineering evaluation that takes place in establishing a setpoint. This will take the form of instrument error sensitivity studies. These studies will be done as part of the normal revision process to ECPs for future design changes.


TOTAL INSTRUMENT LOOP ERROR
CST LO LEVEL
625' 9"
± 7.8"
CST
CST LO-LO LEVEL
614'
± 7.8"
2'
17.0"
+
+
22.1"
OLD Mercoid
NEW Barton
AFW PUMP LO SUCTION PRESSURE
612'
± 9.2"
± 14.3"
15"
610' 9"
610' 3"
12" OUTLET PIPE

Observation Number: RBP-2 Revision 1

Issue: The Tech Spec requirement to have a minimum contained volume of 175,000 gallons of water is not in addition to the amount of water available at the CST Lo Lo Level alarm.

Evaluation: The evaluation incorrectly concluded that the 175,000 gallons was in addition to a quantity of water necessary to support 20 minutes of operation after the low low level alarm. Technical Specification (T/Ss) require a minimum contained volume of 175,000 gallons of water in the Condensate Storage Tank (CST) in Modes 1, 2, and 3. In addition, our letter AEP:NRC:0307C (June 26, 1980) committed us to having the low low level alarm on the CST set such that the operator would have at least 20 minutes from the time the low-low level alarm came in until he had to find an alternate water source, assuming operation of the largest capacity auxiliary feedwater pump.

A subsequent review addressed by Problem Report 87-706 has determined that the volume to support 20 minutes of operation beyond the low-low alarm is not in addition to the 175,000 gallons T/S requirement. Also, our present procedures and setpoints are adequate to ensure compliance with our T/Ss and commitments.

Details of the review of various commitments and additional information is present below.

1. Commitments

The requirement for at least 20 minutes of time originated in a letter from Darrel Eisenhut of the NRC to John E. Dolan of AEPSC, dated October 30, 1979. The purpose of the letter was to advise us of requirements for our auxiliary feedwater system in light of the accident at Three Mile Island. Short-Term Recommendation No. 1, from the NRC's Lessons Learned Task Force and the Bulletins and Orders Task Force, stated:

> The licensee should provide redundant level indications and a low-level alarm in the control room for the AFW system primary water supply to allow the operator to anticipate the need to make up water or transfer to an alternate water supply and prevent a low pump suction pressure condition from occurring. The low-level alarm setpoint should allow at least 20 minutes for operator action, assuming that the largest-capacity AFW pump is operating.

In the same letter, the NRC, in describing our CST, stated:

> Each condensate storage tank has a capacity of 500,000 gallons, of which 175,000 gallons are reserved by Technical Specification for AFW system use.

These two quotations from the NRC's letter indicate that the NRC understood the amount of water necessary to meet our commitment for 20 minutes of CST capacity after the switchover alarm is included in the 175,000 gallons necessary to meet the T/S requirements.

2. Additional Reviews

For the same of completeness, the CST alarms and Cook Plant procedures were also reviewed. This was done to ensure that our present procedures and alarms are adequate to ensure compliance and safety.

A. T/S Requirements

T/S require 175,000 gallons of contained water. The Bases section for both units indicates that this amount of water is sufficient to maintain hot shutdown conditions for 9 hours assuming loss of offsite power. In addition, the Unit 2 Bases, which are derived from a later version of the Standard T/Ss than the Unit 1 Bases, indicate that the required volume "includes an allowance of water not usable because of tank discharge line location or other physical characteristics."

Cook Plant procedures require CST level to be greater than 37% for T/S compliance. This provides a volume of water of approximately 176,000 gallons above the centerline of the discharge pipe. In addition, there is over 20,000 gallons below the centerline of the discharge pipe. Therefore, Cook Plant procedures are conservative, since they provide for 175,000 gallons of usable water, rather than 175,000 gallons of contained water, in the CST.

Nuclear Safety & Licensing (NS&L) performed a calculation to determine the amount of water necessary for 9 hours of hot shutdown operation assuming loss of offsite power. The calculation used 102% of the rating of Unit 2 (since it has the highest rated power) for purposes of determining the decay heat load. The NS&L calculation conservatively determined that approximately 135,000 gallons of water is sufficient for 9 hours of hot shutdown operations. Thus, the 175,000 gallons required by T/Ss is adequate, even if the T/S requirements were taken as usable rather than contained volume.

(RBP-2 Rev. 1 cont'd)

B. Lastly, NS&L investigated the requirement that the operator have 20 minutes to switch to an alternate water source. Cook Plant emergency procedures require the operator to begin the switchover to an alternate source when the CST level has dropped to the low-low alarm setpoint. As described in our letter AEP:NRC:0976, dated June 13, 1986, 30 minutes of time is required to drop the level in the CAST from the low-low level alarm to the centerline of discharge pipe, based on a conservative pump rate of 2000 gpm. At a pump rate of 900 gpm (the pump rate of the largest capacity AFW pump, as committed to in AEP:NRC:0307C), over one hour would be required. Thus, it is seen that the CST alarms are set so that they conservatively meet our 20-minute commitment.

The above discussion shows that no safety significance is evident.

Future Action Required: No future actions are required since the plant procedures and the CST alarms are conservative with respect to T/S requirements and other commitments.

Observation Number: RBP-3 Revision 0

Issue: The design control process for preparation, checking and verification of design calculations need to be improved.

Evaluation There appears to be confusion over the method used to generate ECPs and their approval process. The issue, discussion and examples raised questions regarding verification, reviews and ECP formatting. The process for generation of an ECP and its relation to a RFC or PM are discussed below using the ECP 1-2-C1-01 as an example.

A.) Traceability: Each of the ECP revisions contain information in the revision description stating what caused the revision to be made. This information is given by reference to the initiating change document (RFC) or other document which impacts the ECP. Each item is annotated with the letter (A) on the attached ECP coversheets.

B.) Issue of addenda with coversheet control: The ECP issues are revisions not addenda. Both the old style and current ECPs are controlled by the MED I & C Section. Evidence of this control is provided at the top of the ECP 1 package revision record. See annotation of (B) on the attached. Also, the Appendix B Calculations are only issued by means of a ECP 1 package revision record form. This is even though the calculations have their own review and approved record coversheet.

C.) Format of the ECP: Each ECP contains a coversheet which identifies the content of the document. This includes what Appendices have been issued. These Appendices are indexed by form ECP 3 showing the number of pages for each Appendix reference number. Additionally, each Appendix reference indicates the number of pages contained on its approval coversheet. These items are identified by the annotated (C) on the attached.

D.) Independent or interdisciplinary review: These reviews and approvals are shown in two ways on the ECP document. An authorizing document (such as an RFC) is identified for the various revisions. These authorizing documents are subject to a number of separate verifications and reviews. Additionally, the ECP is subjected to checks and reviews as indicated by the signatures or initials contained in the approval block on the ECP coversheet and the Appendix B Calculations approval coversheet. These items are annotated on the attached as (D).

The above discussion shows that the ECP is properly controlled and checked, therefore, no safety significance is evident.

Future Action Required: No future action is required as the points raised by this observation are adequately addressed.

A.E.P.S.C. CALCULATION
MECHANICAL ENGINEERING DIVISION
INSTRUMENTATION AND CONTROLS SECTION

C

E.C.P. CALCULATION No. [illegible]

SHEET 1 OF [illegible] APP. 3 REV. 1

TYPE PRELIMINARY OR FINAL

PLANT Cook UNIT 1 & 2

SUBJECT [illegible]

COMPANY I&M Power Co

TANK LEVEL ALARMS

CALCULATED BY S. Misiko

*AND INDICATION * & HI ALARM ACCURACY

CHECKED BY R. L. Shobe 12/10/79

SUPERSEDES CALCULATION NO. ——

APPROVED BY D. [illegible] 12/12/79

FILE LOCATION C1-01

AND DATE 12/12/79

D

PROBLEM DESCRIPTION:

CALCULATE SET POINTS FOR HI, LO & LO-LO LEVEL ALARMS IN CONDENSATE STORAGE TANKS. *REV. 1 OF CALC: DETERMINE CALIBRATION FOR CLT-113 (LT-113)

*REV. 2 OF CALC: DETERMINE LOOP ACCURACY OF HI LEVEL ALARM

① REV. 3 OF CALC.: DETERMINE % READING for 175,000 gal. AVAILABLE

DESIGN BASIS AND REFERENCES:

DWGS: 12-5566 C
12-5354
12-5352

RFC-DC-12-2452

*REV. 1 OF CALC: PER AMENDMENT 1 OF RFC-DC-12-2452

*REV. 2 OF CALC: C/R NO. 2-05-84-752
SYS. DESC. HP-120

① REV. 3 OF CALC.: Request by Plant for Tech. Spec. compliance.

A

D

E.C.P. REVISION			NO CALCULATION CHANGE	1	4
NO.	DATE	CHANGE	CALCULATION BY/DATE	CHECKED BY/DATE	APPROVED BY/DATE
* 2	082780	RECORDED ON E.C.P. PACKAGE REVISION RECORD	DKurtz 082780	R. L. Shobe 101580	D. [illegible] 10/15/80
* 3	112585		D.V. SCHIESER 112585	[illegible] 11/26/85	R.L. Shobe 11/26/85
① 5	063086		D.V. SCHIESER 063086	[illegible]	R.L. Shobe 070186
6	03/09/87		J. L. [illegible] 03/09/87	[illegible] 3/13/87	R.L. Shobe 031387

A.I.D. E.C.P. 4
030877

SUPERSEDED BY E.C.P. CALCULATION NO. ____ REASON ____

SUPERSEDED BY/DATE

A.E.P.S.C. - M.E.D.

INSTRUMENTATION AND CONTROLS SECTION

ADMINISTRATIVE INSTRUCTION AND DESIGN PROCEDURE

ENGINEERING CONTROL PROCEDURE

B

C

CONTROLLED DISTRIBUTION FOR E.C.P. PACKAGE

I - INITIAL ISSUE
✓ REVISED THIS ISSUE

[illegible] - [illegible] ; [illegible] - [illegible]
[illegible] Stoeckel - [illegible] ; [illegible] - Bridgman
P. Lutter - [illegible] ; [illegible] - Bridgman
B. K. Wu - [illegible] ; [illegible] - Bridgman
J. Friel - [illegible] ; [illegible] - Bridgman
J. Mustaro - 103? ; M. D. Ballet - Room 909
D. Duncan - Bridgman ; [illegible] - [illegible]
R. Bischoff - Bridgman
J. Hylock - Bridgman
R. Sammons - Bridgman

DRAWING REVISION NO.	REVISION DESCRIPTION AND AUTHORIZING DOCUMENT I.D.	LOGIC DIAGRAM DIGITAL	LOGIC DIAGRAM ANALOG	SCHEMATIC DIAGRAM	CALIBRATION DATA	CALCULATIONS		REVISION BY	APPROVED BY DATE ISSUED
0	REDRAWN NSK-34 TO THIS DWG CHANGING CPX-110 TO CSK-[illegible] AS PER [illegible]-12-[illegible] AND ADDED KPS-[illegible]/120 AS PER [illegible]-2-[illegible]-52			✓	✓	I		LJH 12-11-79	[illegible] 4-13-[illegible]
1	ADDED [illegible] AS PER [illegible]-DC-12-2452 DELETED KPS-119 + KPS-120 AND CHANGED MODEL OF KPS-110 + KPS-111 FROM [illegible] TO UNITED ELECTRIC DUAL SWITCHES TO GIVE [illegible] + [illegible] [illegible] AS PER [illegible]-12-2452			✓	✓			LJH 3-6-80	[illegible] 3188
2	ADDED [illegible]LI-115 PER RFC-DC-12-2452-AMEND. 1		I	✓	✓	✓		[illegible]	[illegible]

A

D

REVISION RECORD IS CONTINUED ON FORM No. MED-137/A

PLANT [illegible]	[illegible]	DWG. [illegible]
E.C.P. PACKAGE REVISION RECORD		SHEET 2 OF 15

A.I.D. E.C.P. I
030877

FORM MED-137

A.E.P.S.C. - M.E.D.
INSTRUMENTATION AND CONTROL SECTION
ENGINEERING CONTROL PROCEDURE

CONTROLLED PACKAGE DISTRIBUTION (B)

REVISION NO

( ) PLANT PERFORMANCE SUPERINTENDENT (5)
( ) MECHANICAL CONSTRUCTION CHIEF (2)
( ) RELAY CHECKOUT SUPERVISOR
( ) PIPING & VALVES SECT LEAD ENGR
( ) STEAM GENERATION SECT LEAD ENGR
( ) FIRE PROTECTION SECT LEAD ENGR
(/) HEATERS & PUMPS SECT MGR
(/) CHEMICAL SECT LEAD ENGR
(/) TURBINE SECT MGR
(2) ELECTRICAL GENERATION SECT LEAD ENGR
(/) ELECTRICAL DESIGN SECTION MGR (2)
(/) MECHANICAL DESIGN SECTION MGR
( ) ASH HANDLING & DISPOSAL SECT MGR
(1) COOK PLANT INFORMATION & RECORDS Center

(/) I&C SECT MGR/ FILE
( ) MED ASST. DIV. MGR
( ) TECHNICAL EDUCATION SECT MGR
( ) PROJECT MGR
(1) NUCLEAR OPERATIONS
(1) TECHNICAL EDUC SECTION MGR.

I = ISSUED NI = NOT ISSUED R = REVISED

REVISION NO	REVISION DESCRIPTION AND AUTHORIZING DOCUMENT I.D.	APPENDIX A	APPENDIX B	APPENDIX C	APPROVAL SIGNATURES: I & C ENGR DATE / ENG'G REVIEWER DATE / I & C SECT MGR DATE
3	ECP CALCULATION (1-2-21-01 revised (REV.2) by adding calculation of Total loop accuracy of instrumentation used for HI level alarm. (A) FOR INFORMATION AND USE.				D.V. Achieser 11-26-85 W. S... 11/26/85 R. L. Shoberg 112685
4	Added: PHYSICAL SCHEMATICS for CLI-110, CLR-110, CLR-111 and CLI-113 (SHEETS 6 thru 13) which incorporate PHYSICAL DWG.'s 1-C-1-1316, 1-C-1-1361, 1-C-1-1362, 1-C-1-1363, 2-C-1-3235, 2-C-1-3236, 2-C-1-3237 and 2-C-1-3238; CLI-110 scale info. and CLI-113 style info. to SHEET 3; sensing leg size and description to SHEETS 6 thru 13. Deleted: "Make" description from PHYSICAL SCHEMATICS (SHEETS 6 thru 13); CLI-110 scale info. from SHEETS 6 and 10; CLI-113 style info. from SHEETS 9 and 13; CLI-113 Serial Number from SHEET 13. Revised: CLI-110 symbol on SHEETS 6 and 10, and CSX-100 symbol on SHEET 4 per FLOW DIAGRAM 12-5104 Rev. 9; all SHEET numbers to incorporate SHEETS 6 thru 13. (A) FOR INFORMATION AND USE				MARCH 7, 1986 D.V. Achieser S.C. ... 3/7/86 R.L. Shoberg 031086
5	ECP CALCULATION 1-2-21-01 revised (REV.3) by adding calculation to determine (for Tech. Spec. compliance) % reading of CLR-110, CLR-111, and CLI-113 for 175,000 gallons available in Condensate Storage Tank. FOR INFORMATION AND USE.				June 30, 1986 D.V. Achieser S.C. ... R.L. Shoberg 070186
6	ADDED: CLI-114 INSTRUMENT CHANNEL ON SHTS. 3,4,5,&6 REVISED: CALCULATION 1-2-C-1-D ON SHT. 3 TO SHOW CLI-114 CALIBRATION. CHANGES PER RFC DC-12-2930 SYSTASK D.17 (A) FOR ENGINEERING & DESIGN			I	D. Z. Colmin 03/04/87 ... 3/12/87 R.S. Shoberg 031387

PLANT D.C. COOK PL. 1 & 2	TITLE CONDENSATE STORAGE	E.C.P. 1-2-21-01
E.C.P. PRIVATE REV. + EQUIP	TANK LEVEL	SHEET 1 OF 15

E.C.P. 1 PACKAGE REVISION RECORD

043082

AEPSC - MED
Instrumentation & Control Section
ECP Appendix Cover Sheet

Plant D.C. COOK	ECP [illegible]	Appendix 2 : CALCULATION

Table of Contents

Ref. No.	Sheets	Description
1	[illegible]	[illegible] LEVEL ALARMS, INDICATION, & [illegible]
2		
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C

Observation Number: RBP-4

Issue: Documentation of safety review evaluation procedure for 10 CFR 50.59.

Evaluation: This observation addresses a generic concern that safety reviews by the Nuclear Safety and Licensing Section are completed at the beginning of the design process and are not revised.

Our review process is currently as follows: (1) The RFC is given to the Nuclear Safety and Licensing Section for an independent conceptual review of the design (2) This reviewed document is returned to the lead engineer for resolution of reviewer's comments. Open items are addressed and closed out by documentation in the design change packet. The detailed engineering is also independently verified and the addition of the closeout documentation to the package is verified before transmittal to the site. (3) The completed packet is independently reviewed upon completion of installation by site personnel. We believe this process meets the requirements of 10 CFR 50.59.

Future Actions Required: No further action is required

Observation Number: MB-1

Issue: A weakness was observed in some of the procedures to mitigate the potential for steam binding.

Evaluation: The inspection identified the lack of controls on the teletemp stickers, which are installed to indicate the temperature of the auxiliary feedwater piping to the steam generators, and are used to indicate potential steam binding of the auxiliary feedwater pumps. The procedure in question is CHP4021.056.002, which requires that the temperature of the feed lines be verified less than 140°F at approximately 30 and 90 minutes after flow to the steam generator from the auxiliary feedwater pumps has been stopped.

The teletemps were removed. The operator is instructed to feel the pipe to see if it is hot and to use the readily available temperature measuring device available in the SS office to quantify the pipe temperature if it is hot to the touch. Feeling the pipe was used in several other procedures and has proven effective.

Future Actions Required: No further action is required.

Observation Number: MB-2

Issue: Information for setting the TDAFP controller to rated flow is not available at the Hot Standby Panel.

Evaluation: There is no longer a need for the information from OHP4030.STP.017T to be posted at the hot shutdown panel or even on the main control panel. The requirement was necessary before the last refueling outage when the governor valves were re-calibrated so that rated flow was achieved at approximately 0%. Prior to this change the rated speed was achieved at about 20% on one unit and 10% on the other. Now both units are set at 0%. The verification in STP.017T confirms the calibration has not drifted.

Future Actions Required: No further action is required.

Observation Number: MB-4

Issue: Procedure inconsistency with direction on when and what to do for low and low-low (extreme low) condensate storage tank level and auxiliary feedpump low suction pressure alarms.

Evaluation: The plant Operations Department's position is that these variations in recommended actions are consistent with the anticipated initiating action. However, when the actions are compared together an appearance of inconsistency does exist.

Future Actions Required: The Operations Department will review actions required by the alarms in question and determine if the actions are appropriate and consistent with the circumstances the procedures are written to address. The procedure review and any necessary changes will be completed by the end of the second quarter of 1988.

Observation Number: MB-5

Issue: Training material used in operator requalification training contains some conflicting and incorrect information.

Evaluation: MB-5 was discussed with the plant Training Department, and they feel that the numbers listed in the lesson plans are used for guidance only. Each lesson plan is reviewed by the instructor, and any differences are noted and presented at that time.

Future Actions Required: No further action is required.

Observation Number: MB-6 Revision 0

Issue: Inconsistency on engineering units stated in various procedures for Condensate Storage Tank Level.

Evaluation: The observation is the same as several made by ourselves during the Detailed Control Design Review (DCRDR) process undertaken as part of NUREG0737. The observation that consistency of information presentation to operators was needed was identified by ourselves during the DCRDR process for the overall plant. A number of Check List Observation/Human Engineering Discrepancies (CLO/HED) identified that engineering units were not uniform between items such as Instrument Meter Scales, Annunciator Response Procedures, Operating Procedures, Recorder Faces, Computer Displays and Emergency Operating Procedures. Examples of this are CLO/HED 3.1-13, 5.1-50, 6.1-66, V1-61 and V2-10. The detailed schedule and corrections to these items in particular and the DCRDR Program in general is presented in AEP:NRC:0773X and 0773V. Overall completion of DCRDR Program is scheduled for 12/90. The DCRDR Program has been evaluated by the NRC. Based on the above no adverse safety significance is evident.

Future Actions Required: The DCRDR process monitoring established by General Procedure 3.1 Design Changes assures that these types of concerns are addressed in the future. We consider this process which includes the completion of the committed DCRDR enhancements to be adequate, therefore, no future action is required.

Observation Number: WL-1 Revision 2

Issue: An environmentally qualified instrument is not installed in accordance with the manufacturer's requirements to maintain qualification.

Evaluation: At the time of the inspection the devices were in the condition noted. However, a design change was in progress at the time to change the instruments for Reg. Guide 1.97. As stated in Problem Report PR-87-713, a design change RFC DC-12-2900 Subtask A.15 was in progress at the time of the inspection. This change required installation of new cabling to the Auxiliary Feedwater flow transmitters. As such the transmitter and its integral junction box had not yet been accepted for installation configuration. Therefore, the Issue itself is not valid. Also, since the change i=was still in progress no safety significance is evident.

Future Action Required: The Design Change Coordinator for RFC DC-12-2900 Subtask A.15 was requested to re-emphasize that the proper installion configuration be used environmentally qualified equipment. This action was completed by August 31, 1987, therefore, no future actions are required.

Observation Number: WL-2

Issue: A weakness exists in the control of greases used in Limitorque motor operated valves. In addition, several lubrication inspections of motor operated valves have documented greases characteristic typical of adverse chemical reaction caused by mixing greases with different soap bases.

Evaluation: The mixing of greases with different soap bases in the main gear box of a Limitorque motor operated valve could render the operation and its associated valve inoperable. When mixed together the greases react chemically which may result in any of the following:

- o Breakdown into mud-like substance
- o Breakdown into watery liquid or
- o Separation into hard cake-like substance and watery liquid

Limitorque also cautions against the mixing of greases with different soap bases on page 12 of their Maintenance and Instruction Manual SMBI-82C.

Limitorque operators with serial numbers greater than 295809 are shipped with Exxon Nebula EP-0 or EP-1 in the main gear box. Exxon Nebula is a calcium based grease. Limitorque operators with serial numbers less than 295809 were more than likely greased with Sun Oil Company 50 EP or Nebula EP-0. With the exception of the new SMB-000 operators purchased for the AFW motor operator discharge valves the serial numbers for the installed MOVs are lower than 295809. Sun Oil Company grease 50 EP is lithium based.

In the early 1970's, Cook Plant selected Mobil Oil Company as the supplier for lubricants for plant equipment. Mobilux EP-2 and Mobilgrease 77, which are identical greases with different brand names, are the greases used at Cook Plant for this application. Mobilux EP-2 is a lithium based grease which is fully compatible with Sun Oil grease 50 EP.

In December 1984, a visual inspection of the grease in a representative sample of safety related motor operators was conducted. The inpection revealed that there was no abnormal degradation of the grease and that the lubricating qualities appeared satisfactory. Hence the conclusion that mixing greases at Cook Plant was not a problem.

We disagree with WESTEC's findings that MOVATS inspections revealed that some of the grease in motor operated valves exhibited signs of mixing. Our interpretation of the MOVATS inspection are as follows:

- o The grease in MCM-221 and 231 exhibited caking as a result of being exposed to high temperatures.
- o The liquid on top of the grease was a result of settling. The motor operator was not used often and the grease remained stagnant.

The condition of the grease in the valve operators (MCM-221 & -231) was not inspected prior to this outage. These valves are included in the Preventive Maintenance Inspection Plan for Environmentally Qualified Valves.

The new AFW motor operated valve operators (those with Exxon Nebula in the main gear box) installed in Unit 1 have been identified to contain Exxon Nebula grease. Replacement grease is stored in a special area under the control of the Maintenance Supervisor.

A sample of Exxon Nebula EP-0 and Mobilux EP-2 have been sent for laboratory testing to determine the extent of their incompatiblity. New Limitorque motor operators that are received with Exxon Nebula EP-0 or EP-1 will be degreased, cleaned and greased with Mobilux EP-2 or strictly controlled to preclude mixing.

Future Actions Required:

1) The PH&F Section will make recommendations to the Plant Maintenance Department regarding the use of greases in safety related motor operated valve Limitorque Operators by November 30, 1987.

2) Formalize the established controls to preclude the mixing of Exxon Nebula and Mobilux EP-2 greases. Action by Plant Maintenance by December 31, 1987.

3) Review the results of the laboratory test and recommend appropriate course of action. Action by Chem Engineering and PH&F sections.

References:

1. Letter from P. Fisher to J. Droste dated September 21, 1987.

Observation Number: WL-3

Issue: An unqualified lubricant may be used in the main gear case of Limitorque motor-operated valves.

Evaluation: Exxon Nebula EP-0 or EP-1 is the lubricant supplied by Limitorque and qualified by Limitorque in their report B0058 for use in the main gear box of the actuator. D. C. Cook Nuclear Plant uses Mobil lubricants in this application and has accepted the qualification of Mobilux EP-2 for use in Limitorque main gear case for inside and outside containment applications.

Qualification parameters are shown on page Gl-1 of the D. C. Cook SCEW sheets. It was noted in WESTEC's review of Maintenance Procedures 12 MHP 5021.001.006 Rev. 3 and 12 MHP 5021.001.042 Rev. 1 that both Mobil-Mobilux EP-2 and Mobilgrease 77 were specified as acceptable lubricants for use in the main gear box of Limitorque SMB and HBC valve operators. However, Mobilgrease 77 is not listed on the D. C. Cook SCEW sheets as a qualified lubricant. However, a letter dated January 4, 1985 from J. D. Allard to the Maintenance Supervisors stated that Mobilgrease 77 was compatible with Mobilux EP-2 and could be used.

We disagree with WESTEC's comment as to Mobilgrease 77 being an unqualified grease. In a telephone conversation with Mobil Oil Company on July 31, 1987, Mobil again stated that Mobilgrease 77 and Mobilux EP-2 are the same product with different brand names. Mobil Oil Company has confirmed this by letter dated September 16, 1987.

Based on the above evaluation, WESTEC Finding WL-3 has no adverse safety significance.

Future Actions Required: No further action required.

References: 1. Response to PR-87-710 dated 8-18-87, response date is September 10, 1987.

Ob.ervation Number: WL-4

Issues: a) Tape splice found on EQ valve that did not match PDS design drawing.

b) EQ not established for invalid splice that was found.

c) Tape slice process and training problems.

Evaluation: As a result of the observation, the larger generic question of the quality of splice taping in all of D. C. Cook's environmentally qualified motor operators, and therefore their reliability, has been investigated. The concerns stem from two sources:

1. A lack of documentation as to what specification was used as a guideline for taping splices on 1-MCM-221 and 1-MCM-231 and;

2. Three specific instances where the wrong tape was found to be covering splices. These instances involved 1-MCM-231, 1-FMO-221 and 1-FMO-241.

To answer these specific concerns, the electricians who performed the re-taping on the valves listed above were contacted. They confirmed that the re-taping was performed in accordance with applicable electrical design standards including the use of the correct tape.

To answer the larger generic concern about the environmental qualification status of D. C. Cook's motor operators as a whole, an investigation has revealed the following:

1) Environmental qualification inspections were performed on all Unit 1 and Unit 2 environmentally qualified valve operators in 1986 and 1987 as part of the qualified jumper wire inspection. One of the required E.Q. inspections is a "visual examination of all exposed, accessible cables and terminations on or near the associated E.Q. equipment." Therefore, as of the end of the jumper wire inspection, all of D. C. Cook's environmentally qualified motor operators were verified as having the proper terminations. It was during this inspection that the incorrect tape was discovered in the valve operators listed above. Based on the inspection of valve operators and the small number of splices found with the incorrect tape, this problem is non-generic.

2) A complete splice or termination is performed according to **12MHP5021.082.006, "Power Cable Termination and Splicing" which requires that splices

be done in accordance with applicable electric design standards. However, when the job merely requires replacement of the tape on a splice the procedure is not required. Discussions with the electrical supervisors confirmed that taping of E.Q. cables is always done as directed by applicable electrical design standards. However, this fact has not always been documented.

For the reasons stated above, it is reasonable to conclude that all cable splices in E.Q. valve operators have been taped in accordance with applicable requirements. There appear to be no generic implications related to these incidents.

Future Actions Required: No further action is required.

Observation Number: WL-5

Issue: Actual MOV torque switch settings different than design values.

Evaluation: While we agree that some MOV torque switch settings differed from design, we disagree that valve operability is in question as a result. This issue was reviewed in two previous engineering evaluations. The first review (Reference 1) was in response to I.E. Notice 84-10. The second review was documented in Reference 2, which compares 1985 and 1986 torque switch settings. The conclusion in both evaluations was that the actual torque switch settings were acceptable. A third review (Reference 3 and 4) was conducted in response to WL-5, in which the following conclusions were drawn:

1. Limitorque does not consider the design torque switch settings to be minimum settings as implied in Westec Finding WL-5. The design setting is a nominal value and the actual setting can be above or below the design setting, depending on individual valve characteristics.

2. All of the Unit 1 and 2 valves with settings below design were reviewed and an engineering evaluation made with respect to valve operability, as discussed in Reference 3. In all cases, the ability of the valve to perform its safety function was justified.

Based on the above evaluations, WESTEC Finding WL-5 does not have adverse safety significance.

Future Actions Required: No further action required.

References:

1. Letter from A. J. Lewandowski to J. D. Allard, Limitorque Motor-Operated Valve Torque Switch Settings, I.E. Information Notice No. 84-10, dated August 30, 1985

2. Letter from J. D. Hoffman to J. D. Allard, Motor-Operated Valve Torque Switch Settings, dated November 26, 1986

3. Letter from J. D. Hoffman to J. B. Droste, Motor-Operated Valve Torque Switch Settings, dated September 3, 1987

4. Letter from J. D. Hoffman to R. A. Czajka, Motor-Operated Valve Torque Switch Settings, dated September 11, 1987

Observation Number: WL-7

Issues: Meggering Limitorque motors and other recommended maintenance items were not fully incorporated into plant S/M/R program.

Evaluation: Limitorque recommended maintenance manual LC-9 has been incorporated into the D. C. Cook S/M/R program except for the meggering of the motors. We do not believe that meggering valve actuator motors gives accurate life/damage data.

Future Actions Required: Provide documentation in EQ file as to why meggering valve actuator motors is not necessary. (Target Completion by EGS-N - 6/88)

Observation Number: WL-8

Issue: Nonconformance with plant directives and NRC requirements regarding potential deficiencies in the environmental qualification of equipment.

Evaluation: Only two examples of this nonconformance were cited although no Condition Reports were written. Both of these examples had high level management attention and when immediate corrective action was required, immediate corrective action was taken.

Maintenance Department personnel have been reminded of the necessity of reporting environmental qualification nonconformities via the Condition Report System (PMI-7030). It is the Maintenance Department's policy to write Condition Reports when they are required. Condition Reports for the two nonconformities were written on August 10, 1987.

The Maintenance Department does not perceive these two nonconformities as a generic problem.

Future Action Required: Condition Reports will be written when required in the future.

Observation Number: WL-9

Issue: Missing valve covers. No oil level indication for inboard and outboard pump bearings.

Evaluation: The covers were ordered and arrived October 3. A job order was issued and the work was completed on October 20, 1987.

The oil levels in the auxiliary feedwater pumps are checked each shift via Operations Procedure OHP 4030.001.001 and are adjusted as necessary.

Future Actions Required: No further action is required.

Observation Number: WL-10

Issue: Deficiency in Maintenance Procedure 12MHP5021.001.037, Rev. 2, which could result in backseating of motor-operated valves due to inertia.

Evaluation: In general, we agree with the observation but do not consider it a problem for the following reasons:

1. Revision 3 of the subject procedure, which has been issued, includes additional steps to ensure that the open limit switch is set to allow for coast of the valve stem to preclude backseating. Consequently, any future adjustments will preclude backseating.

2. Of 108 Unit 1 safety-related valves in the IST program, many have been checked for backseating. Thirty-five valves were set up with MOVATS equipment during the current outage and are known to be free of backseating. An additional 16 valves were reset as part of RFC-2934 and have been checked to ensure they are not backseating. Another 28 valves are butterfly type in which backseating is not a concern. Finally, of the remaining 29 valves, none are fast acting valves with motor brakes, which are the valves most likely to backseat due to inertia.

3. Of the 35 valves originally set up using Revision 2 of the subject procedure and subsequently analyzed with MOVATS test equipment, 10 were found to be backseating during "as-found" testing. However, in no case did the backseating thrust exceed the maximum allowable operator or valve thrust. The valve cited in the WL-10 as an example, 1-QMO-410, did not have "excessive backseat thrust" as stated in the report. The measured backseat thrust was 4,600# as compared to the allowable thrust of 14,000#.

4. All IST valves are stroke tested periodically to ensure operability. We know of no case in which a valve has failed due to backseating. Therefore, we do not consider backseating a phenomenon likely to cause valve failures in the future.

Based on the above, WESTEC Finding WL-10 does not have an adverse safety significance.

Future Actions Required:

1. Perform MOVATS checks on 35 valves in Unit 2 during 1988 outage and correct any backseating noted.

2. Perform RFC-2934 work on 16 additional IST valves during 1988 outage and correct any backseating noted.

3. Check 26 remaining valves in each unit for backseating during future outages. Plant Maintenance

References:

1. 12MMP5021.00.037, Rev. 3 date effective October 15, 1987.

2. J. D. Hoffman letter to J. Droste dated October 13, 1987.

Observation Number: RB-1 Revision 0

Issue: The response time of AR Time Delays in the RCP bus undervoltage circuit for the turbine-driven auxiliary feedwater pump auto start are not included in total channel response time.

Evaluation: The inspection observation issue on missing a response time is correct. Problem Reports PR-87-717 and PR-87-683 were generated on this item. Additionally, LER 87-14 was written on Unit 1. The time responses for the AR time delay relays were tested on Unit 2. These items resulted in a as-left overall response of less than 45 seconds which is less than the 60 seconds allowed. The affected procedures have been changed to incorporate the requirements to time response test these relays. The actual time responses show that no safety significance is evident.

Future Actions Required: None, the affected procedures have been changed.

Observation Number: RB-2 Revision 0

Issue: The response time of the west Main FPT stop valve closure relays for the motor driven auxiliary feedwater pumps auto start are not included in surveillance testing for loss of main feedwater pumps initiation.

Evaluation: The inspection observation issue on missing a response time is correct. Problem Reports PR-87-717 and 87-693 were generated on this item. Additionally LER 87-14 was written on Unit 1. The time responses for the loss of West Main Feedpump was tested on Unit 2. These times results in a overall response of less than 40 seconds which is less than the 60 seconds allowed. The affected procedures have been changed to incorporate the requirements to time response test these logics. The actual time responses show that no safety significance is evident.

Future Actions Required: None, the affected procedures have been changed.

Observation Number: RB-3 Revision 1

Issue: The response time from when the 4160 Volt Emergency Bus loss of Voltage relays sense a loss of voltage to the auto start initiation of the diesel generator is not being included in verifying that the Technical Specification Time Response limit is not being exceeded for the Motor Driven Auxiliary Feedwater Pumps.

Evaluation: The inspection observation issue on not including data already taken in a total time response is correct. Problem Report PR-87-717 was generated on this item. The data was retrieved from that data already contained in the STP.217 series of Unit 2 procedures. The addition of these times to the time response resulted in an overall response of less than 42 seconds which is less than the 60 seconds allowed. The Unit 1 procedure has been changed to incorporate the requirements to compile this data to verify the time response of these relays. The actual time responses show that no safety significance is evident.

Future Action Required: The Unit 2 procedure will be changed to incorporate appropriate requirements prior to completion of the next surveillance test.

Observation Number: RB-4 Revision (Not Listed)

Issue: Functional and calibration tests allow instrument setpoints to be set inconsistent with the Technical Specification Trip Setpoints for Steam Generator Water Level Low-Low and High-High.

Evaluation: The inspection observation issue states too narrow interpretation of the Technical Specification requirements. The values for Technical Specification Trip Setpoint and Allowable Values are based on analysis which includes a 0.5% allowance for calibration errors on both the transmitter and the channel electronic equipment (i.e. rack). Condition Report 12-8-87-1309 and Problem Report PR-87-790 were written to discuss this observation. Since the analysis allows a 0.5% calibration error the use of this tolerance in performing actual calibrations is also allowed.

Additionally, the use of the 0.5% tolerance in the procedures still leaves the as-left calibration of the devices within the bounds of the Technical Specification Allowable Value. Therefore, the setpoints calibrations are conservative with respect to Technical Specifications and no safety significance is evident.

Future Action Required: None, the use of the calibration tolerance leaves the devices conservative with respect to Technical Specifications.

Observation Number: RB-5 Revision 0

Issue: Response Time Testing of Auxiliary Feedwater (AFW) Pumps (pump to pressure) to final discharge pressures that can be in noncompliance with Technical Specification Definition 1.23.

Evaluation: The observation issue does not reflect that the AFW System overall time response time is governed by 12-THP-4030.STP.205A and 12-THP-4030.STP.205B which record total time response from initiating signal thru pump reaching rated speed and head. The discussion portion of the observation states that testing to STP.017R allows for the AFW pumps to be response tested to inconsistent discharge pressures each time and does not insure that the pumps are tested until they reach the parameters assumed in the accident analyses. The TDAFP is tested when the steam generator pressure is 310 psig. This pressure is the minimum pressure which must be applied to the turbine in order to reach the design speed. The accident analyses assumes that the intact steam generators (i.e., during a feedwater or steam line break) reach approximately 1100 psig. When examining the TDAFP performance curve at the design flow/speed (900 gpm, 4350 rpm), we find that the brake horsepower is 800. Utilizing this brake horsepower, the steam pressure can be determined from the turbine expected performance curve. This curve, with the brake horsepower, requires a steam pressure of 310 psig to operate at the design speed. Therefore, as long as the rated speed is obtainable, it is permissible to test with varying steam generator pressures. Additionally, with the steam being supplied at higher pressure, it is expected that the turbine should reach rated speed faster and not slower.

A review of the pump horse power shows that the demand does not change significantly with increased flow due to lower steam generator pressures. Therefore, since testing at lower pressure will result in slow turbine speed response, the low pressure test is more conservative. Since the lower pressure is conservative no safety significance is evident.

Future Action Required: None, the present testing results in a more conservative time response.

Observation Number: RB-6

Issue: Discrepancies in valve lineups and numbering.

Evaluation: We agree with the RB-6 findings, although the auditor's comment as to the safety significance of valve positions shown on the flow diagrams is not pertinent. It should be noted that each operating procedure has a valve list which reflects that procedure's valve line-up; this valve list is used to align the system as well as insuring that the system line-up is correct by requiring sign-offs on the list. We feel that there is no safety significance to the RB-6 findings since the plant is operated using procedures and not the flow diagram.

Future Action Required: The procedures addressed in the review will be revised by the plant to eliminate the minor discrepancies.

References: Plant procedures: 1-OHP.4030.STP.017T
1-OHP.4021.056.001
1-OHP.4030.STP.035

Observation Number: RB-7

Issues: Elementary drawing errors.

Evaluation: From the WESTEC observation, the drawing errors appear to be minor.

Future Actions Required: Review drawing discrepancies described in RB-7 and correct drawings if necessary (Target Completion by EGS-N - 1/88)

Observation Number: RB-8

Issue: Extrapolating acceptance criteria for the separate response time testing of the individual pumps (pump start to reaching required pressure) is incomplete and inappropriate in **1-OHP4030.STP.017R, Auxiliary Feedwater Pump Response Time.

Evaluation: The purpose of **1-OHP4030.STP.017R is to obtain the time it takes from when an auxiliary feedpump is activated until the pump is delivering a minimum of design flow to its associated steam generators. The times for each of the three auxiliary feedpumps are then provided to Performance Section personnel to make the official determination as to the acceptability of the response times. The maximum times in the OHP are to provide indication to the operator of a potential problem so this fact can be brought to the Performance Section personnel's attention in a timely manner. Therefore the Operations Department does not consider the inclusion of the maximum available times in STP.017R a problem.

Future Actions Required: The Operations Department personnel will, prior to the next use of the procedure (performed at refueling frequency), revise the OHP to clarify which times are obtained from Performance to determine the OHP guideline times. Also, a clarification will be added to the procedure to inform the operators of the significance of exceeding the guideline times and to provide required actions to be taken when the guideline time is exceeded.

Observation Number: RB-9

Issue: Procedural deficiencies that can lead to errors in performance.

Evaluation: While we agree with the philosophy of providing adequate procedural guidance for the performance of maintenance, test, and calibration activities, we do not agree that our procedures do not provide such guidance. The statement is made that items noted in specific procedures "can lead to errors in performance." We have no historical basis at D. C. Cook to show that the items noted have led to errors in performance. In most cases, a combination of trained, qualified personnel, and other programmatic and procedural attributes provide adequate assurance that error-free performance of procedures can be expected.

Future Actions Required: The individual items noted will be reviewed by the respective plant department for possible procedure enhancement.

Observation Number: RB-10

Issue: Minimum flow requirements and testing for the auxiliary feedwater pumps.

Evaluation: We agree that there are no physical provisions to measure the ELO flow. The function of a pump's ELO line is to protect the pump from overheating and to allow stable pump operation at the minimum flow condition. As pointed out by WESTEC, the quantifiable flow through the ELO line was not verified. However, the active flow through the ELO was verified during the pre-operational test. This flow was verified by recording the flow change through the 3" test line (discharge flow path) when the ELO valve was cycled (opened/closed). Therefore, since the flow through the test line changed, the active flow through the ELO was verified but not quantified. The ELO line has been designed as a fixed flow path and therefore flow through it must remain constant. Consequentially, no flow instrumentation is required since stable pump operation indicates that the fixed flow is met. There is no safety significance since the pump has successfully operated when aligned to the ELO flow path on numerous occasions during the past ten years, which indicates the minimum flow required is being met.

Future Action Required: The AFW surveillance test procedure, under limitations, will be revised to delete the flow range. The following will be added under limitations: The ELO valve must be open when the flow path is not to the steam generators or through the test line. The procedure revision will be completed during the next biennial revision of the associated procedures.

References: Plant surveillance test procedures:

1-OHP.4030.STP.017T TDAFP
1-OHP.4030.STP.017E EMDAFP
1-OHP.4030.STP.017W WMDAFP

Observation Number: GJO-1

Issue: A System's manual is not controlled and may lead to error or misinformation.

Evaluation: System's Training Manuals are used for general reference and are not kept current. They are not used for plant operations.

Future Actions Required: No further action is required.

Observation Number: CW-1

Issue: Skill of the trade

Evaluation: In the area of EQ Splices it was stated that "EQ splicing is accomplished relatively infrequently." The technique used for EQ splices is the same as that used on many different pieces of equipment throughout the plant. These splices are done almost daily by the electricians at the plant; therefore, we have the waivers on qual card EM-O-B402 "Prepare/Make Low Voltage Terminations." It should also be noted that a person waived from a task is qualified to perform that task, just like a person who takes the prerequisites and completes the qual card.

In the area of MOVATS, we have the exam results from the 2-week classes presented on MOVATS training, and the attendance sheets, and course outlines are being sent to us.

In the area of MOV training, the people who attended from the "A" (senior) classification had an average of 8 years experience in the electrical nuclear field, thus the reason they were waived from the MOV qual cards. The "B" men who attended the eight hour class have not been waived from the required training, and will complete the MOV qual cards. It should also be noted that the waiver process is not determined by the instructors, but by the individual's supervisors. This decision was made based upon individual experience level and daily job performance.

We do agree to a point that "skill of the trade" cannot be an assumption in any activity, but our waiver process is not made on assumptions. Each individual's work skills are reviewed before a waiver is submitted, and for infrequently performed tasks a review of the material is given as appropriate.

Future Actions Required: These concerns will be discussed through quarterly meetings with the Maintenance Department and correspondence with Supervisors and the Training Specialist.

Observation Number: PM-1

Issue: **The design change program does not address safety concerns associated with the installation of non-seismic structures, systems or components in safety-related areas.**

Evaluation: The basis for this observation is RFC DC-12-1803. During the implementation of this RFC, Seismic Class III piping was installed in the auxiliary feedwater pump rooms. The RFC packet, however, contained no documentation that the potential impact of the piping on all safety-related equipment was evaluated.

The seismic interaction of the subject cooling piping in RFC-1803 is not a concern. The piping was installed to approved procedure DCC-PM-401-QCS. The Seismic Class III piping (less than 2 inches in diameter) is normally installed as per the industry guidelines, and supports are located as per standard catalogues. The anchor bolts for the supports were installed per procedure DCC-CE-135-QCN, which is for safety-related activity. The anchor bolts of the supports were pull-tested and tested for embedment to assure their integrity after installation. These procedures will assure that the piping supports would resist the seismic forces. Therefore, catastrophic failure of this piping is an unlikely event. It is believed that changes to procedures are not required.

NS&L procedures, the safety review memo and the NSL-QP7 Checklist Guide were reviewed. There are at least two questions in the NSL-7 Checklist Guide (I.C and III.B.5) which examine the potential interactions and possible missile effects that a proposed design change may create after installation. The safety review memo did mention the effects of falling pipe without mentioning seismic event per se. The potential seismic interactions were considered during the safety evaluation.

It is of note that the design change procedure has always included the consideration of safety concerns associated with the installation of non-seismic structures, systems, or components. As stated above, this is explicitly included in Nuclear Safety and Licensing procedures, and by reference to appropriate safety classification in corporate general procedures. Further, for plant modifications, current review procedures require the plant to consider this as well. For these reasons, we do not believe the WESTEC Observation PM-1 is supported by the example cited, or any other condition.

Future Actions Required: No further action is required.

Observation Number: DK-1

Issue: Incorrect information appears in the auxiliary feedwater system description concerning the signals used for automatic start of the motor-driven auxiliary feedwater pumps.

Evaluation: We agree the motor driven auxiliary feedpumps do not start on reactor coolant pump bus undervoltage but do start on loss of normal voltage to the 4Kv safety bus. The auxiliary feedwater system description was revised on 9/23/87 to correct this discrepancy. We agree with WESTEC's conclusion that there is no safety significance.

Future Action Required: None required. Action to date has resolved this item.