

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 50-315; 50-316  
License Nos: DPR-58; DPR-74

Report No: 50-315/98012(DRP); 50-316/98012(DRP)

Licensee: Indiana and Michigan Power  
500 Circle Drive  
Buchanan, MI 49107-1395

Facility: Donald C. Cook Nuclear Generating Plant

Location: 1 Cook Place  
Bridgman, MI 49106

Dates: April 28 through June 11, 1998

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## EXECUTIVE SUMMARY

D. C. Cook Units 1 and 2  
NRC Inspection Report 50-315/98012(DRP); 50-316/98012(DRP)

This inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a 5-week period of resident inspection and includes the followup to issues identified during previous inspection reports. The following specific observations were made.

### Operations

- During routine evolutions, the inspectors noted that the operators were attentive to their panels and to annunciators. During special evolutions, such as the reactor coolant system partial drain down for maintenance, the inspectors observed that good quality pre-job briefings were held (Section O1.1).
- During a drain down of the reactor coolant system (RCS), the inspectors observed the operators stop the drain down upon observing a discrepancy between RCS level indicators. Even though the procedure allowed the drain down to continue for several more feet, the operating shift decided to stop the evolution until instrumentation and control personnel could identify the cause. This was indicative of a conservative operating philosophy (Section O1.2).
- Several days prior to a RCS drain down, the inspectors determined the licensee had planned to drain down the RCS to approximately 1 to 2 feet above the reactor vessel flange. The inspectors' review of the operating procedure determined the procedure did not address draining down to 1 to 2 feet above the flange. Prior to draining the RCS, the licensee changed its plans for the RCS draindown to be consistent with the drain down procedure (Section O1.2).
- The inspectors determined that command and control of the operating shifts during Modes 5 and 6 was not well defined with the Unit Supervisor out of the control room. In addition the inspectors determined that the procedure addressing absence of the Unit Supervisor was weak. In response to the inspector's questions, the licensee provided guidance for limits on the duration of absence and whereabouts of the Unit Supervisor and who was in charge during the Unit Supervisor's absence from the control room (Section O1.3).
- The licensee's procedural guidance for the required position of ventilation system hand switches to support the operability of certain safety-related components was weak. The procedures for the normal lineup of safety-related components had ventilation guidance that was inconsistent between systems. The procedure addressing ventilation contained erroneous guidance allowing hand switches to be placed in off without addressing equipment operability (Section O3.1).
- The inspectors determined that prompt operability determinations for action requests and condition reports were weak and contained inconsistent documentation. The licensee had recently identified the need to provide additional guidance and training and was revising their process for performing operability determinations (Section O3.2).



## Maintenance

- Licensee contractor personnel identified that they had a wrong unit error and inadvertently worked on a Unit 1 valve instead of a Unit 2 valve. The wrong unit error occurred on the non-safety-related portion of the feedwater system while the system was cooled down and depressurized. Licensee management met with the contractor senior management and the contractor management informed the licensee of the seriousness in which they were taking the error (Section M1.1).
- During a contractor performed freeze seal on a non-safety-related portion of the non-essential service water system (NESW), licensee employees failed to take the temperature data required by the job order. The licensee employees assumed that they could transfer the contractor's data after the work had been performed. However, when the licensee maintenance workers attempted to copy the contractor's data after the freeze seal had been thawed, they determined that the contractor's procedure did not require recording temperature data at every location that the licensee's job order required (Section M1.1).
- The inspectors identified that the job order used for filling ice bags did not contain detailed instructions or assign crew responsibilities and was not appropriate to the circumstances. A violation of 10 CFR Part 50, Appendix B, Instructions, Procedures, and Drawings was issued (Section M1.2).
- On May 5, 1998, while lining up the fire system suction source in preparation for a routine surveillance, an auxiliary equipment operator inadvertently isolated both fire water tanks, resulting in the automatic start of all three fire pumps. A root cause investigation team assigned by licensee management to investigate this incident had not yet issued a final report. An inspection followup item was opened pending the inspectors' review of the team's report (Section M1.3).
- Due to a failure to adequately correct a previous occurrence, the licensee performed an expected plant cooldown and failed to comply with surveillance requirements designed to monitor the formation of a gas bubble in the reactor vessel head. Inconsistent procedures, inattention to detail, and a large number of items in the open items log contributed to the repeat failure to follow the procedural requirements. A violation for inadequate corrective action was issued (Section M7.1).

## Engineering

- The inspectors determined that the procedural guidance which controlled the ventilation requirements for safety-related equipment was weak. The guidance within the procedure was provided by Engineering Department personnel. Engineering Department personnel did not adequately consider the consequences of inoperable ventilation equipment when providing guidance to a procedure utilized by the Operations Department (Section E1.1).



• The inspectors determined that the System Engineering Review Board (SERB) and the Restart Oversight Committee (ROC) appeared to be doing an effective job of reviewing the items identified by the system engineers; however, there was a failure to comply with the SERB charter. This resulted in the initial failure of the Restart List to reflect the shared concerns of Operations, Maintenance and Engineering. The inspectors discussed observations of this failure with licensee management several times before effective corrective actions were taken (Section E7.1).

Plant Support

• No discrepancies were noted.



## Report Details

### Summary of Plant Status

Unit 1 remained in Mode 5, Cold Shutdown, during this inspection period. The unplanned outage was in response to NRC and licensee concerns with the operability of the containment recirculation sump and other engineering issues. On May 29, 1998, the licensee completed melting ice in the Unit 1 ice condenser. The ice melt was performed to allow for the efficient repair of the ice condenser.

Unit 2 remained in Mode 5, Cold Shutdown, during this inspection period. The unplanned outage was in response to NRC and licensee concerns with the operability of the containment recirculation sump and other engineering issues. Preparations for melting the ice in the Unit 2 ice condenser were begun following the completion of the ice melt in the Unit 1 ice condenser.

### I. Operations

#### O1 Conduct of Operations

##### O1.1 General Comments (71707)

Using the referenced inspection procedure, the inspectors conducted frequent reviews of ongoing plant operations. During routine evolutions, the inspectors noted that the operators were attentive to their panels and to annunciators. During special evolutions, such as the reactor coolant system partial drain down for an ultra-sonic test, the inspectors observed that good quality pre-job briefings were held.

During this inspection period, the licensee completed the ice melt of the Unit 1 ice condenser. The ice melt appeared to be controlled properly such that melt water was contained within the ice condenser. However, there appeared to be many problems with ice melt water leaking past the floor seals of the ice condenser, draining into areas below the ice condenser, resulting in the occurrence of numerous electrical grounds.

Each electrical ground was reviewed by control room personnel, and the appropriate priority given to find and repair the ground. In addition, condition reports were written documenting each ground.

##### O1.2 Observations During Drain Down of Reactor Coolant System (Unit 2)

During the drain down of Unit 2 on May 13, 1998, the inspectors observed the operators stop the drain down upon observing a discrepancy of about 1 foot between reactor coolant system (RCS) level indicators. Even though the procedure allowed the drain down to continue, the operating shift decided to stop the evolution until instrumentation and control (I & C) personnel could identify the cause. After many hours of troubleshooting, I & C personnel vented a small gas bubble from a sensing line and the discrepancy was corrected. The operator response to this event was conservative.

Several days prior to the drain down, the inspectors determined the licensee had planned to drain down the RCS to approximately 1 to 2 feet above the reactor vessel flange. The



inspectors reviewed Operations Head Procedure (OHP) 4021.002.005, Revision 13, "RCS Draining." The procedure did not address draining down to 1 to 2 feet above the reactor vessel flange. The procedure objectives allowed for draining down the RCS 1 to 2 feet below the flange, draining to half loop, and draining with no fuel in the vessel. The inspectors questioned why the licensee was deviating from the procedure. Prior to draining the RCS, the licensee changed its plans for the draindown to be consistent with the drain down procedure. The inspectors also reviewed the drain down procedure to determine if a safety problem would have resulted from draining the RCS 1 to 2 feet above the flange. No safety problems were identified during the review of the drain down procedure.

O1.3 Control Room Staffing (Both Units)

a. Inspection Scope (71707)

On May 13, 1998, the inspectors observed the Unit Supervisor leave the control room for a short period. The unit was in Mode 5 (Cold Shutdown) at the time. The inspectors performed a review of the licensee's procedures and practices for control room licensed operator coverage in Mode 5.

b. Observations and Findings

On May 13, 1998, the inspectors, during a control room walkdown, observed the Unit Supervisor leave the control room after announcing his departure from the room. The Unit Supervisor holds a Senior Reactor Operator (SRO) license.

Technical Specification (TS) Table 6.2-1 requires a SRO on shift only in Modes 1 - 4. Historically, the licensee had maintained full control room staffing with a Unit Supervisor in all modes of operation. Change sheet 2 to Revision 11 of Operations Head Instruction (OHI) - 4011, "Conduct of Operations (Shift Staffing)," Revision 11, dated May 5, 1998, allowed the Unit Supervisor, with permission of the Production Manager or Operations Manager, to leave the control room during Modes 5 or 6.

The inspectors discussed the staffing requirements with the Production Manager. The inspectors determined that OHI-4011 did not give guidance regarding the duration of Unit Supervisor absences or limits on the whereabouts of the Unit Supervisor. The Production Manager stated that the Shift Manager was expected to provide guidance for his crew, and that a change to OHI-4011 was in progress to modify the granting authority to the Shift Manager vice the Production Manager/Operations Manager. The pending change did not address any of the inspector's comments.

The Operations Manager stated the change to staffing in Modes 5 and 6 was made because of the extended shutdown of both units. He stated that he felt the tempo of operations in Mode 5 and 6 was such that having an SRO in the control room at all times was unnecessary. He also stated that by allowing short breaks for the Unit Supervisor, the need to maintain an additional SRO for watch relief would be eliminated and the extra SRO would be free to perform other tasks.

On May 28, 1998, the inspectors observed the Unit Supervisor provide a turnover briefing to the two licensed operators on watch and depart the control room. The inspectors



interviewed the Reactor Operator (RO) to determine who was in charge during the Unit Supervisor's absence. The RO stated that no one was designated as "in charge," but felt the senior licensed operator would assume that responsibility. After further consideration, he stated that the RO would be "in charge." The inspectors determined that the licensed operator did not know who was in charge of the unit while the Unit Supervisor was away from the control room. The inspectors interviewed the Production Manager (on watch as the Shift Manager) to determine his expectations. He stated that the Unit Supervisor was in charge of the unit even when the Unit Supervisor was not in the control room.

The Production Manager directed the Shift Managers to provide direction to their crews concerning duration of absence, whereabouts of the Unit Supervisor and chain of command during the Unit Supervisor's absence from the control room. The Shift Managers provided this guidance via shift briefings and E-mail to their shift crews.

c. Conclusions

The inspectors determined that command and control of the operating shifts during Modes 5 and 6 was not well defined with the Unit Supervisor out of the control room. In addition, the inspectors determined that the procedure addressing absence of the Unit Supervisor was weak. In response to the inspector's questions, the licensee provided guidance for limits on the duration of absence and whereabouts of the Unit Supervisor and who was in charge during the Unit Supervisor's absence from the control room.

O3 Operations Procedures and Documentation

O3.1 Weak Procedure Addressing the Impact of Ventilation on Safety-Related Equipment (Both Units)

a. Inspection Scope (71707)

During a routine review of the Unit 2 control room logs, the inspectors observed that while the Unit 2 AB diesel generator (2 AB D/G) was inoperable for planned maintenance, the 2 CD D/G intake fan hand switch was placed in off. The inspectors evaluated the factors that entered into the licensee's decision to place the fan hand switch in off. Additional inspector evaluations were performed on the impact of placing safety-related ventilation systems in a condition requiring a manual start by the operators. The general issue of ventilation not being properly addressed in procedures was first discussed in Inspection Report 50-315/98008, Section O1.3.

b. Observations and Findings

The 2 AB D/G had been removed from service for routine preventive maintenance and corrective maintenance. At the time, all four D/Gs were inoperable (but available) due to a failure to meet cable separation requirements. One of the jobs in progress on the 2 AB D/G was the sandblasting and repainting of the exhaust stack. The intake fan for the 2 CD D/G ventilation was located in close proximity to the sand blasting and as a precaution its hand switch was placed in off on May 7, 1998.



In response to inspectors' questions, the Unit 2 Unit Supervisor stated that:

- The crew had debated extensively the need for and consequences of placing the 2 CD D/G intake fan hand switch in off.
- The guidance contained in Plant Managers Procedure (PMP) 4030.001.001 had been followed. Specifically, the PMP allowed the placement of fan hand switches in off without declaring the associated component inoperable (the procedure recommended placing the fans in automatic).
- The operating crew had reviewed the normal lineup procedure for the D/Gs and observed that the procedure allowed the intake and discharge fans to be left in off, automatic or on.
- The D/G was already inoperable for the cable separation issue, so the crew had debated whether an inoperable D/G could be made more inoperable.

The inspectors pointed out that while the D/Gs were inoperable, the inoperability was declared based on the occurrence of a cable fault. However, by placing the intake fan hand switch in off, other challenges to the availability of the D/Gs had been introduced. The inspectors' review of the PMP verified that the procedure allowed placing the hand switch of any or all fans to certain safety-related components in off without questioning the operability of the component. In the case of the hand switches for the D/Gs, placing them in off would cause an increase in room temperature. Depending upon the outside air temperature and other variables, running a D/G with the ventilation fans hand switches in off could result in electronic controls to the D/G overheating and failing.

#### Review of Placing 2 CD D/G Ventilation Hand Switch in Off on May 7, 1998

The PMP on ventilation had requirements to be followed in the event that a fan was "incapable of moving air." Even though the hand switch being in off was allowed by the PMP, the inspectors reviewed the procedural requirements for a D/G fan that was incapable of moving air. The PMP required that the personnel access door to the D/G room remain closed, that the exhaust fan be capable of moving air, that the outside air temperature be less than 80° F, and that the intake damper remain open. The inspectors verified that while the operators had not specifically verified the PMP requirements for an intake fan that was incapable of moving air, the requirements had in fact been met.

#### Review of PMP 4030.001.001

The inspectors reviewed the safety evaluation screening for Revision 0 of the PMP and determined that the safety review did not specifically discuss the placement of hand switches in off. The inspectors then requested that the licensee review the PMP to ensure that the procedure met the requirements for manual operation of equipment required to support TS required equipment.

On May 15, 1998, licensee management informed the inspectors that the PMP would be revised to ensure that administrative controls over the hand switches would be



strengthened and ensure that the switches would be operated in accordance with design assumptions. The licensee also stated that it was their intention to revise the procedure by May 22, 1998.

The inspectors determined that the licensee did not address the control of the ventilation hand switches while waiting for the procedure to be modified. The inspectors noted that the outside temperatures were, on average, increasing, and expressed concern regarding the ability to cool safety-related equipment that had the associated ventilation system hand switch in off. Based on the increase in outside temperature, the inspectors requested the licensee to provide those corrective actions taken to ensure that safety-related equipment was adequately ventilated. In response, the licensee directed the operators not to use the guidance provided by the PMP which allowed the ventilation hand switches to be placed in off.

#### Normal Operating Procedures

The inspectors reviewed the licensee's procedures for the normal lineup and operation of selected safety-related systems. The inspectors determined that the licensee's procedures contained inconsistent guidance for verifying that the required ventilation was operable. For example, the lineup procedures for the essential service water (ESW) systems required that the room ventilation be on or in automatic, while the lineup procedures for the auxiliary feedwater system did not address ventilation requirements at all. As mentioned above, the lineup procedures for the D/Gs addressed room ventilation but allowed the hand switches to be placed in any position.

Even though the system lineup procedures were inconsistent, the licensee had placed a requirement in the procedure addressing the position of hand switches for the ventilation system during area walkdowns (Operations Head Procedure [OHP] 5030.001.001) by the auxiliary equipment operators (AEOs). Attachment 2 to the walkdown procedure required that ventilation hand switches be in automatic, but this requirement was not documented in the form filled out during area walkdowns. The inspectors interviewed a number of AEOs and determined that most AEOs took a copy of Attachment 2 on their tours because the requirements listed in the attachment were not included in either the tour documentation sheet or the electronic version of the tour sheet. The inspectors interviewed a sample of the AEOs who did not take Attachment 2 with them and determined that they were knowledgeable of the requirement to check the room ventilation systems.

Prior to the end of the inspection period, the licensee had begun a preliminary review of the operating procedures for ventilation issues. The licensee determined that all of the reviewed Normal Operating Procedures which contained safety-related ventilation signoffs or checks also stated that the ventilation hand switches could be in off. The licensee's review also found no guidelines for ventilation out of service time per the Emergency Operating Procedures.

#### Treatment of Ventilation in the Licensee's Individual Plant Examination (IPE)

The inspectors reviewed the licensee's IPE and interviewed licensee Probability Risk Assessment (PRA) personnel to determine if the ventilation requirements were appropriately addressed. The inspectors identified that the IPE ventilation assumptions



were different than the assumptions used in PMP 4030.001.001. Examples included the assumption in the IPE that ventilation to Engineered Safety Features (ESF) equipment, such as the residual heat removal pumps and the safety injection pumps, was assumed to not be required for 24 hours following an accident (less restrictive than the PMP). Another example was that the IPE assumed that both the intake and the exhaust fans were required for the proper operation of the D/Gs (more restrictive than the PMP).

The system engineer responsible for PMP 4030.001.001 was informed of the inspectors' findings and began discussions with the PRA personnel in an effort to resolve the discrepancies. However, the inspectors noted that the IPE was not required to reflect operational procedures or worst case assumptions. Instead, the IPE reflected more realistic failure probabilities. For example, both D/G fans were assumed to be required because the IPE did not take credit for manual operator actions when the fans stopped delivering air flow. At the end of the inspection period, no flaws with the IPE had been identified.

c. Conclusions

The licensee's procedural guidance for the required position of ventilation system hand switches to support the operability of certain safety-related components was weak. The procedures for the normal lineup of safety-related components had ventilation guidance that was inconsistent between systems. The procedure addressing ventilation contained erroneous guidance allowing hand switches to be placed in off without addressing equipment operability.

O3.2 Shift Technical Advisor Performance of Prompt Operability Determinations (Both Units)

a. Operability Evaluations (71707)

During a routine plant tour the inspectors observed that two of four Component Cooling Water (CCW) pumps had seal packages with less than full thread engagement. The inspectors performed followup to the thread engagement issue and resultant operability evaluation questions.

b. Observations and Findings

The Unit 1 East and Unit 2 East CCW pumps had new seal packages installed in the summer of 1997. The new seal packages were wider than the old seal packages with the result that the mechanical seal gland stud nuts had less than full thread engagement. Action Requests (AR) had been written to address the less than full thread engagement.

Review of CCW Pump Operability Evaluations

The inspectors reviewed the ARs and the evaluation for TS operability performed by the Shift Technical Advisor (STA). Action Request A0146494, written July 31, 1997, concluded that less than full thread engagements on the Unit 1 East CCW Pump did not represent an operability concern. While the inspectors' review of the pump seal design resulted in agreement with the STAs conclusion, the inspectors had questions on some of the logic used to support the conclusion.

- The evaluation stated, "The CCW is a closed loop system ... Seal leakage will not prevent the pump from pumping."

The evaluation did not address the expected leak rate from the CCW system and whether the closed system would lose enough water to cause the leaking train to become inoperable.

- The evaluation also stated, "[The retaining nuts'] function is to hold the seal package in the pump (similar to a packing gland nut). Per Engineering Technical Direction Memo (ENTDM) 97-077 (Plant Engineering Thread Engagement Guide), there is no operability concern for loose, missing or incomplete thread engagement on packing bolts if there is no observable leakage."

While prompt operability determinations are allowed to use reasonable engineering judgement, the STA did not initiate a more detailed operability assessment in order to support the conclusion that the seal package was similar to a valve packing gland.

On December 1, 1997, another AR was written on the Unit 1 East CCW Pump in order to replace the mechanical seal retaining nuts. An evaluation in the AR stated, "The concern with the limited engagement of the CCW seal retaining bolting is cosmetic ... and in my judgement, the bolting is of sufficient size to provide the needed strength to retain the seal on the pump with only 50 percent thread engagement." The evaluation also took credit for the condition existing for some months with no operational problems. The evaluation was weak, but it did request a backup operability determination.

The backup operability determination was documented in Condition Report (CR) 97-3445, dated December 1, 1997. The backup operability determination addressed both units' CCW Pumps. The backup operability was generally adequate to address the thread engagement operability question.

The inspectors' review of the operability determination procedure (PMP 7030.OPR.001) identified that the procedure lacked specific requirements on the timeliness of the backup determination and on the quality of the determination. Prior to the inspectors informing the licensee of this inspection finding, a licensee engineer reached the same conclusion and initiated CR 98-2181, dated May 20, 1998.

#### Review of Other Thread Engagement Prompt Operability Determinations

The inspectors performed a plant walkdown to identify other examples of inadequate thread engagement with AR tags. The inspectors then reviewed the technical adequacy of the AR evaluations. The inspectors reviewed approximately 10 ARs and determined that there was inconsistent quality in the prompt operability determinations. For example, A0140601 addressed two of 11 bolts in the manway to the residual heat removal suction valve from containment recirculation sump having inadequate thread engagement. In the evaluation the STA stated, "... this device is only designed for low pressure." While peak containment pressure is designed to be less than or equal to 12 psig, the STA did not properly evaluate the bolt stresses imposed from the peak containment pressure acting



on the manway. Other points in the STA evaluation gave enough data that an independent reviewer was able to reach the conclusion that the inadequate thread engagement did not represent an operability concern.

#### Licensee Corrective Actions to the Weak Prompt Operability Evaluations on Thread Engagement

Interviews with the STAs and other licensee personnel determined that additional guidance had recently been supplied to the STAs for thread engagement operability determinations. Operations Head Instruction (OHI) - 7030, Revision 2, Screening Action Requests and Condition Reports for Significance and Operability had been re-issued on May 14, 1998. Previously, this instruction had been canceled, but when it was re-initiated, it contained additional guidance for thread engagement issues. The additional guidance consisted of procedural steps and a methodology for calculating the ability of the remaining threads to carry the required load.

The OHI also corrected weak statements contained within ENTDM 97-077. For example, the ENTDM stated there was no operability concern on inadequate thread engagement with valve packing nuts if there was no leak. The OHI included this allowance but added the restriction "... with system pressurized and if applicable In-Service Inspection [sic] stroke times are within limits." The inspectors had noted this weakness in the ENTDM but had not yet informed the licensee of the weakness before it was corrected.

#### Review of Prompt Operability Determinations Unrelated to Thread Engagement Issues

The inspectors reviewed approximately 15 prompt operability determinations and assessed the adequacy of the licensee's operability determinations. The inspectors agreed with the conclusions of these determinations but found the quality of the assessments to be inconsistent.

The inspectors interviewed licensee personnel and determined that, as part of the corrective actions discussed in the Restart Plan, operability determination procedures had been re-evaluated. The licensee had already determined that the procedures, policies, and other guidance given for the performance of operability determinations needed substantial improvement. This finding was listed in the Operations Department self-assessment and would be implemented as part of that self-assessment.

Inspector review of licensee restart activities will be guided by NRC Manual Chapter 0350. The inspectors will select various licensee findings for review and assessment of corrective actions. While operability assessments may not specifically be reviewed the 0350 plan will assess the need for review of selected licensee activities.

#### c. Conclusion

The inspectors determined that prompt operability determinations for action requests and condition reports were weak and contained inconsistent documentation. The licensee had recently identified the need to provide additional guidance and training and was revising their process for performing operability determinations.

## II. Maintenance

### M1 Conduct of Maintenance

#### M1.1 General Comments

##### a. Inspection Scope (62707 and 61726)

Portions of the following maintenance job orders, action requests, and surveillance activities were observed or reviewed by the inspectors:

- 02 OHP - 4030. Surveillance Test Procedure (STP).030, Revision 24, Daily and Shiftly Surveillance Checks.
- C0044324, Disassemble, inspect, and change grease on inlet shutoff Valve 2-FW-114-2 to feedwater regulating Valve 2-FRV-220
- \*\*12 Engineering Head Procedure (EHP) 4030 Administrative Technical Requirement (ATR).223.001, Revision 0, Fire Pump Performance and Starting Sequence Tests
- C0043828, Maintenance Support to Fill and Load Bags with Ice

##### b. Observations and Findings

###### Wrong Unit Error

On May 21, 1998, licensee contractor personnel identified that they had inadvertently worked on Unit 1 Valve FW-114-2 instead of Unit 2 Valve FW-114-2. The error was discovered during a routine supervisory check of the work area. The wrong unit error occurred on the non-safety-related portion of the feedwater system. In the present operating Mode the feedwater system was cooled down and depressurized. However, the wrong unit error did represent a personnel safety near miss. Upon discovery of the error, the valve contractor immediately contacted the Shift Supervisor and stopped work.

The Area Service Manager, the Regional Service Manager, and the President and Chief Executive Officer of the contractor involved came to the plant on the following day. Licensee management expressed their disappointment to the contractor management, and the contractor management informed the licensee of their immediate corrective action plans. Following these meetings, the contractor management visited the inspectors and informed the inspectors of the seriousness in which they were taking the wrong unit error and their corrective actions.

Following re-training on the importance of following procedures and performing quality briefings, the licensee contractors were allowed to return to work approximately three days later. Due to previous contractor control problems (reference Inspection Report 50-315/98005), the licensee had been performing routine monitoring of contractors. Following the occurrence of a wrong unit error, increased monitoring of contractors was performed.

### Failure to Take Freeze Seal Data

On April 29, 1998, licensee personnel performed a freeze seal as part of necessary maintenance on a non-safety-related portion of the non-essential service water system (NESW). The 16" freeze seal was performed by contractor personnel and monitored by licensee employees. As part of their job order, the licensee employees were required to take periodic pipe temperatures at various locations. The contractors' procedures also required the recording of pipe temperatures.

The licensee employees assumed that they could transfer the contractor's temperature data after the work had been performed. When the licensee maintenance workers attempted to copy the contractor's data after the freeze seal had been thawed, they determined that the contractors procedure did not require the recording of data for every location that the licensee's job order had required.

#### c. Conclusions

Licensee contractor personnel identified that they had a wrong unit error and inadvertently worked on a Unit 1 valve instead of a Unit 2 valve. The wrong unit error occurred on the non-safety-related portion of the feedwater system while the system was cooled down and depressurized. Licensee management met with the contractor senior management and contractor management informed the licensee of the seriousness in which they were taking the error.

During a contractor performed freeze seal on a non-safety-related portion of the non-essential service water system (NESW), licensee employees failed to take the temperature data required by the job order. The licensee employees assumed that they could transfer the contractor's data after the work had been performed. However, when the licensee maintenance workers attempted to copy the contractor's data after the freeze seal had been thawed, they determined that the contractor's procedure did not require recording temperature data at every location that the licensee's job order required.

### M1.2 Ice Transport and Loading (Unit 1)

#### a. Inspection Scope (62707)

The inspectors observed licensee maintenance personnel move ice to the loading station and complete ice loading into temporary storage containers. The inspectors reviewed the job order paperwork; and the licensee procedures on maintenance planning and foreign material exclusion work practices.

#### b. Observations and Findings

The licensee produced safety-related borated ice which would later be loaded into the ice condenser baskets after the completion of ice basket inspection and repairs. The borated ice required temporary storage off-site until the baskets were ready for loading.

The inspectors reviewed Job Order (JO) C0043828, Maintenance Support to Fill and Load Bags with Ice, for loading borated ice into bags for temporary storage. The JO was written as guidance for performing the task, not as a procedure with detailed work steps.

Foreign material introduced into the ice during manufacture, storage or transport could be transported to the recirculation sump, possibly affecting the operability of the sump. Therefore, maintaining proper foreign material exclusion on the ice during manufacture, transport and storage was an activity affecting quality.

The inspectors reviewed Maintenance Administrative Procedure (MAP) MA3.3-05, Maintenance Planning. This MAP contains Attachment 5, Procedure Determination Screening Checklist, for use in determining whether a procedure is required for the proposed job order. The maintenance procedure supervisor stated that the attachment was not used when the JO for ice bag loading was prepared. The inspectors noted that no step in the body of the MAP directed the planner to use Attachment 5 during the course of planning the JO. This lack of procedural direction was considered a weakness.

The inspectors informed the ice condenser production manager of their determination that the ice loading evolution was not properly controlled by a detailed procedure. Loading of ice bags was suspended until a detailed procedure was developed and approved. The inspectors reviewed the new procedure, 12-MHP.SP.C43828, Ice Bag Filling, Revision 0, dated June 4, 1998, and had no additional observations.

10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

The task of loading ice required inspections for foreign material exclusion (FME) during bag filling, and affixing of an FME tag and security seal to each full bag prior to transport off-site is an activity affecting quality requiring appropriate quantitative or qualitative acceptance criteria for foreign material exclusion. The failure of the JO to contain detailed instructions or contain quantitative or qualitative acceptance criteria to crew members to ensure that foreign material did not enter the ice was considered a violation of 10 CFR Part 50 Appendix B, Criterion V, Instructions, Procedures, and Drawings (50-315/98012-02(DRP)).

c. Conclusions

The inspectors identified that the job order used for filling ice bags did not contain detailed instructions or assign crew responsibilities and was not appropriate to the circumstances. A violation of 10 CFR Part 50, Appendix B, Instructions, Procedures, and Drawings was issued.

M1.3 Isolation of Fire Pump Suction (Both Units)

a. Inspection Scope (71707)

On May 5, 1998, while lining up the fire system suction source in preparation for a routine surveillance, an auxiliary equipment operator (AEO) inadvertently isolated both fire water tanks, resulting in all three fire pumps automatically starting. Licensee management



assigned a root cause investigation team to determine the sequence of events and the cause or causes leading to the inadvertent isolation of the fire pump suction. The inspectors followed the team's investigation.

b. Observations and Findings

Licensee management promptly identified this event as a significant condition adverse to quality and assigned a root cause investigation team to the event on the same day the event occurred. The inspectors observed the team's interviews of the principle participants in the event (the AEO, Unit Supervisor, and test engineer). From these interviews and a review of the control room logs, the team determined the sequence of events leading to the automatic start of the fire pumps. The inspectors also observed the team's discussion and assessment of the information obtained from the interviews.

The licensee's investigation team determined that a pre-job brief was held between the AEO, Unit Supervisor, and test engineer prior to beginning the valve lineup. Following the brief, the AEO went to the fire water tanks and found that, contrary to his expectation, the south fire tank was in service. The AEO called the control room to report the unexpected lineup and received instruction to perform the test procedure lineup. The AEO followed the lineup in sequence, which resulted in the inadvertent isolation of both fire water tanks from the fire pumps. Fire header pressure dropped, and all three fire pumps automatically started. The Unit Supervisor then directed the AEO to reverse what he had done, and fire header pressure was restored. Subsequent surveillance testing of all three fire pumps was satisfactorily completed, and the pumps did not show any signs of damage. The inspectors did not find any discrepancies in the team's findings for the sequence of events.

At the end of this report period, the team had not yet issued the final report of their findings. The inspectors considered the root cause analysis of this event an inspection followup item (50-315/98012-03 (DRP)) pending a review of the final root cause analysis report.

c. Conclusions

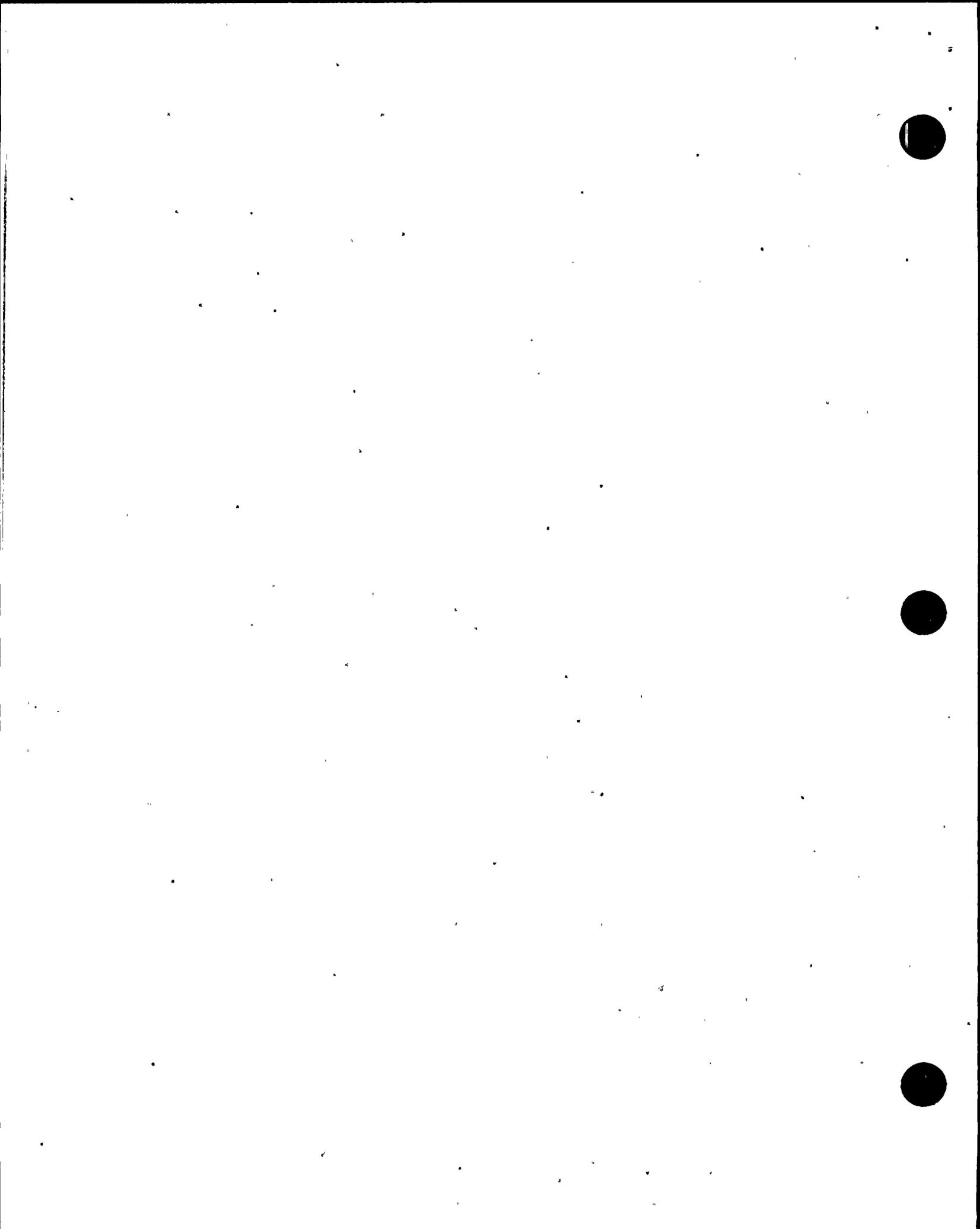
On May 5, 1998, while lining up the fire system suction source in preparation for a routine surveillance, an auxiliary equipment operator inadvertently isolated both fire water tanks, resulting in the automatic start of all three fire pumps. A root cause investigation team assigned by licensee management to investigate this incident had not yet issued a final report. An inspection followup item was opened pending the inspectors' review of the team's report.

**M7 Quality Assurance in Maintenance**

**M7.1 Inadequate Corrective Action for Failure to Perform Procedurally Required Surveillance (Unit 2)**

a. Inspection Scope (40500, 62707)

On May 5, 1998, licensed reactor operators identified that reactor vessel level was not being recorded as required by a surveillance procedure. Several days earlier the last



operating reactor coolant pump (RCP) was turned off as part of a planned evolution to perform a partial drain down of the reactor coolant system (RCS). The RCS was in Mode 5 (cold shutdown), and a surveillance procedure required that reactor vessel levels be recorded in order to ensure that a void did not form in the reactor vessel. With the last RCP shut off, non-condensable gases could accumulate in the reactor vessel head. The surveillance was to verify the extent of any non-condensable gas in the reactor vessel head. The inspectors performed an independent assessment of the licensee's findings and corrective actions.

b. Observations and Findings

On May 3, 1998, the operators stopped last operating RCP in Unit 2. On May 5, 1998, the Unit Supervisor performed a routine panel walkdown and open items review and identified the failure to comply with surveillance Procedure 02 OHP- 4030.STP.030, Daily and Shiftly Logs. The surveillance procedure required that the operators record reactor vessel level every 8 hours with the reactor in Mode 5 and no RCPs running. The procedure also required the daily venting of the RCS if the required channels of the reactor vessel level instrumentation system (RVLIS) were inoperable.

The Unit Supervisor identified that the RVLIS data required to be recorded after the last RCP was removed from service had a "Not Applicable" recorded instead. In addition, the Unit Supervisor identified that RVLIS data was taken on May 4, 1998, even though the RVLIS instruments were inoperable and listed in the open items log. With the RVLIS instruments inoperable, the surveillance procedure, performed each shift, required the reactor head to be vented once per day.

Although the RVLIS instruments were listed as inoperable, they were still available. RVLIS had been made inoperable for routine activities during the refueling outage that had begun in late 1997. Following the refueling outage, the RVLIS instruments had been reconnected and tested. All surveillances on the instruments were current; however, the post maintenance test (PMT) included a requirement to check for leaks once the reactor had been restored to normal operating pressure. The reactor had not yet been at normal operating pressure; therefore, the PMT had not been performed. Following notification by the control room on the morning of May 5, 1998, that the RVLIS instruments were needed, I&C modified the procedure to allow the RVLIS instruments to be declared operable pending a normal operating pressure walkdown.

Previous Instances of Failure to Comply with the Surveillance Requirement

The licensee identified a previous example of entering the conditions that required the monitoring of reactor vessel level and failing to do so. On December 17, 1997, a Unit Supervisor identified that the required RVLIS data was not being taken. At that time, the open items list showed that Channel 2-NLI-121 was operable and that Channel 2-NLI-120 was inoperable. Data was taken using 2-NLI-121, and the reactor head was not vented. The inspectors determined that, contrary to the status as shown in the open items list, both channels were inoperable because they had not had their required post maintenance testing following the refueling outage. At the end of the inspection period, licensee personnel were still evaluating the discrepancy between the open items list and the maintenance records for the operability of the RVLIS instruments.



Prior to December 16, 1997, the reactor vessel head had been vented at least once per day as required by the shiftly surveillance procedure. The inspectors' review of control room logs determined that RVLIS data was taken between December 16, 1997, and December 28, 1997, instead of the head being vented. This was due to the mistaken belief that one train of RVLIS was operable. On December 24, 1997, the licensee removed gas bubbles from the steam generators by running the RCPs for a short time. Following the short run of the RCPs the head was vented. On December 27, 1997, the RCPs were started and the need to monitor the reactor vessel head for voids was no longer applicable.

#### Open Items List

As noted above, the RVLIS instruments were shown as inoperable in the open items list. The operations shift turnover procedure required that the operators and supervisors review the list of open items prior to shift turnover. The inspectors interviewed operators about the components in the open items list. Most operators and supervisors stated that due to the large number of structures, systems, and components (SSCs) that were inoperable, it was difficult to maintain awareness of all components in the open items list. The inspectors concluded that the quality of the surveillance procedures, normal operating procedures, and maintenance procedures was important in order to ensure that the operators did not inadvertently depend upon instruments or equipment which were inoperable.

#### Mode 5 Normal Operating Procedure

Cooldown Procedure 02-OHP 4021.001.004 was being used to control the stopping of the RCPs. A note in the cooldown procedure stated that if RCS pressure dropped below 80 psig, then maintenance should install the reactor head vent rig so that manual venting could be performed. However, the surveillance procedure covering daily and shiftly requirements stated that for Mode 5, (which includes RCS pressures from 350 psig to 0 psig) the RVLIS instruments should be used to monitor vessel level. If the RCPs were not operating and RVLIS was inoperable, then the head should be vented once per day. The discrepancy between the cooldown procedure and the surveillance procedure contributed to the failure to comply with the surveillance procedure.

Data Sheet 5, Item 3.0, of STP.030 required that with the reactor in Mode 5 and no RCPs running, the operators record reactor vessel level every 8 hours or vent the reactor head once per day. On December 17, 1997, the licensee identified that on December 16, 1997, RVLIS data was not taken nor was venting of reactor head performed following the shutdown of the last operating reactor coolant pump. Corrective action consisted of a lessons learned E-Mail to the plant operators. On May 5, 1998, the licensee identified that on May 3, 1998, RVLIS data was not taken nor was venting of the reactor head performed following the shutdown of the last operating reactor coolant pump. The failure to implement adequate corrective actions for missed surveillance, STP.030, following the December 17, 1997 missed surveillance, resulted in missed surveillances on May 3, 1998. The inspectors concluded that the failure to take adequate corrective actions for a significant condition adverse to quality constituted a violation of 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Action (50-316/98012-01(DRP)).



The cooldown procedural requirements and the shiftly surveillance requirements were not identical. Thus, when cooling down in accordance with the cooldown procedure, the licensee encountered conditions for which they had not adequately prepared. Licensee personnel had known for several weeks that a cooldown was going to be performed. Detailed planning was not performed for this evolution with the result that the inoperable RVLIS instruments were not known to the operators.

On May 7, 1998, the licensee depressurized the reactor and vented the head in order to perform ultra-sonic testing of the part length control rod housings. The inspectors observed the operators manually vent the head and performed an independent calculation of the amount of non-condensable gases vented. The amount of gas was approximately 61 cubic feet and did not represent a threat to safely maintaining the unit in a shutdown mode.

c. Conclusions

Due to a failure to adequately correct a previous occurrence, the licensee performed an expected plant cooldown and failed to comply with surveillance requirements designed to monitor the formation of a gas bubble in the reactor vessel head. Inconsistent procedures, inattention to detail, and a large number of items in the open items log contributed to the repeat failure to follow the procedural requirements. A violation for inadequate corrective action was issued.

M8 **Miscellaneous Maintenance Issues 92903**

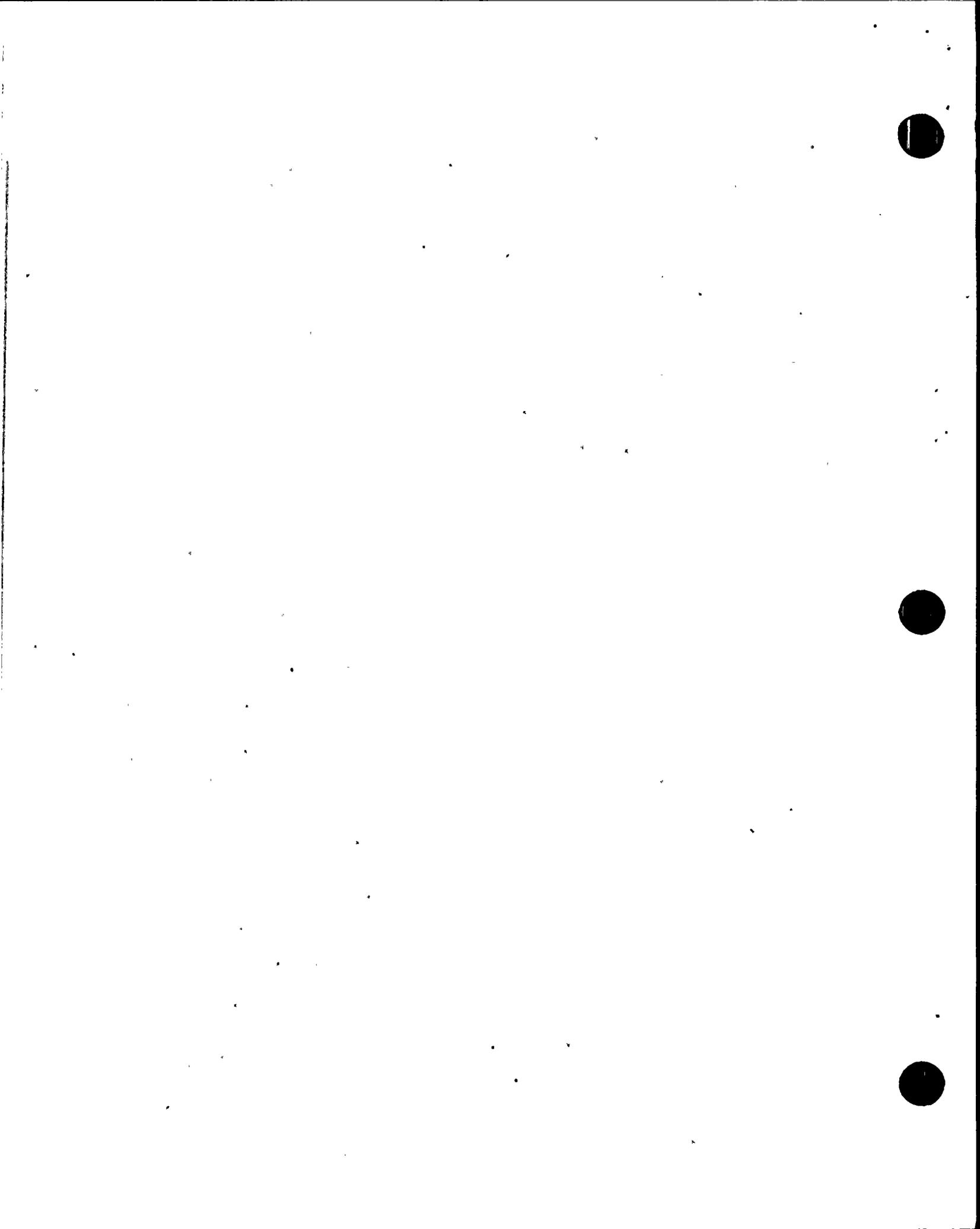
M8.1 (Closed) Notice of Violation (50-315/316-96013-01A2 and A3), Inadequate Procedure and Failure to Follow Procedure.

As part of the followup to the prompt operability determinations discussed in Section O3.1, the inspectors also reviewed the licensee's corrective actions to an inadequate thread engagement violation issued in Inspection Report 50-315/96013, System Operational Performance Inspection (SOPI).

The inspectors reviewed the licensee's corrective actions and selected some items for a more detailed assessment. The inspectors noted that the licensee had performed walkdowns to identify examples of inadequate thread engagements, had issued a new maintenance standing order (MSO - 009) requiring "flush or better" for thread engagement, and had enhanced Maintenance Head Procedure (MHP) 5021.001.009, Torque Selection, by requiring flush threads or better.

The inspectors review of Revision 8, Change Sheet 3 to MHP 5021.001.009, identified that a change had been implemented to add a requirement in Change Sheet 2 (dated March 10, 1997) to Attachment 3. Note B of Attachment 3 stated, "Minimum thread engagement of flush or better is required for all fasteners unless evaluated and tagged per MSO - 009 or ...."

The inspectors determined that even though flush or better requirements had been added to Attachment 3 that the original requirement of only 0.8 times nominal bolt diameter had been inadvertently left in Step 3.4.5. Upon notification, change Sheet 4 was issued which modified Step 3.4.5 to match Note B of Attachment 3. Inspector interview with selected



maintenance and quality control personnel determined that, even though Step 3.4.5 had not been altered, the requirement of flush or better was known and was followed.

The inspectors also determined that, the statement in Attachment 3 notwithstanding, MSO - 009 did not have adequate guidance for tagging components to show that less than full thread engagement had been reviewed and was acceptable. The MSO stated that thread engagement issues could be reviewed and tagged as allowable but failed to provide guidance on the nature of the review or provide a tagging mechanism. The inspectors also determined that the tagging of bolts as acceptable was not utilized by licensee personnel.

Licensee personnel identified the weakness in MSO - 009 before the inspectors notified them of the weakness. Licensee personnel wrote a CR and began corrective actions. This violation is closed.

### III. Engineering

#### E1 Conduct of Engineering

##### E1.1 Quality of Engineering Input Into Operations Procedure on Ventilation Requirements (37551)

The inspectors determined that the procedural guidance which controlled the ventilation requirements for safety-related equipment was weak. The guidance within the procedure was provided by Engineering Department personnel. Engineering Department personnel did not adequately consider the consequences of inoperable ventilation equipment when providing guidance to a procedure utilized by the Operations Department.

#### E3 Engineering Procedures and Documentation

##### E3.1 Misleading Engineering Technical Direction Memo (ENTDM) (37551)

On May 11, 1998, during a routine review of control room documentation, the inspectors determined that ENTDM 97-0138, dated December 12, 1997, was misleading. Interviews with reactor engineering personnel determined that the purpose of the memo was to save time and money by preventing an unnecessary dilution of the RCS and subsequent re-orientation for test purposes. The memo as written appeared to add procedural requirements to maintain the RCS boron concentration differently than specified by the control room shutdown margin calculations.

Reactor engineering personnel issued ENTDM 98-056, dated May 13, 1998, which clarified that the boron concentration in the memo was only requested and was not a required value. On June 6, 1998, the inspectors attended a portion of the Operations Department self-assessment debriefing. The portion attended discussed reactivity control. In the meeting, four of five Shift Supervisors stated that ENTDM 98-056 was confusing in that it appeared to add new and unreviewed boron concentrations limits. The Operations Superintendent directed that a CR be issued and that reactor engineering be requested to revise the memo again.



E7 Quality Assurance in Engineering Activities

E7.1 System Engineering Review Board (SERB)

a. Inspection Scope (37551 and 40500)

The inspectors observed selected SERB meetings, assessed SERB activities and verified compliance with the SERB charter.

b. Observations and Findings

During the SERB meetings attended by the inspectors the SERB members were observed to question and challenge the system engineers' walkdown findings. The SERB members applied the restart criteria contained in an attachment to the Restart Plan to the walkdown items identified by the walkdown teams. The inspectors observed the SERB members to question and challenge the statements by the system engineers and to place items on the potential restart list as needed. The items on the potential restart list were later reviewed by the Restart Oversight Committee (ROC) for approval to be added to the Restart List.

The inspectors observed that the SERB did not appear to be in compliance with the intent of the SERB charter. The purpose of the SERB as stated in the Restart Plan was to "... ensure that restart decisions reflect the shared concerns of Operations, Maintenance and Engineering." Towards that end, Action 1 of the SERB charter stated:

"... A representative of Operations and Maintenance knowledgeable of the system's restart issues will support the system engineer and ensure the perspective of the other production groups is considered. The Operations representative will normally be an Shift Supervisor or a Unit Supervisor of the Operations crew responsible for the system, but can be a Shift Supervisor assigned to the Work Control Center."

Actions 2 and 3 of the SERB charter stated, "Designate systems that are required to be presented to the SERB by system engineer, Maintenance and Operations." and "The system engineer, Operations or Maintenance representatives will also identify other issues which are not identified as potential restart issues but may be questioned."

The inspectors had observed that the SERB meetings did not include any representative from the Operations or Maintenance departments. When questioned concerning the apparent failure to meet the intent of the SERB charter, the SERB chairman initially stated that Operations and Maintenance were not intended to be a part of the SERB meetings. The SERB chairman then stated that the SERB was still on a learning curve and would include Operations and Maintenance in later meetings. The inspectors pointed out that the status charts showed that the system readiness reviews were approximately 60 percent complete.

On May 4, 1998, the inspectors attended the regularly scheduled SERB meeting. A member of Operations was present; however, it was one of the extra Reactor Operators on shift and was not a licensed Senior Reactor Operator (SRO). No member of Maintenance was present. On May 5, 1998, the Assistant Operations Superintendent (an



SRO) attended, but part way through the meeting he called the extra RO to take his place. Again, no member of Maintenance was present. On May 6, 1998, no member of Operations or Maintenance was present.

The inspectors informed licensee senior management of the apparent failure to meet the intent of the SERB charter with the result that on Monday, May 11, 1998, a SRO attended the SERB meeting. Several days later a member of the maintenance organization began attending the SERB meeting.

c. Conclusions

The inspectors determined that the System Engineering Review Board (SERB) and the Restart Oversight Committee (ROC) appeared to be doing an effective job of reviewing the items identified by the system engineers; however, there was a failure to comply with the SERB charter. This resulted in the initial failure of the Restart List to reflect the shared concerns of Operations, Maintenance and Engineering. The inspectors discussed observations of this failure with licensee management several times before effective corrective actions were taken.

IV. Plant Support

**R1 Radiological Protection and Chemistry Controls (71750)**

During the resident inspection activities, routine observations were conducted in the areas of radiological protection and chemistry controls using Inspection Procedure 71750. No discrepancies were noted.

**S1 Conduct of Security and Safeguards Activities (71750)**

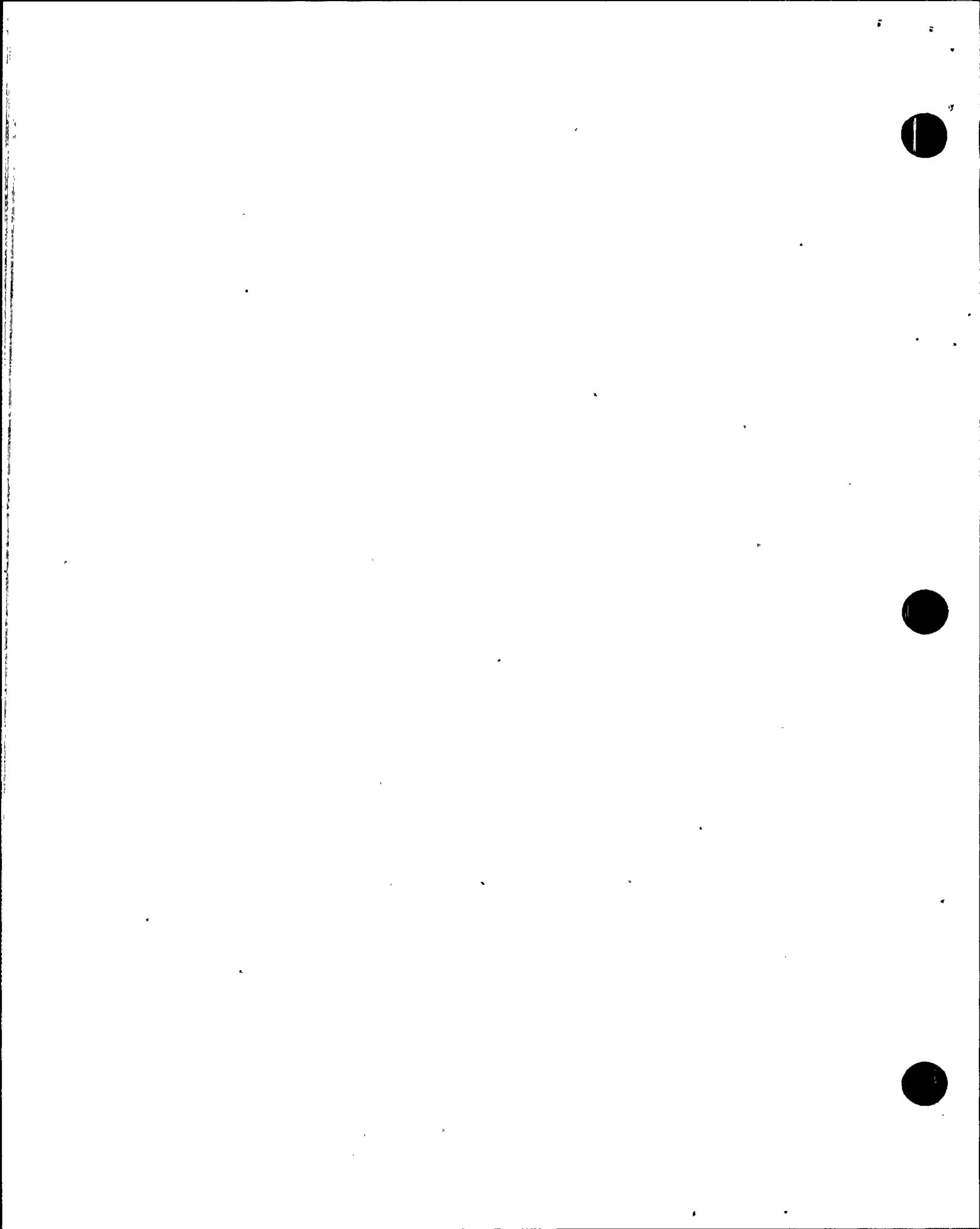
During normal resident inspection activities, routine observations were conducted in the areas of security and safeguards activities using Inspection Procedure 71750. No discrepancies were noted.

**F1 Control of Fire Protection Activities (71750)**

During normal resident inspection activities, routine observations were conducted in the area of fire protection activities using Inspection Procedure 71750. No discrepancies were noted.

**X1 Exit Meeting**

The inspectors presented the inspection results to members of the licensee management at the conclusion of the inspection on June 8, 1998. The licensee had additional comments on some of the findings presented. No proprietary information was identified by the licensee.



## PARTIAL LIST OF PERSONS CONTACTED

### Licensee

#M. Ackerman, Nuclear Licensing  
#K. Baker, Manager, Production Engineering  
#J. Boesch, Maintenance Superintendent  
#S. Brewer, Regulatory Affairs  
#D. Cooper, Plant Manager  
#MB. Depuydt, Nuclear Licensing  
#M. Eberhardt, Nuclear Licensing  
#S. Farlow, Supervisor I&C Engineering  
#M. Finissi, Supervisor, Electrical Systems  
#R. Gillespie, Operations Superintendent  
#G. Hines, Mechanical Component Engineering  
#P. Holland, Radiation Protection  
#J. Hoss, Design Engineering  
#D. Morey, Chemistry Superintendent  
#P. Russell, Supervisor, Plant Protection  
#P. Schoepf, Supervisor, Safety-related Mechanical Systems  
#J. Tyler, Manager, Plant Protection and Emergency Preparedness  
#L. VanGinhoven, Materials Management  
#A. Verteramo, Supervisor Reactor Engineering  
#D. Walton, Performance Assurance

#Denotes those present at the June 8, 1998, exit meeting.

INSPECTION PROCEDURES USED

IP 37551 On-site Engineering  
IP 61726 Surveillance Observations  
IP 62707 Maintenance Observation  
IP 71707 Plant Operations  
IP 71750 Plant Support Activities  
IP 92700 Onsite Review of LERs

ITEMS OPENED, CLOSED, AND DISCUSSED

ITEMS OPENED

50-316/98012-01 VIO Inadequate corrective actions related to monitoring reactor vessel level indication or venting the reactor head.  
50-315/98012-02 VIO Procedure inappropriate to the circumstance for moving ice  
50-315/98012-03 IFI Review of licensee's root cause assessment of operating all three fire pumps without a suction source.

ITEMS CLOSED

50-315/96013-01A2 VIO Inadequate Procedure and Failure to Follow Procedure  
50-316/96013-01A2  
50-315/96013-01A3 VIO Inadequate Procedure and Failure to Follow Procedure  
50-316/96013-01A3



## LIST OF ACRONYMS

AEP	American Electric Power
bcc	blind carbon copy
cc	carbon copy
CCW	Component Cooling Water
CFR	Code of Federal Regulations
CR	Condition Report
DCC	Donald C. Cook
DRP	Division of Reactor Projects
DPR	Demonstration Power Reactor
ECCS	Emergency Core Cooling System
EDT	Eastern Daylight Time
ENTDM	Engineering Technical Direction Memo
ESF	Engineered Safety Feature
ESW	Essential Service Water
I&C	Instrumentation and Control
IHP	I&C Head Procedure
IR	Inspection Report
JO	Job Order
LOCA	Loss of Coolant Accident
MI	Michigan
NCV	Non-Cited Violation
NESW	Non-Essential Service Water System
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulator
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RVLIS	Reactor Vessel Level Instrumentation System
PDR	Public Document Room
SE	Safety Evaluation
SM	Shift Manager
SP	Special Procedure
SRO	Senior Reactor Operator
STP	Surveillance Test Procedure
S/G	Steam Generator
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item

