APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-285/90-36 Operating License: DPR-40

Docket: 50-285

Licensee: Omaha Public Power District
444 South 16th Street Mall
Omaha, Nebraska 68102-2247

Facility Name: Fort Calhoun Station (FCS)

Inspection At: FCS, Blair, Nebraska

Inspection Conducted: December 3-20, 1990

Inspectors: John Pellet for J. E. Gagliardo, Team Leader 2/21/91 Date

M. E. Murphy, Reactor Inspector, Test Programs Section, Division of Reactor Safety
L. E. Ellershaw, Reactor Inspector, Materials & Quality Programs Section, Division of Reactor Safety
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Approved: John Pellet 2/21/91
J. P. Jaudon, Deputy Director, Division of Reactor Safety Date

Inspection Summary

Inspection Conducted December 3-20, 1990 (Report 50-285/90-36)

Areas Inspected: Special, announced reinspection of maintenance activities in the areas that were found to be of concern in the original maintenance team inspection conducted March 13 through April 21, 1990.

Results: Within the areas inspected, no violations or deviations were identified. The overall conclusion drawn by the team was that the licensee had evidenced improvement in all areas of the inspection with some areas showing marked improvement. There was the additional conclusion that the licensee was committed to further improvement and that this was to be an on-going process.

DETAILS

1. PERSONS CONTACTED

OPPD

*M. P. Bose, Mechanical Maintenance Planner
M. W. Butt, Instrumentation and Control (I&C) Supervisor
*G. S. Cary, I&C Planner
*J. W. Chase, Manager, Nuclear Licensing
*G. M. Cook, Nuclear Licensing Engineer
*M. R. Core, Supervisor, Maintenance
*S. K. Gambhir, Division Manager, Production Engineering Division
*W. G. Gates, Division Manager, Nuclear Operations Division
E. Gleisberg, I&C Trainer
T. Green, I&C Technician
T. W. Jamieson, Supervisor, Pressure Equipment Maintenance
*R. L. Jaworski, Manager, Station Engineering
R. Johansen, Supervisor, Planning and Scheduling
*L. T. Kusek, Manager, Nuclear Safety Review Group
R. H. Lichtenstein, Systems Engineer
C. J. Linden, Preventative Maintenance Coordinator
T. Matthews, I&C Trainer
*T. J. McIvor, Manager, Nuclear Projects
R. J. Mueller, Supervisor, Nuclear Projects
T. Nguyen, Systems Engineer
*W. W. Orr, Manager, Quality Assurance/Quality Control (QA/QC)
*T. L. Patterson, Plant Manager
R. Perry, I&C Technician
*R. L. Phelps, Manager, Design Engineering
D. L. Rollins, Special Services Engineer
*C. F. Simmons, Station Licensing Engineer
*T. G. Therkildsen, Supervisor, Nuclear Licensing
*J. E. Vanecek, Senior Maintenance Planner, Electrical
S. Vittitoe, Meter Test and Equipment (MT&E) Clerk (I&C)
S. Wilsbacher, I&C Technician

The inspectors also contacted other members of the licensee's staff during the inspection.

*Denotes those persons that attended the exit interview on December 20, 1990.

2. ACTION ON PREVIOUSLY IDENTIFIED INSPECTION FINDINGS (92701)

2.1 (Closed) Inspector Followup Item (285/8940-06): Stroke Testing of Pressurizer Power Operated Relief Valves

This item concerned the licensee's apparent lack of stroke testing of the power operated relief valves (PORVs) under conditions approximating those under which these valves are required to operate.

The licensee developed Surveillance Test Procedure OP-ST-RC-3004, "Power Operated Relief Valves (PORVs) Low Temperature Low Pressure Exercise Test (PCV-102-1 and PCV-102-2)." The licensee performed the stroke test on both valves, with acceptable results, on February 20, 1990, during the 1990 refueling outage and the procedure has been incorporated into Revision 5 of the inservice testing program plan.

This item is considered closed.

2.2 (Closed) Unresolved Item (285/8901-04): Auxiliary Feedwater (AFW) System Pumps Test Methodology

This item dealt with the licensee's method of testing the AFW pumps. The tests were performed using minimum flow rates rather than measuring full flow rates.

The licensee installed flow lines which would allow the measuring of full flow rates for both AFW pumps (FW-6 motor driven and FW-10 steam driven). This work was primarily accomplished under Modification FC-88-017 and was completed during May 1990. The first full flow rate tests performed on each pump were completed on July 6, 1990, using Special Procedure SP-FW-17, "Auxiliary Feedwater Full Flow Recirculation Test," Revision 0, dated June 14, 1990. Subsequently, a surveillance test procedure was developed in order to perform the required quarterly inservice tests. Procedure SE-ST-AFW-3004, "Auxiliary Feedwater Pumps, Steam Isolation Valve, And Check Valves Test," Revision 1, was used for the performance of the second quarterly test completed on October 2, 1990.

The actions taken by the licensee were responsive to this issue, therefore, this item is closed.

2.3 (Closed) Inspector Followup Item (285/8940-04): Implementation of Class IE Inverted Preventive Maintenance (PMs)

This item related to the development and implementation of PM Procedure EM-PM-EX-0800, "Instrument Inverted Maintenance." The inspector reviewed the completed procedures for all four instrument inverters. Procedure EM-PM-EX-0800 had been conducted satisfactorily on all instrument inverters during the 1990 refueling outage. The licensee had established a frequency for conducting maintenance during every refueling outage. The inspector verified that the procedure provided instructions for cleaning, inspecting, and verifying operability of the inverters.

This item is considered closed.

2.4 (Closed) Open Item (285/9004-01): Responsibility for Post-Maintenance Testing Not Established

This item dealt with the lack of a clear assignment of responsibility for specifying post-maintenance testing for maintenance work items. The inspector reviewed Standing Order M-101, "Maintenance Work Control", Revision 11, dated

September 24, 1990, and determined that responsibility for specifying post-maintenance testing had been assigned to the system engineers.

This item is considered closed.

2.5 (Closed) Open Item (285/9004-02): Responsibility for Post-Maintenance Testing For Temporary Modifications Not Specified

This item dealt with the fact that Standing Order O-25, "Temporary Modification Control", did not specifically address requirements for review of the temporary modifications for post-installation or restoration testing. The inspector reviewed Standing Order O-25, Revision 32, and determined that responsibility for the review of temporary modifications for post-installation and restoration testing has now been included.

This item is considered closed.

3. REINSPECTION OF MAINTENANCE PROCESS

3.1 Reinspection Objective

Background

Temporary Instruction (TI) 2515/097 was issued in September 1988 to provide guidance for conducting assessment inspections of the maintenance process at all operating nuclear power stations. The team inspections performed under this TI began in the fall of 1988 and were completed in late 1990. The NRC has been evaluating the need for the issuance of a maintenance rule and has concluded that the criteria for determining the need for rulemaking should include the progress that licensees have made in improving the areas of maintenance assessed as needing significant improvement under the original inspections. In October 1990, the NRC issued TI 2515/108 to provide guidance for conducting reinspections of the maintenance process at selected sites. The objective of the reinspections is to examine the scope and effectiveness of the corrective actions taken as a result of the findings from the previous maintenance team inspections at the selected sites. The inspections are also designed to assess the status of the present maintenance process at a site as compared to the status of maintenance at the time of the previous inspection.

Scope

The guidance in TI 2515/108 calls for the maintenance team reinspections to be performed at those plants for which the maintenance process was in need of significant improvement. The reinspections includes a review of the findings (violations, unresolved items, and weaknesses) that remain open from the previous inspection. The reinspection also include those areas that were colored "red" in the initial inspection report tree, and those areas colored "yellow" for which weaknesses or concerns were identified. The Fort Calhoun site was selected for this inspection based on the results of the original inspection conducted in March through April 1989. The inspection team reviewed NRC Inspection Report (50-285/89-01), which documented the findings from the previous inspection, and determined the scope of the reinspection.

The licensee's response to the original report and the results of followup inspections in maintenance were also reviewed as part of the preparation for this inspection effort. The areas that were reinspected and the inspection findings are identified in this report.

Report Format

The findings sections of this inspection report are provided in two styles of print to facilitate comparison between the maintenance process as found during the original inspection and that found during this inspection. The findings from the original inspection are presented first in italicized print and can be traced back to the original report through the page number referenced in parentheses. In reading this report, the reader will note that there appear to be redundant findings from the original report list in more than one section of this report. This occurs because of the report format changes and the inherent overlap of areas covered in maintenance team inspections. References to licensee response letters or to followup inspection reports are also shown in parentheses. The findings from this inspection effort follow that from the original effort and are in standard print. The rating assigned to each area is shown on the attached tree. The "Conclusion" sections of the report document the inspection team's conclusions regarding the licensee's performance in that area. The conclusions include a statement that indicates the team's position as to whether or not the area has improved, declined, or remained unchanged.

3.2 Overall Plant Performance Related to Maintenance

3.2.1 Direct Measures

3.2.1.1 Scope

This portion of the NRC inspection dealt with reviewing the direct measures for determining overall plant performance, plant operability, and the general reliability of plant systems and components. The inspection and assessment of direct measures were conducted by performing extensive tours of the plant to observe and assess the material condition of the plant, to monitor ongoing maintenance activities, and to note the status and use of clearance tags, deficiency tags, and other means of identifying material deficiencies and ongoing or future maintenance activities.

3.2.1.2 Findings

(Findings from original report 50-285/89-01)

Housekeeping was found to be poor in several areas, e.g., fuel oil and fuel oil soaked rags were found in the diesel generator areas; control room panels were in disrepair and with trash and debris in them; trash in safety-related cable trays; damaged cable tray covers; and cable tray covers and dividers with loose and missing fasteners. (page 33)

(Findings from this inspection effort)

The inspectors reviewed the licensee's Standing Order Procedure G-6, "Housekeeping." The procedure assigned specific responsibilities for the implementation of plant walkdown inspections and the documentation of the inspection results. The procedure also established guidelines to ensure material deficiencies, industrial safety hazards, cleanliness and housekeeping deficiencies, and radiological protection deficiencies were identified and corrected.

The inspectors toured selected areas of the facility, including the control room, electrical switchgear rooms, station battery rooms, emergency diesel generator rooms, raw water intake structure, and selected turbine building areas to assess the material condition of the plant.

The installation of the system, company and structure name tags was nearing completion and was deemed by the inspectors to be a significant enhancement to plant safety.

The inspectors toured the area of the recently installed diesel driven AFW pump. Licensee representatives stated that the pump had not been tested routinely. The pump was lined up to take a suction from the condensate storage tank (untreated demineralized water) and the licensee did not desire to add untreated water (with corrosion products) to the steam generators during normal operations or testing activities. A modification to the system was planned to provide the third AFW pump with a chemical feed system.

With the exception of two findings by the inspector, housekeeping was found to be good in all areas observed. The two exceptions were the observation of a fuel oil leak on the floor of room 65 under the drain valve of the No. 2 diesel generator's day tank and the accumulation of dirt and trash in the cable trays between the diesel generators and their respective switchgear. The licensee took immediate action to correct these discrepancies.

The inspectors observed that material deficiencies were being identified by the licensee. A sample of the licensee observed deficiencies found that these deficiencies were being corrected.

During the plant tours, the inspectors noted that the heating units for the emergency diesel generator rooms were supplied from the plant auxiliary steam system. The inspector discussed the matter with the system engineer and reviewed the design basis documents associated with the emergency diesel generators and the heating and ventilation (HVAC) system. The auxiliary steam system supplied heating steam for a number of building areas and equipment, including the emergency diesel generator rooms. The supply of steam to the auxiliary steam system was from the main steam (secondary system) or the auxiliary boiler, representing a contained source of high energy steam within the safety-related areas at FCS. The auxiliary steam system was not designated as seismically designed system (classified as a safety-affecting or safety-related) and had apparently not been included in design basis documents.

The inspectors were concerned regarding the ability of the auxiliary steam system to withstand a design basis event or system failure without adversely impacting safety-related equipment, which was designed to function in a mild environment (normal temperature and humidity conditions). This issue is an inspector followup item (285/9036-01) and will be evaluated in a subsequent inspection.

3.2.1.3 Conclusions

The plant tours revealed the overall condition of the plant areas to be well maintained and controlled and had significantly improved from the conditions found in the original inspection.

The licensee's efforts in the performance of plant walkdown inspections have improved dramatically since the original maintenance team inspection. The implementation and effectiveness of the licensee's housekeeping and plant inspection programs indicate that responsible managers and supervisors understood and supported excellent standards in this area.

3.3 Management Organization and Administration

3.3.1 Establish Policy, Goals and Objectives for Maintenance

3.3.1.1 Scope

This portion of the inspection dealt with determining the extent to which management supported the maintenance activities through corporate and plant directives, assignment of responsibility and authority, and accountability for the maintenance process.

3.3.1.2 Findings

(Findings from original report 50-285/89-01)

Licensee maintenance management support was adequate, but could still be strengthened. Licensee management was aware of maintenance program weaknesses and was implementing improvements. (page 38)

(Findings from this inspection effort)

The inspectors reviewed the licensee's policies, goals, objectives, and interviewed a large cross section of plant personnel, including technicians, supervisors, and managers.

The licensee had made considerable effort in the development of policies, goals, and objectives. Written procedures were in place to accomplish this objective. A review of training records and interviews with several individuals indicated that these policy goal and objectives were being communicated during training sessions. The attitudes towards acceptance of these policies and willingness to comply with these policies were positive by plant personnel.

The inspectors found some discrepancies in the implementation of the licensee's directives. There was an apparent reluctance on the part of the supervisors and system engineers to write or request temporary procedure changes when such changes were needed. A licensee representative acknowledged the concern and indicated that the licensee was trying to develop a change in attitudes on this issue.

The inspectors also noted that many valuable means were available to the supervisors and were being used. It was not apparent, however, if management was paying appropriate attention to one of these improvement mechanisms "Observation Worksheet" (Form FC-1120). Several of these observation worksheets were reviewed by the inspectors and many excellent observations were noted. For example, in November 1989 the need for a general trouble shooting guideline was identified, but MDI-10 (the trouble shooting guideline) had not yet been issued. This observation raised the question regarding management's openness to suggestions for improvement and their willingness to act upon these suggestions.

The observation worksheets were not "user friendly." A large amount of paperwork had to be performed in preparing the worksheet, and the inspector believed this fact might deter personnel from documenting observations. This reluctance would keep valuable information from being identified and would limit the effectiveness of the licensee's self evaluation and performance monitoring program.

3.3.1.3 Conclusions

This area was viewed by the team as having improved from the last inspection. The licensee had developed a strong set of policies, goals, and objectives for the maintenance area. They also had a strong program to maintain and improve the policies, goals, and objectives. Some minor discrepancies were found in the implementation of these policies, goals, and objectives that warrant improvement.

3.3.2 Conduct Performance Measurements

3.3.2.1 Scope

This portion of the inspection dealt with the quality and extent of the measures taken by the licensee to measure the performance of maintenance activities. The inspectors reviewed the licensee's efforts to determine if performance measures such as surveillances, work sampling, walkdown inspections, root cause analyses, feedback information, and performance indicators were used to assure that the quality of the maintenance efforts met licensee expectations.

3.3.2.2 Findings

(Findings from original report 50-285/89-01)

A history of leakage problems with two AFW discharge check valves, the main feed water pumps and various main feed water valves indicated that an improved PM program including root cause analysis was warranted. (pages 17, 23)

It was also found that the high pressure safety injection pumps were tested using the pump minimum recirculation flow path, and no flow measurements were required. This test was conducted in accordance with Procedure ST-SI/CS-1. The minimum flow tests, without flow measurement, did not provide sufficient information to detect degraded pump performance. The inservice testing engineer indicated that full-rated flow pump tests would be performed for future surveillance tests. (page 7) (See also Unresolved Items 285/89-01 & 89-04)

(Findings from this inspection effort)

The inspectors reviewed the programs and controls that had been established to monitor the performance of plant equipment. The inspectors also reviewed selected test procedures and test data associated with the surveillance and inservice test programs.

The inspectors found that the opening and closing times on Valve HCV-865 had changed and was within the alert range. The ISI coordinator had noted the need for a retest of the valve in December 1990 as part of the evaluation of the situation to determine specific corrective actions. The subsequent review of the licensee actions regarding this matter is considered an inspector followup item. (285/9036-02)

A 5-year check valve test plan had been established that included the implementation schedule and methodology to be used through 1994 for selected check valves. The inspection plan was a dynamic document. The plan addressed 280 check valves. Eight additional valves were to be added after a modification to the emergency diesel generator starting air system. The specific check valve failure rate was included as an item within the October performance indicator report and was compared to the industry failure rate. The licensee calculations indicated that the FCS check valve failure rate for October 1990 was slightly above the industry failure rate, but the overall 1990 failure rate was trending downward. The licensee attributed the higher failure rate in October to the failures identified during scheduled maintenance on check valves which had not been previously tested or inspected.

The emergency diesel generator performance data issued on November 5, 1990, indicated that the monitored parameters were normal with the exception of the fuel oil pump discharge pressure on the No. 1 emergency diesel. This pressure had been increasing over a period of time, but the fuel oil pump discharge pressures on both emergency diesels was normal during the most recent testing activities. The inspector discussed this situation with the system engineer and found that the emergency diesel fuel oil tanks had been cleaned during the previous outage; sediment had been removed. The elevated fuel oil pump

discharge pressures were a result of residual tank sediment entering the installed duplex filters. The filters were changed. The system engineer stated that a differential pressure instrument was to be installed during the 1991 outage to measure the pressure drop across the fuel oil filters and to provide enhanced monitoring of filter performance.

The most recent station battery performance data revealed that cell number 6 of battery EE8A had exhibited a decrease in the specific gravity reading. The system engineer stated that no adverse trend existed regarding the performance of this battery cell.

The inspector reviewed the maintenance observation process established by the licensee. The inspector discussed the process with the licensee. Licensee representatives stated that the process was difficult and time-consuming and that some changes were needed to improve the efficiency and effectiveness of the activity. The licensee's goal was for first-line supervisors to perform two observations each month in 1990 and four each month in 1991. The observations were for the purpose of early problem identification.

The licensee's performance indicator report was prepared monthly by the system engineering test and performance group. It included about 80 selected FCS indicators. The report contained about 20 performance indicators associated with the safety enhancement program items and also included the 10 industry key parameters. The report also included adverse trend indicators requiring increased management attention. The inspectors noted that the distribution of the routine report within the OPPD organization was extensive. The performance indicator for the number of corrective, nonoutage maintenance work orders open at the end of the reporting month (backlog) was 361. The goal for this indicator was "less than 500." The licensee indicated that a reduction in this goal was being considered based on their good performance to date.

The inspectors reviewed post-maintenance testing, surveillance testing (ST) records, maintenance work orders (MWOs), and observed the repair of leak rate test of a mechanical penetration of a reactor coolant sample line containment isolation valve in an attempt to assess certain performance measurements. With respect to surveillance activities, it was noted that maintenance and test procedures had undergone considerable changes and revisions which indicated that the procedures had been reviewed and revised as required. The number of changes tended to indicate that procedural attributes could not or had not been verified at some time in the past and that there were several iterations required in order to assure a complete and technically correct procedure.

The inspectors attended plan-of-the-day meetings, at which personnel from the various disciplines (i.e., mechanical, I&C, electrical, procurement, engineering, and quality) met to review, coordinate, and discuss the status of scheduled activities, and any newly identified activity. The meetings showed that there were considerable interface activities and that the work item status was clearly understood.

The inspectors observed prework meetings among the personnel assigned to perform work. The inspectors did not observe any supervisory walkdown activities during the performance of the maintenance work and the subsequent testing; however, a lead craftsman, with procedurally specified qualifications, was responsible for the accomplishment of these tasks. Assigned QC personnel were observed performing their required activities.

It was noted that the MWOs provided information regarding a description of the problem, applicable Technical Specifications, technical equirements (i.e., procedures to be used, required post-maintenance testing, and operability testing), planning, and quality requirements. Additionally, provisions for documenting the actual work performed were also provided. In addition tagging requirements were specified; operability of redundant equipment was verified; and any limited condition for operation was delineated.

As identified in the original maintenance team inspection, the high pressure safety injection (HPSI) pumps and the AFW pumps had been tested using the pump's minimum recirculation flow path and no flow measurements were being taken. The licensee performed an extensive review of their ISI/IST program which resulted in the identification of needed changes. Revision 5 to the ISI/IST program was submitted on October 8, 1990. In Part 3, Table 3.1 of the program delineated the test requirements and frequencies for each of the 26 American Society of Mechanical (ASME) Class 1, 2, or 3 pumps. Each of the pumps were full flow tested on a quarterly basis with the exception of the HPSI pumps, low pressure safety injection (LPSI) pumps, containment spray (CS) pumps, and the boric acid (BA) pumps. These pumps were tested quarterly using the minimum flow recirculation line, and they will be tested for full-flow rate either during a cold shutdown or a refueling outage. This exception was documented in Code Exception Number E4, "Relief Request," Revision 5.

While it was observed that supervisory personnel in the I&C and electrical disciplines did perform walkdowns regarding the work activities of their crews, these walkdowns were not consistent. It was not apparent that specific walkdown requirements were specified. Review of observation worksheets, (Form FC-1120) revealed that supervisors did perform observation activities as was shown by some of the documented observations.

3.3.2.3 Conclusions

The licensee's efforts in measuring the performance of maintenance activities had improved since the original maintenance team inspection.

3.4 Technical Support

3.4.1 Engineering Support

3.4.1.1 Scope

This portion of the inspection dealt with the engineering support area and included a review of the following:

- Failure analysis
- Preventive maintenance (PM)
- Inhouse versus contracted maintenance
- Material qualifications
- Compliance with applicable codes and standards
- Industry initiatives
- System engineering
- Post-maintenance testing

The inspectors reviewed documentation; held discussions with plant engineering and management personnel; and examined in-process, completed, or scheduled maintenance activities to ascertain the adequacy of the engineering support of the maintenance process.

3.4.1.2 Findings

(Findings from original report 50-285/89-01)

Procedure ST-ISI-SI-1, for safety injection valves, was not consistent with the requirements of ASME, Section XI. Two different stroke times were measured; one was a local stroke time, and the other a light-to-light stroke time. The lesser of the two stroke times was always used to compare with the acceptance criteria. This practice is unacceptable in identifying maintenance needs for valves. (page 7) (See also Inspector Followup Item 285/8901-02)

The HPSI pumps were tested using the pump minimum recirculation flow path, and no flow measurements were required. The minimum flow test, without flow measurement, did not provide sufficient information to detect degraded pump performance. (page 7) (See also Unresolved Items 285/8901-01 and 04)

Scheduled maintenance for air-operated valves was not identified. (page 12)

The licensee indicated that these items would be corrected.

The licensee failed to have a safety evaluation for several modifications, in accordance with 10 CFR Part 50.59. (pages 25, 26) (Violation 285/8901-05, closed in NRC Inspection Report 50-285/90-27)

It was also noted that post-maintenance testing was not always performed, and no explanation was given for not performing the testing. The licensee had recently issued Standing Order M-102, which provided for control of post-maintenance testing. (page 8)

Weaknesses were also identified in the documentation of, and the methodology for setting up reference values for pump and valve testing, and in the root cause and trending analysis of post-maintenance test data. (pages 9, 10)

(Findings from this inspection effort)

The inspectors reviewed selected areas to assess the programs, procedures, implementation, and engineering involvement and support of maintenance activities.

The PM programs applied to all systems at FCS and included periodic maintenance, predictive monitoring, performance analyses, and planned maintenance activities. The predictive maintenance program included only vibration analyses and lube oil analysis. The maintenance department was tasked with the overall planning and scheduling of the PM activities, and each FCS department was responsible for implementing their assigned PM tasks.

The PM tasks were scheduled and performed as an integral part of the overall maintenance program. The status of the tasks were included in the daily routine maintenance activity planner and reviewed in the routine, twice-a-day plan-of-the-day meetings. The PM status report indicated that 862 of 866 scheduled PM tasks were accomplished by October 1990. The FCS monthly performance indicator (PI) on maintenance effectiveness revealed an overall decrease in failures.

The licensee's PM upgrade project had completed the PM upgrade project for 53 of 99 systems. This effort included providing a basis for the PM tasks for the 53 systems. The licensee planned to complete the reviews of the remaining systems (46) during the next 3 to 5 years.

The inspectors reviewed the licensee's process for planning and performing post-maintenance testing program. The determination of the type of post-maintenance testing required was assigned to the appropriate system engineer. The development of the post-maintenance testing activities was an integral part of the maintenance preplanning activities. The system engineer, the planner, the maintenance disciplines, operations, and QC were routinely involved.

The controls established regarding the post-maintenance testing activities including the involvement of the system engineers, were viewed as effective and acceptable.

The inspectors reviewed the status of the licensee's Project 1991 labeling program. The project was nearing completion in mid-December 1990 with about 1200 electrical and miscellaneous tags to be installed. The inspector toured a number of plant areas including the emergency diesel generator rooms, switchgear and battery rooms, control room, raw water intake structure, and turbine building. No instances were noted where equipment and structures were not appropriately labeled.

The licensee's upgrade of the labeling program and the implementation of the labeling of plant systems, components, and structures was nearing completion. The plant program and procedures associated with plant labeling addressed the continued maintenance of the labeling during future normal maintenance and modification activities, was considered to be effective.

The inspectors reviewed the overall controls established for plant modifications. The program addressed modifications, abbreviated modifications, temporary modifications, and engineering change notices (ECNs). Detailed instructions, flow charts, and checklists were also provided for each activity. Selected configuration change control documentation packages were also reviewed.

During the plant tour, the inspectors identified a 4-inch drain hose connected to the condensate cooler (FW-3) drain valve (CW-289) to direct water from the heat exchanger to a local floor drain. The licensee controls for temporary modifications applied to both safety-related and nonsafety-related systems and provided "exclusions" for temporary hoses connected from system drains to floor drains. No further guidance was provided relative to the installation of drain hoses. It was apparent that the temporary hose and flange impacted the drain line connection to the heat exchanger (FW-3). The configuration change was not processed as a temporary modification nor had it been subjected to engineering reviews and other QA program controls. The specific hose was connected to a "nonsafety-related" system and had no apparent safety significance. After discussing the potential concern with the licensee, the licensee reviewed the situation; no similar installations were identified; however, the potential existed for such temporary modifications to be installed on safety-related systems. The licensee also evaluated the specific installation of the drain hose on the heat exchanger (FW-3) drain (CW-289). Preliminary calculations by the actual configuration indicated that the bending stress of the pipe on FW-3 and the weld size of the connection were acceptable. The licensee conducted a plant walkdown to identify the hoses that were attached to various drain lines. A total of 25 hoses were identified (PED-SYE-90-1567J). The initial review by the licensee identified no installations which would affect plant safety.

The licensee indicated that the procedure controls were being evaluated to determine the appropriate corrective actions. A similar walkdown of the containment was to be conducted during an outage to identify hose connection.

The matter, including the evaluation of Standing Order Procedure O-25, Step 2.2, addressing drain hoses; the results of the walkdown of the containment; and the licensee evaluations of the plant walkdown findings is considered an inspector followup item. (285/9036-04)

The overall program and procedures established regarding configuration controls appeared to be appropriate. The review of the program, procedures, and the activities indicated that the controls had resulted in satisfactory and consistent design analyses and safety evaluations.

The licensee had a program which allowed plant personnel to submit technical inquiries. Standing Order Procedure G-82, "Engineering Assistance Requests [EAR]," Revision 0, and PED-QP-1, "Engineering Assistance Requests", Revision 0, addressed the actions concerning the requests. Standing Order Procedure G-82 established the priority system (Priority 1 - immediate impact; Priority 2 - commitment or response to a finding; Priority 3 - positive return regarding efficiency or productivity; and Priority 4 - minor return, but beneficial) and detailed processing of the EAR.

The EAR status was included in the FCS monthly performance indicator report. The data, provided in the October 1990 report indicated a total of 127 open EARs existed. This was an increase from 59 in May 1990. The licensee noted this as an adverse trend and contributed the increase to the discrepancies being identified by the procedures upgrade project. The report also provided

the number of open EARs by age (0 to 3 months - 40 items; 3 to 6 months - 5 items, and greater than 6 months - 50 items). The EAR status was recently changed to reflect the age of the EARs, since the EARs were intended to be a quick turn-around document.

The EAR program was established and appeared to be functioning to respond to technical questions and requests from plant personnel. The station engineering and system engineering groups and plant management were involved in the EAR process. The EAR status was provided as an item in the FCS monthly performance indicator report.

The review of the PM program procedures, reports, and the discussions with licensee personnel indicated that the PM program was established and implemented. The PM backlog had been effectively eliminated. The PM program status and adequacy was being monitored effectively by management routinely in the FCS monthly performance indicator report.

The licensee upgrade of the labeling program and the implementation of the labeling of plant systems, components, and structures was nearing completion.

3.4.1.3 Conclusions

The licensee's performance in this area has significantly improved since the original inspection.

3.4.2 Role of Quality Control

3.4.2.1 Scope

This portion of the inspection dealt with the role of quality control type activities over the maintenance process such as:

- Criteria for inspections and audits
- Inspection holdpoint adequacy
- Deficiency reporting
- Trending
- Corrective action.

The inspectors reviewed the QC activities applicable to the licensee's maintenance process and discussed their use with licensee personnel to determine the overall adequacy of these activities in assuring that plant equipment is properly maintained.

3.4.2.2 Findings

(Findings from original report 50-285/89-01)

The inspectors noted that post-maintenance testing was not always performed, and no explanation was given for not performing the testing. (page 8)

There was a large backlog of missed and late PMs. The licensee had recognized this concern and was attempting to correct the problem by providing higher

visibility to PMs in the plan-of-the-day and by strengthening management responsibility and accountability for PMs. (page 12)

Weaknesses were identified in the documentation of, and methodology for setting up reference values for pump and valve testing, and in the root cause and trending anslysis of post-maintenance test data. (pages 9, 10)

The surveillance test procedure for the safety injection valves was not consistent with the requirements of ASME, Section XI. Two different stroke times were measured; one was a local stroke time, and the other a light-to-light stroke time. The lesser of the two stroke times was always used to compare with the acceptance criteria. This practice is unacceptable in identifying maintenance needs for valves. (page 7) (See also Inspector Followup Item 285/8901-02)

(Findings from this inspection effort)

The inspectors reviewed selected portions of the FCS process for monitoring, identifying, and correcting discrepancies associated with safety-related activities.

QC involvement in maintenance activities included the review of active MWOs, the performance work inspections, and the review of completed MWOs. QC also reviewed the post-maintenance testing activities to ensure that they were planned and completed as required.

The inspectors reviewed two QC reports associated with post-maintenance testing and operability checks and a number of inspection reports and observation sheets performed by the QC group. The review of these documents revealed the need to enhance the overall types of maintenance activities covered by the observations. Licensee representatives indicated that the QC observation program was being expanded to encompass other maintenance activities. One of the QC observations reviewed raised a question regarding a QC inspection report (905780) that documented that a fastener had been improperly marked. A corrective action report (CAR) had not been initiated. The inspectors discussed this item with the QC supervisor, who promptly issued a CAR (90-519) to disposition the item. The fastener was subsequently reviewed and found to be acceptable.

The inspector reviewed an incident report (IR 900478) initiated as a result of a manual plant trip following the partial loss of feedwater resulting from a failure of the instrument air header in the turbine building. The licensee's incident evaluation team (IET) identified specific matters related to this event including a previous failure in the instrument air system. The licensee's root cause analysis review of the event was in progress and had not been completed at the time of the inspection, but the plant trip review had been reviewed by the plant review committee and the plant manager on November 20, 1990.

The inspector reviewed the completed portions of the plant trip review documentation. The document reviews and personnal interviews revealed that the plant trip response was as expected for a loss of instrument air pressure,

but the plant trip review package revealed a number of items requiring further inspection followup, including:

- The automatic isolation of the nonsafety-related instrument air to the main feedwater regulator valves (MFRV) at 75 psig decreasing,
- The erratic letdown flow control, and
- The MFRV rampdown circuit's failure to function when the valve controllers were in MANUAL operation or upon a loss of instrument air pressure which resulted in overfilling the steam generators.

Further review of the response of the plant systems associated with the low instrument air pressure, manual reactor trip, and the completed root cause analysis for the event is an inspector followup item (285/86036-05). The licensee's resolution of these concerns will be reviewed during a subsequent inspection.

The inspector reviewed the licensee's IR process, which was established for identification, control, and correction of deficient conditions at the [redacted]. The IR system was being effectively utilized by all levels of supervision at FCS; and the IRs received prompt review by the shift technical advisor, shift supervisor, the incident evaluation team (IET), and the incident evaluation coordinator (IEC).

Root cause analysis guidelines had been established and implemented, which provided detailed instructions and worksheets for performing a root cause analysis (RCA). The review of selected RCAs was performed by the Nuclear Safety Review Group (NSRG) and was documented in a report issued to designated personnel. The RCAs reviewed by the inspector appeared to be adequate; however, it was noted that the NSRG reviews had identified areas where the RCAs needed improvement.

The NSRG also reviewed the IR trend reports. The NSRG had identified a number of apparent valid concerns, including the number of open IRs which were not available to be trended, the number of overdue IRs, the identification of repeat problems by the process, and the occurrences resulting from failures, personnel errors, and procedure problems. The results of the NSRG reviews were distributed to OPPD management for review and action.

The inspector reviewed the licensee's process for screening, evaluating, correcting, and tracking operating experiences from industry and in-house events. The operating experience program appeared to be functioning very well.

The MWO was the controlling document for maintenance activities, and it was required that system engineering, operations, and QC personnel review the MWO in order to verify that appropriate actions had been identified. The inspector observed that prior to the initiation of work, the involved personnel held a prejob meeting in which responsibilities were discussed and

QC established any witness or hold points. Review of completed MWOs and surveillance and post-maintenance testing procedures showed that QC had taken an active role in the performance of both the work and the subsequent testing.

3.4.2.3 Conclusions

The licensee's performance in this area has significantly improved since the original inspections. The minor discrepancies identified in this area were not indicative of any programmatic or implementation problems.

3.5 Work Control

3.5.1 Work Order Control

3.5.1.1 Scope

This portion of the inspection involved the review of the licensee's work control process. The inspectors evaluated the means for work identification, the review and approval process, the accuracy of work orders, the adequacy of work procedures, and the use of emergency work orders.

3.5.1.2 Findings

(Findings from original report 50-285/89-01)

The maintenance procedures reviewed were considered to be poorly written and controlled. The document review process, both in the planning stages and during document closure, was poor. (The equipment history database sampled, was found to be incomplete and ineffective for use in trending and root cause analyses. (page 15)

(Findings from this inspection effort)

The inspector reviewed the controls that the licensee had established for the overall control of maintenance activities.

The maintenance group had established maintenance department instructions to address specific program areas. Additional maintenance instructions were being considered to improve the control of the MWO packages. The troubleshooting guidelines had not been written at the time of the inspection; however, troubleshooting activities were being processed using the established MWR/MWO requirements. Planning meetings were routinely conducted each day, including two plan-of-the-day meetings.

The inspector reviewed the methods utilized by the licensee to identify "rework" activities. Procedure MDI-1, "Maintenance Work Order," addressed rework as part of the maintenance planning requirements. The licensee used the criteria for rework as ". . . repeat of the repair performed in the previous 60 days . . . ." The rework required and the number of times the rework was ". . . required to pass the PMT [post-maintenance testing] . . . ." was also provided on the MWO. Interviews revealed that the data was being

accumulated in the database and was available for review; however, the specific use of the information had not been established (eg., tracking and trending of specific component and personnel performance).

The inspector reviewed the process established for controlling and tracking deficiency tags. This process had significantly improved since the original maintenance inspection, and the use of deficiency tags was being effectively implemented.

3.5.1.3 Conclusions

The licensee's performance had significantly improved in this area since the original inspection.

3.5.2 Equipment Records and History

3.5.2.1 Scope

This portion of the inspection dealt with the licensee's maintenance history and equipment record system. The inspectors evaluated the licensee's equipment list and their ability to update and retrieve equipment records. The inspectors also reviewed the use of the equipment history in determining the root cause of equipment failures.

3.5.2.2 Findings

(Findings from original report 50-285/89-01)

The maintenance procedures reviewed were considered to be poorly written and controlled. The document review process, both in the planning stages and during document closure, was poor. The equipment history database sampled, was found to be incomplete and ineffective for use in trending and root cause analysis. (pages 9, 10, 15, 17, 23)

(Findings from this inspection effort)

The equipment history and database had been improved and was being maintained current. The inspectors requested information pertaining to specific equipment, MWOs, tests (post-maintenance tests and STs), and IRs. The licensee, through the use of the Computerized History and Maintenance Planning System (CHAMPS), was able to quickly and accurately provide the requested information. Several comparisons were made between the information provided by CHAMPS and the actual documentation associated with the equipment. In each instance, the information provided by CHAMPS had been updated and was correct. The licensee personnel who provided the requested information to the inspectors had been trained in the use of CHAMPS and appeared to be quite knowledgeable in the use of the system.

3.5.2.3 Conclusions

The licensee has made considerable improvements to the CHAMPS system and it appeared to be an effective tool for determining the history and status of equipment. Overall this area had been improved since the original inspection.

3.5.3 Job Planning

3.5.3.1 Scope

This portion of the inspection dealt with the licensee's maintenance planning efforts and included the following planning activities:

- Determination of safety impact
- Coordination with other organizations
- Use of drawings and technical manuals
- Sequencing of tasks
- Availability and qualification of tools and parts
- Control of special processes
- Control of radiation exposure.

3.5.3.2 Findings

(Findings from original report 50-285/89-01)

The maintenance procedures reviewed were considered to be poorly written and controlled. The document review process, both in the planning stages and during document closure, was poor. (page 15)

(Findings from this inspection effort)

The inspector observed excellent coordination between system engineering, planning, operations, and QC personnel. This was evident during the prejob meetings that were held prior to beginning the work. Safety considerations included plant/system integrity/operability and limiting conditions for operation which were addressed and had to be verified on the MWO prior to the initiation of the work.

3.5.3.3 Conclusions

The inspectors noted marked improvement in this area since the original inspection.

3.5.4 Work Prioritization

3.5.4.1 Scope

This portion of the inspection dealt with the licensee's process for prioritization of maintenance activities. The inspectors evaluation included the extent to which the licensee considered safety significance, PRA data, and the effect of balance-of-plant (BOP) on the safety of the plant in the assignment of work priorities.

3.5.4.2 Findings

(Findings from original report 50-285/89-01)

It was not clear if a pump would be declared inoperable and a maintenance order initiated immediately after unacceptable test data was noted from the surveillance procedure. A potential delay of up to 96 hours in declaring a pump inoperable and initiating maintenance work was permissible by the procedure. Such delays are not consistent with the applicable technical specification action statements. (page 7) (See also Inspector Followup Item 285/8901-03)

(Findings from this inspection effort)

The inspectors reviewed the program and procedures which established and controlled the classification and the priority of the maintenance work activities.

The program included a number of work classifications and priorities for work that was not controlled in another program such as PM.

Deficient conditions were documented on a MWR and reviewed by the planning group to determine if a MWR or a MWO was appropriate. A number was provided on the MWO to describe the degree of attention (priority) given to the activity. The licensee utilized number designations (priorities) of 1 (emergency), 2 (necessary), 3 (routine), and 4 (fill-in). The priorities were determined based on potential plant damage, safety and availability, personnel hazards, danger to the public, and continued plant and system operations.

During the original inspection a concern was identified regarding the inadequacy of procedures which allowed a potential delay of up to 96 hours in declaring a pump inoperable after unacceptable test results, it was noted during the review of mechanical surveillance test procedures that this issue had been addressed. The procedures had been revised and contained the following statement: "Test data shall be evaluated by the shift technical advisor and reviewed by the shift supervisor for acceptability within 24 hours following completion or this test. If the test values fall within the required action range, then the pumps shall be immediately declared inoperable and not returned to service until the cause has been determined and corrected." The inspector reviewed a number of mechanical surveillance test procedures, and verified that the concern had been corrected. In addition, the review of completed surveillance tests did not identify any instance where the licensee had failed to immediately declare a pump inoperable upon observing test values that fell within the required action range.

3.5.4.3 Conclusions

The licensee's program to prioritized maintenance activities appeared to be effective, and had been improved since the original inspection.

3.5.5 Backlog Controls

3.5.5.1 Scope

This portion of the inspection dealt with the licensee's practices in controlling the amount of maintenance backlog. The inspectors reviewed the current maintenance backlog, the licensee's method for measuring and tracking the backlog, the reasons for deferring maintenance, the relationship between backlog and maintenance priorities, the breakdown of backlog in the various maintenance disciplines, and the extent of backlog and backlog control over BOP maintenance.

3.5.5.2 Findings

(Findings from original report 50-285/89-01)

In the electrical maintenance area there was a large backlog of missed and late PMs. The licensee had recognized this concern and was attempting to correct the problem by providing higher visibility to PMs in the plan-of-the-day, and strengthening management responsibility and accountability for PMs. (page 12)

(Findings from this inspection effort)

The inspector found that the licensee had made significant improvements in establishing controls to reduce maintenance backlogs. MWO backlog for corrective, nonoutage maintenance had been maintained below the licensee's established 1990 goals. Licensee representatives indicated that the 1991 goals would be 25 percent lower than the 1990 goals. The licensee had established the goals for overdue PM items in the upper 25 percent of the industry's average. During 1990, the licensee consistently maintained their backlog within that goal. The backlog distribution between the maintenance disciplines appeared to be at a level that was reasonably within the capability of each discipline's staffing.

3.5.5.3 Conclusions

The licensee's efforts in controlling the maintenance backlog and the status of the backlog has improved dramatically since the original maintenance team inspection. Improvements in the CHAMPS database, plan-of-the-day meetings, daily planning meetings, and for prioritizing maintenance, the methods have contributed to the licensee's improvement in this area. Monthly status and trending reports provided management with additional information.

3.5.6 Maintenance Procedures

3.5.6.1 Scope

This portion of the inspection dealt with the overall adequacy of the maintenance procedures provided. The inspectors reviewed selected maintenance procedures to verify that the following features of the procedures and/or the procedure development process were adequate:

- Development and approval process
- Technically correct and consistent
- Tested (validated and verified) prior to issuance
- Cautions and warnings included
- Adequately controlled
- Periodically reviewed and changed

3.5.6.2 Findings

(Findings from original report 50-285/89-01)

The maintenance procedures reviewed were considered to be poorly written and controlled. The overall quality and documentation of work performed should be strengthened through improved instructions and procedures. Examples of these weaknesses were found in the documentation of, and the methodology for setting up reference values for pump and valve testing; lack of clear guidance on declaring equipment inoperable immediately after unacceptable test data was identified; inconsistencies with the requirements of ASME, Section XI requirements; poorly written procedures coupled with the willingness of station personnel to deviate from verbatim compliance; and, the calibration procedure and drawing for the computer trend recorder had not been revised to reflect the 1985 modification to the recorder circuitry. (pages 7, 9, 10, 12, 15, 31, 32)

The licensee had established programs to upgrade plant procedures and plant component tagging identification. The procedure upgrade was scheduled for completion in June 1989. The component tagging effort was scheduled for completion in July 1990. (page 34) (See also Inspector Followup Item 285/8901-02 and -03)

(Findings from this inspection effort)

The mechanical maintenance procedures, including post-maintenance test and surveillance test procedures had undergone a complete review and had been rewritten to be consistent and user friendly. The inspector did not observe any difficulties encountered by the maintenance or QC personnel in regards to their performing the steps specified by the procedures.

The mechanical maintenance procedures had been revised and were much improved over the previous ones. The inspector observed one MWO being worked on a reactor coolant sample line containment isolation valve. The maintenance procedure was well organized and provided concise instructions as to how to perform the task. The procedures require sign-offs by the personnel performing the work. They also required that the identification of tools and measuring and test equipment used on the work be recorded. The inspector verified that the tools and equipment used on this job were accurately recorded and that the calibration status was correct.

3.5.6.3 Conclusions

The mechanical maintenance procedures reviewed had been improved dramatically. While the effort was not yet complete, the licensee has made great strides in this area.

3.5.7 Post-Maintenance Testing

3.5.7.1 Scope

This portion of the inspection dealt with the licensee's practices related to the performance of post-maintenance testing. The inspectors reviewed the post-maintenance testing activities to verify that the testing assured the operational readiness of the equipment based on the design basis for the equipment/system that had been worked. The inspectors also verified that appropriate qualitative and quantitative acceptance criteria had been included in the post-maintenance test procedures/instructions.

3.5.7.2 Findings

(Findings from original report 50-285/89-01)

Weaknesses were identified in the documentation of, and the methodology for setting up reference values for pump and valve testing, and in the root cause and trending analysis for post-maintenance test data. (pages 9, 10)

The inspectors noted that post-maintenance testing was not always performed, and no explanation was given for not performing the testing. The licensee had recently issued Standing Order M-102, which provided for control of post-maintenance testing. (page 8)

(Findings from this inspection effort)

The MWO was the vehicle used to delineate the various requirements for maintenance activities, including post-maintenance testing. The MWO packages contained all the referenced documents (i.e, procedures, tagging verification sheets, and drawings). There were provisions for a review to assure that operational readiness, design basis, and acceptance criteria were considered and specified. There was good coordination observed between the various disciplines involved. Both post-maintenance testing and operational testing requirements specified the applicable procedures for performing the tests. The responsible system engineer was procedurally required to review and assure that the design basis of the affected equipment was considered with respect to testing requirements. In addition, the MWO required verification of operability of redundant equipment prior to tagging out the equipment and system to be tested. During the inspectors' review of completed MWO work packages, the applicable sections had been signed and initialed and dated. The specified procedures were also included in the MWO packages and each of these provided the acceptance criteria for the specified tests. In addition, any limiting conditions for operation were identified.

The inspector observed the surveillance tests and post-maintenance testing performed on the reactor coolant sample line containment isolation valve, HCV-2504B (MWO 904627). Prior to the performance of the testing, a pretest meeting was held between the maintenance and QC personnel to ensure that each person was cognizant of the requirements and of their responsibilities. Each of the required sign-offs was accomplished including the shift supervisor, who authorized the release of the MWO and the specified testing.

3.5.7.3 Conclusions

It appeared that the licensee had established good controls over activities dealing with post-maintenance testing. The inspectors considered this area to be a licensee strength and found that the licensee had considerably improved this area since the original inspection.

3.5.8 Review of Completed Work Control Documents

3.5.8.1 Scope

This portion of the inspection dealt with the licensee's process for the review of completed work control documents. The inspectors reviewed completed work documents and discussed the review process with licensee representatives to verify that the review process was proceduralized, included walkdown inspections of the completed work, provided for feedback of review findings, and was part of the close-out system for the maintenance process.

3.5.8.2 Findings

(Findings from original report 50-285/89-01)

The calibration procedure and drawing for the computer trend recorder had not been revised to reflect the 1985 modification to the recorder circuitry. This raised concerns regarding why the defects were not identified during the calibrations performed since the 1985 modification. (page 32)

(Findings from this inspection effort)

The inspector reviewed several completed work documents in various areas. The licensee had involved the supervisors and system engineers in the review of completed work packages. The inspectors found that the system engineers had been extensively used in the review process and were eager to become involved. The documents requested by the inspectors were retrieved in a timely manner. Several of the completed work documents reviewed included the deficiency tags in the package. This had been a concern in the previous inspection. Post-maintenance testing was being performed and documented. Several new programs had been put in place and were assessed by the inspector. Two programs of particular interest to the inspectors were the trending program and the tracking of rework on completed jobs. The trending program was written, but actual trending and the use of trending data by the licensee appeared to be lacking. Interviews with licensee representatives (technicians, craftsmen, planners, and system engineers) indicated that trending was being accomplished but these individuals were not knowledgeable of the program. Rework was being

documented by the planning and scheduling department and the format appeared adequate. The program was new and insufficient data had been compiled to assess its effectiveness. Licensee representatives believed that these programs would result in an overall improvement in plant maintenance performance.

The inspectors were concerned with the condition of the maintenance documents inspected. The documents had numerous line outs and were sloppy. All of the information was available, but the inspectors had to search through the information to find it. The inspectors believed that many of the procedural errors found during this inspection could have been identified with a thorough review of the completed work documents.

3.5.8.3 Conclusions

The licensee had made good progress in their review of completed work documents. The inspectors noted improvements in the retrievability and completeness of the maintenance records. The documents were, in general, technically correct but contained numerous line outs and sloppy entries. This area was viewed by the inspection team as having improved from the conditions found in the original inspection.

3.6 Plant Maintenance Organization

3.6.1 Control of Mechanical Maintenance Activities

3.6.1.1 Scope

This portion of the inspection dealt with the overall control of the activities of the mechanical maintenance group to verify that the following elements and features of the maintenance process were controlled:

- Means to identify the need for action
- Assurance of plant and system integrity
- Monitoring controls
- Rework and temporary repairs
- Control and update vendor technical manuals
- Personnel control
- Procedures control
- Material controls
- Tool controls
- Configuration controls
- Work performance accountability

3.6.1.2 Findings

(Findings from original report 50-285/89-01)

The maintenance procedures reviewed were considered to be poorly written and controlled. Planning and closure reviews were found to be poor. The equipment history database was found to be incomplete. Post-maintenance

testing was not always performed with no explanation given for nonperformance. Housekeeping was found to be poor in several areas. (pages 8, 9, 10, 15, 33)

(Findings from this inspection effort)

As discussed previously, the MWO was the primary controlling document for maintenance activities. Programmatically, the need for the proposed maintenance activity was required to be specified on the MWO; this had been accomplished on every case observed by the inspector. Each MWO clearly described the as-found condition, thus allowing system engineers, QA/QC personnel, job planners, and shift supervisors to have a clear understanding as to the extent of the problem and thereby to determine the corrective actions required. The MWO contained provisions for the shift supervisor to verify that plant and system integrity was maintained (i.e., redundant equipment and systems were operational) prior to the commencement of work. This verification had to occur before the work package could be released. The inspector did not observe any instance where this had not been accomplished. The establishment of responsibilities and controls were accomplished during prejob briefings in which system engineers, maintenance personnel, QA/QC personnel and any others with assigned responsibility, discussed the activities to be performed. It was also noted during the review of MWOs, that the need for temporary modification(s) was identified by the appropriate control number. With respect to control of procedures and personnel involved with a specific MWO, each procedure was compared to the current revision delineated in the master procedure list, and each procedure was performed by a "Lead Man" qualified to a specified level. Review of procedures and qualifications by the inspector did not reveal any instance where either procedures or the personnel identified were incorrect. The use of materials needed for repairs was specified in the MWO. The quantities and description by name, part number, and OPPD stock number were entered. In addition, as part of the MWO package, the warehouse material issue slip provided a complete description and quantity of the items actually issued. The maintenance and test procedures had provisions for recording the specific tools and measuring and test equipment used for each job. The inspector did not observe any instance where the licensee had failed to record the tools or measuring and test equipment used for an MWO. Configuration control was procedurally required to be verified at the completion of work by the performance of operability testing specified on the MWO. There were provisions within the MWO for documenting that this activity had been performed.

The inspector reviewed the licensee's actions with respect to the two AFW discharge check valves (FW-163 and FW-164). These valves had a history of leakage problems, and during visual examination of the valve internals it was noted that disk stops were loose and stop welds were missing. The licensee conducted a detailed review and evaluation of the leakage and the disk stops. It was noted that the valves were manufactured by Mission Manufacturing Company, and were identified in Revision A to Drawing 16259, dated June 9, 1969. The materials list on the drawing showed that Item 4 was a carbon steel stop, welded to the valve body. Since observation revealed that the stops were not welded to the body, the licensee, on November 18, 1988, contacted C&S Valve Company who had purchased the manufacturing rights from Mission Manufacturing Company. It was determined that the stops were not welded but

were retained in a 1/4-inch machined groove in the body such that the disk could not travel past 90 degrees from the closed position. Based on the discussion with C&S Valve Company, it was determined that Revision A to the Mission drawing was incorrect with respect to the weld requirement. The licensee initiated Engineering Change Notice (ECN) 89-013 to revise the drawing so that the actual method of fabrication would be delineated. The ECN was approved on September 29, 1989, and the drawing was revised by deleting the "welded to the body" note.

With respect to the leakage history, the licensee's evaluation resulted in a change of gasket material to a graphite filler gasket, during December 1988, and the establishment of specific torque requirements. Review of documentation for these valves showed that no body to bonnet leaks had occurred since implementation of the two changes.

The inspectors selected Diesel Generator Compressor Discharge Check Valves SA-187 and SA-188 for review of ISI/IST test performance activities. It was noted that prior to Revision 3 of the ISI/IST program, dated December 16, 1987, these check valves were not included in the ISI/IST program. During the latter part of 1987, the licensee conducted a complete review of the ISI/IST program which resulted in the identification that these valves were not listed. The licensee committed to include the valves in Revision 3 to the program. The check valves were added to the program as Category C valves and tested in the closed position by monitoring the pressure on the compressor discharge upstream of the check valves. Review of Procedure ST-ESF-6, "Monthly Diesel Generator Surveillance," Appendix A, Section F.2, Step 20.c showed that it required observation of the diesel generator during the test and that any sign of abnormal or improper operation, overheating, or alarms, to be recorded. One of the elements that was alarmed pertained to pressure. If the pressure dropped below the pressure setpoint, the alarm sounded. This was considered to be an acceptable test of the check valves because pressure drop would reflect faulty check valve operation.

The licensee initiated a modification to install air driers during February 1990. This modification included the installation of new valves, while still retaining the existing valves. However, the modification created a change in the ISI/IST pressure boundary which allowed the deletion of the two existing valves from the program. The inspector verified that the new primary discharge check valves (SA-282 and -288) had been included in Revision 5 to the program which was submitted to NRC by letter dated October 8, 1990. The inspector also verified by documentation review that these valves were being tested in accordance with Procedure SE-ST-SA-3001, "Starting Air Compressors Discharge Check Valve Exercise Test." It was verified that testing had been performed on a quarterly basis since the completion of refueling outage in 1990, with the last test performed on September 27, 1990.

The inspectors also selected the 1990 maintenance and testing records associated with the main steam system valves (YCV-1045A and YCV-1045B) and their associated accumulator check valves (YCV-1045A-C and YCV-1045B-C) for review. Documentation showed that the quarterly valve exercise tests were conducted using Procedure OP-ST-MS-3001, "Main Steam System Category B and C Valve Exercise Test." The initial quarterly valve exercise test was completed

on March 9, 1990. The tests identified that Valve YCV-1045B was in the low alert range for stroke time, thereby requiring an increased test frequency (i.e., monthly rather than quarterly), with the next test scheduled for April 11, 1990. It was also noted that Valve YCV-1045A, while still operating within acceptable parameters, had experienced an increase in the indicated stroke time. The licensee identified this valve for the increased test frequency. This did not, however, include the accumulator check valves. The records showed that the next test was performed on May 9, 1990. The inspector was informed that the 1990 refueling outage was in progress at that time and maintenance work had been scheduled to be performed on the turbine driven AFW pump (FW-10) isolation valve. This work commenced on March 10, 1990, on MWO 873110. Shortly thereafter, MWO 892471 was released on April 13, 1990, to replace the steam chest of FW-10. Therefore, Valves YCV-1045A and YCV-1045B had been tagged out which precluded their being tested at that time. In addition, on May 3, 1990, the solenoid on Valve YCV-1045A had been replaced on PM Order 9004995. Upon completion of the work, both valves were tested on May 9, 1990, and found to be acceptable. The next quarterly test was scheduled for May 29, 1990, because the accumulator check valves had not been tested since March 9, 1990. The test was performed and Valve YCV-1045B was found to be in the low alert range and Valve YCV-1045A was found to be leaking. On May 29, 1990, IR 900355 was initiated to document the condition. It was established that the leak was caused by a failure to tighten actuator bonnet bolts after the solenoid had been replaced. This resulted in the initiation of MWO 907581, which defined the necessary work required to correct the condition. Upon the completion of the work, the valve was retested and new reference values were obtained, which fell within the licensee's established design parameters. Since Valve YCV-1045B was in the low alert range, the test frequency was again increased to monthly. The next test was performed on June 29, 1990, and Valve YCV-1045B was found to be acceptable. Since both valves were tested and found to be within acceptable parameters, the testing frequency reverted back to the quarterly test requirements. Subsequently, quarterly tests were performed on the valves and their accumulator check valves on August 21 and November 16, 1990, with acceptable results.

3.6.1.3 Conclusions

It appeared that the licensee had established the necessary controls to effectively implement their mechanical maintenance activities. While there was a limited amount of mechanical maintenance activity occurring during this inspection, the inspectors did not identify any instances where the licensee failed to perform in accordance with the specified procedures. This area is considered a strength and has improved since the original inspection.

3.6.2 Control of Electrical Maintenance Activities

3.6.2.1 Scope

This portion of the inspection dealt with the overall control of the activities of the electrical maintenance group to verify that the elements and features listed in paragraph 3.6.1.1 were controlled for maintenance in the electrical area.

3.6.2.2 Findings

(Findings from original report 50-285/89-01)

The maintenance procedures reviewed were considered to be poorly written and controlled. There was a large backlog of missed and late PMs. Housekeeping was found to be poor in several areas.

Weaknesses were identified in the root cause and trending analysis of post-maintenance test data. Post-maintenance testing was not always performed, and no explanation was given for not performing the testing. (pages 8, 9, 10, 12, 15, 33)

(Findings from this inspection effort)

The inspector's review of PM procedures in the electrical maintenance area found them to have been greatly improved as a result of the licensee's procedure improvement process. The format, instructions, illustrations, and data record packages of the procedures provided the user with a document that was supportive of an improved work ethic. The procedures addressed post-maintenance testing requirements. The data record packages were supportive of providing the necessary as-found and as-left conditions for trend analysis. The inspector found that housekeeping in the plant and the number of missed or late PM's were no longer a concern in this area.

3.6.2.3 Conclusions

The electrical maintenance activities have shown an improvement since the original maintenance team inspection. Maintenance productivity and quality of work appeared to have benefitted from the improved procedures and support organizations. Job planning support, engineering interfaces, and training improvements have been the major contributors for the noted improvements in this area.

3.6.3 Control of I&C Maintenance Activities

3.6.3.1 Scope

This portion of the inspection dealt with the overall control of the activities of the I&C group to verify that the elements and features listed in paragraph 3.6.1.1 were controlled for maintenance in the I&C area.

3.6.3.2 Findings

(Findings from original report 50-285/89-01)

The maintenance procedures reviewed were considered to be poorly written and controlled. The document review process, both in the planning stages and during document closure was poor. Post-maintenance testing was not always performed, and no explanation was given for not performing the testing. Weaknesses were identified in the documentation of the root cause and trending analysis of post-maintenance test data. (pages 8, 9, 10, 15)

The experience level in the I&C discipline was considered to be a significant problem considering the poor procedures identified and the knowledge needed to adequately perform I&C maintenance. The observed willingness of station personnel to deviate from procedural compliance was an unacceptable practice. (pages 31, 45)

The calibration procedure and drawing for the computer trend recorder had not been revised to reflect the 1985 modification to the recorder circuitry. This raised concerns regarding why the defects were not identified during the calibrations performed since the 1985 modification. (page 32)

Housekeeping was found to be poor in several areas. (page 33)

(Findings from this inspection effort)

The inspectors reviewed the performance of various activities in the I&C maintenance department to assess the licensee's efforts to improve the performance in this area. Interviews were conducted with shop personnel, supervisors, and system engineers who dealt with I&C related equipment. The inspectors reviewed records of past maintenance and observed maintenance in progress. The inspectors also evaluated I&C procedures for technical adequacy and user friendliness. The control of maintenance activities and the support provided by management, the MT&E lab, planning and scheduling, drawing control, and training was also evaluated.

The inspectors noted a large cross section of experience in the I&C department that ranged from technicians who were just qualifying to those who had years of experience. Interviews with shop personnel indicated a positive attitude toward management and the direction with which the licensee was headed. The inspectors observed a training lecture and found it to be adequate. Training records were reviewed for both in-house and contracted technicians and were found to be adequate. The inspector toured the training shop and examined several training mock ups and various pieces of test equipment and tools. The licensee had been actively involved in upgrading the quality of training provided to their personnel.

The inspectors noted some concerns in support activities, such as, procedure writing and the verification and validation process. Several procedures were reviewed and exhibited a wide variation in quality. Some of the procedures appeared to be of high quality but others required additional upgrading. For example, during the performance of Test Procedure IC-PM-DSS-1001, the technician had to stop the test and have the procedure revised prior to continuing. The procedure had several errors in it and the format was not easy to follow. The technician had to separate pages of the procedure to keep from having to flip back and forth from the main body and the sign-off steps of the procedure. Procedure IC-PM-DSS-1001 had been performed for several months in the condition found, and no apparent effort had been made to correct the procedure until the inspector observed the PM in progress. This problem raised questions regarding the verification and validation process of the procedures and the emphasis placed on the need to upgrade procedures in a timely manner.

The inspectors found that for emergency maintenance performed on the back shifts technicians were called out without their supervisor, and thus, the CHAMPS database would not be available for trouble shooting by the technicians because the use of the CHAMPS data system was primarily by the supervisors and not the technicians. The shift supervisors interviewed expressed no problem in receiving I&C support during the backshifts and the operators interviewed felt that the I&C department was very competent.

The inspectors found that there was some confusion regarding the verification by a technician that the most current revision of a procedure was being used. One individual went to the control room controlled copies, which included the latest revision, while another checked the CHAMPS database, which did not indicate the latest revision and was not listed in Standing Order G-7 as the source for obtaining the latest revision.

3.6.3.3 Conclusions

Significant improvements had been made in this area since the original inspection. The control of I&C maintenance and the commitment on the part of management was apparent. The training of I&C personnel was strong and I&C department personnel had a positive attitude towards work, advancement, and the company in general. All areas of the I&C department had undergone upgrading. The inspectors found that the licensee had a good program in place with some minor problems in implementation. These minor problems have occurred from the culture change the licensee was developing. These problems should resolve themselves as the change evolves.

3.6.4 Deficiency Identification and Control System

3.6.4.1 Scope

This portion of the inspection dealt with the licensee's practices for the identification and control of the deficiency tagging system. The inspectors reviewed this area to verify that deficiency identification, reporting, tagging, correction, and close-out were effectively controlled.

3.6.4.2 Findings

(Findings from original report 50-285/89-01)

The licensee failed to take prompt corrective action in accordance with Criterion XVI of Appendix B to 10 CFR Part 50 and the approved QA program. (page 26) (Violation 285/8901-06) (See also NRC Inspection Report 50-285/90-07)

The licensee did not have an effective system for tracking and clearing deficiency tags associated with maintenance orders. (page 33)

There was a large backlog of missed and late PMs. A concern was raised about not declaring equipment inoperable and initiating a MO immediately after identifying unacceptable surveillance test data. Surveillance procedures were

found that were not consistent with the requirements of ASME, Section 11. The history of MFW pumps leaking at various locations and the high frequency of repair on certain MFW valves indicated that an improved PM program was warranted. (pages 7, 12, 17)

(Findings from this inspection effort)

The inspector observed the actions associated with the identification of the leaking reactor coolant sample line containment isolation valve. Upon discovery of the condition, a MWR (9004194) was initiated in order to provide a description of the problem. This resulted in MWO 904627 being issued to correct the identified condition. Appropriate identification, reporting, tagging, corrections, and closeout activ ies were performed.

The inspector also reviewed records associated with a leaking main steam system valve (YCV-1045A) for which IR 900355 had been issued on Ma. 29, 1990. This IR resulted in the initiation of MWO 907581 in order to correct the condition. The records showed that the appropriate identification, reporting, tagging, corrections, and closeout activities were performed.

The inspector also requested information from CHAMPS which would show the status of scheduled PM activities. CHAMPS identified that four PMs were still open; three of which were actually complete but the paperwork had not yet been closed, and the fourth was in process.

3.6.4.3 Conclusions

It appeared that the licensee had made significant improvements in this area since the original inspection.

3.6.5 Maintenance Trending

3.6.5.1 Scope

This portion of the inspection dealt with the licensee's process for trending maintenance activities and equipment performance to determine the overall effectiveness of the maintenance process. The inspectors evaluated the licensee's trending activities to verify that systemic and specific fixes were analyzed, root cause analyses were performed, a self-assessment process had been implemented, performance indicators were used, and rework evaluations were performed.

3.6.5.2 Findings

(Findings from original report 50-285/89-01)

Two AFWS discharge check valves had a consistent history of external leaking problems. The licensee's PM program had not been effective in stopping the leaks. The licensee had performed visual examination of the valve internals.

Loose disc stops and missing stop welds were noted. It appeared that root cause analyses were not being done for the valve leaking and disc stop problems. (page 23)

In the electrical maintenance area the trending program contained historical data, but further development and improvement are necessary to obtain meaningful trend analyses. (page 12)

There were excessive delays in the retrieval of maintenance records from the CMAMPS database. Personnel were unable to obtain closed work documents and other maintenance history in a timely manner. (page 12)

(Findings from this inspection effort)

The inspector reviewed the licensee's process for monitoring and trending certain plant safety and reliability-related components, systems, and structures. The initial data collected for the station batteries and the emergency diesel generators were reviewed and found to be acceptable. The licensee had developed a steam cycle thermal performance program element to monitor the performance of the steam plant based on predetermined acceptance criteria. The licensee planned to provide similar type performance program elements for other areas.

3.6.5.3 Conclusions

The licensee's efforts in trending plant parameters related to the performance of maintenance activities had improved since the original inspection.

3.6.6 Support Interfaces

3.6.6.1 Scope

This portion of the inspection dealt with the licensee's establishment and maintenance of appropriate support interfaces in the areas of engineering, QA, operations, safety, and procurement. The inspectors observed work activities and interviewed licensee personnel to verify that the support interfaces were effective in supporting the maintenance process.

3.6.6.2 Findings

(Findings from original report 50-285/89-01)

Weaknesses were identified in the documentation of, and the methodology for setting up reference values for pump and valve testing, and in the root cause and trending analysis of post-maintenance test data. Post-maintenance testing was not always performed, and no explanation was given for not performing the testing. There was a large backlog of missed and late PMs. (pages 8, 9, 10, 12)

(Findings from this inspection effort)

The system engineers interviewed were knowledgeable of their respective systems. They were routinely involved in the procedure and MWO reviews. They had also been directly involved in the establishment and evaluation of post-maintenance testing requirements. The approval process for MWO's required QA/QC review to establish proper witness or hold points. Operations personnel were cognizant of work activities in that the shift supervisor's signature was required for the release of the work and he also reviewed the completed MWO packages. The affected disciplines held prejob briefings to assure that responsibilities were understood. Safety observations identified areas where work practices and procedures needed to be improved. Planning involvement in the procurement program had improved the coordination of work efforts.

3.6.6.3 Conclusions

The licensee's support interfaces with maintenance activities has shown a marked improvement since the original maintenance team inspection. Daily and weekly planning meetings appeared to have established a team concept within the various disciplines in the support of maintenance activities.

3.7 Maintenance Facilities, Equipment & Materials Control

3.7.1 Control of Meter and Test Equipment

3.7.1.1 Scope

This portion of the inspection dealt with the licensee's control of meter and test equipment (M&TE). The inspectors reviewed the licensee's facilities and program for the control of M&TE. This included the laboratory environmental control, location, and the use of calibration standards.

3.7.1.2 Findings

(Findings from original report 50-285/89-01)

The M&TE lab and issue point were located in an uncontrolled personnel traffic area. The M&TE lab was not environmentally controlled (temperature, humidity, and seismic). There was an excessive amount of floor vibration in the M&TE lab, which could affect the calibration of certain laboratory standards. I&C technicians were observed to be using M&TE lab standards to verify test equipment calibration before starting process equipment calibrations.

The location of the laboratory and the uncontrolled use of calibration standards are considered to be poor practices. (page 44)

(Findings from this inspection effort)

The MT&E lab had undergone significant modifications to upgrade the quality. The lab had also been relocated to a more suitable area and the environment

was being controlled. A cage has been built around the MT&E lab and a full-time check-out clerk was present with proper controls for checking out equipment.

3.7.1.3 Conclusions

There has been a very marked improvement in this area since the original inspection.

3.8 Personnel Controls

3.8.1 Staffing Control

3.8.1.1 Scope

This portion of the inspection dealt with the licensee's personnel practices that assured that the appropriate staffing resources were provided to the maintenance organizations. The inspectors reviewed the following elements and features of the staffing control area:

- Provisions for hiring, firing and promoting personnel
- Job descriptions
- Types and numbers of crafts
- Shift coverage
- Turnover rate control
- Emergency conditions
- Personnel actions

3.8.1.2 Findings

(Findings from original report 50-285/89-01)

The experience level in the I&C discipline was considered to be a significant problem considering the poor procedures identified and the knowledge needed to adequately perform I&C maintenance. (page 45)

(Findings from this inspection effort)

The inspectors found the maintenance divisions to be fully staffed. In the I&C department there were only 6 contract technicians on site. The training department had sufficient personnel to meet their training goals. Planning and scheduling was completely staffed and all supervisor positions were filled. The engineering department had numerous system engineers and was fully staffed. The personnel were knowledgeable of their responsibilities and appeared to have been well qualified. The qualifications requirements for hiring personnel and training them were in place and were clear and concise. A good cross section of personnel (those recently hired to those who had years of service with the company) were observed. A self-evaluation program was in place, but it did not include accountability for performance errors. The licensee had a satisfactory program in place for staffing controls.

3.8.1.3 Conclusions

The overall staffing controls in place by the licensee appeared to be acceptable. No major staffing deficiencies were noted and the inspection team viewed this area as having improved from that identified in the original inspection.

3.8.2 Personnel Training

3.8.2.1 Scope

This portion of the inspection dealt with the licensee's training of maintenance personnel. The inspectors reviewed the licensee's training process for maintenance personnel to verify that the training included general, specific, safety-related, and special work activities.

3.8.2.2 Findings

(Findings from original report 50-285/89-01)

The observed willingness of station personnel to deviate from verbatim procedural compliance was an unacceptable practice. (page 31)

There were excessive delays in the retrieval of maintenance records from the CHAMPS database. Personnel were unable to obtain closed work documents and other maintenance history in a timely manner. (page 12)

(Findings from this inspection effort)

The inspectors' review of the training program found a close working relationship between the training department and the maintenance disciplines. Maintenance procedures were being used in conjunction with training department training aids to enhance task training and to validate the procedure adequacy. The training department had obtained additional training aids and had plans for procuring additional aids to further enhance the support of maintenance needs. Certification of craft personnel was being maintained, and the maintenance procedures required the verification that the "Lead Man" was also certified in the work category. Accredited apprentice training programs were in place and were being aggressively pursued.

Although improvements had been made in procedural compliance, there were several indications of less than desirable understanding or implementation of this requirement. The area of procedural compliance should continue to be monitored and evaluated for future improvements.

3.8.2.3 Conclusions

The licensee's efforts in personnel training have been considerably improved since the original maintenance team inspection. Significant progress had been made in the area of procedural compliance, but additional improvements are warranted.

4. Exit Interview

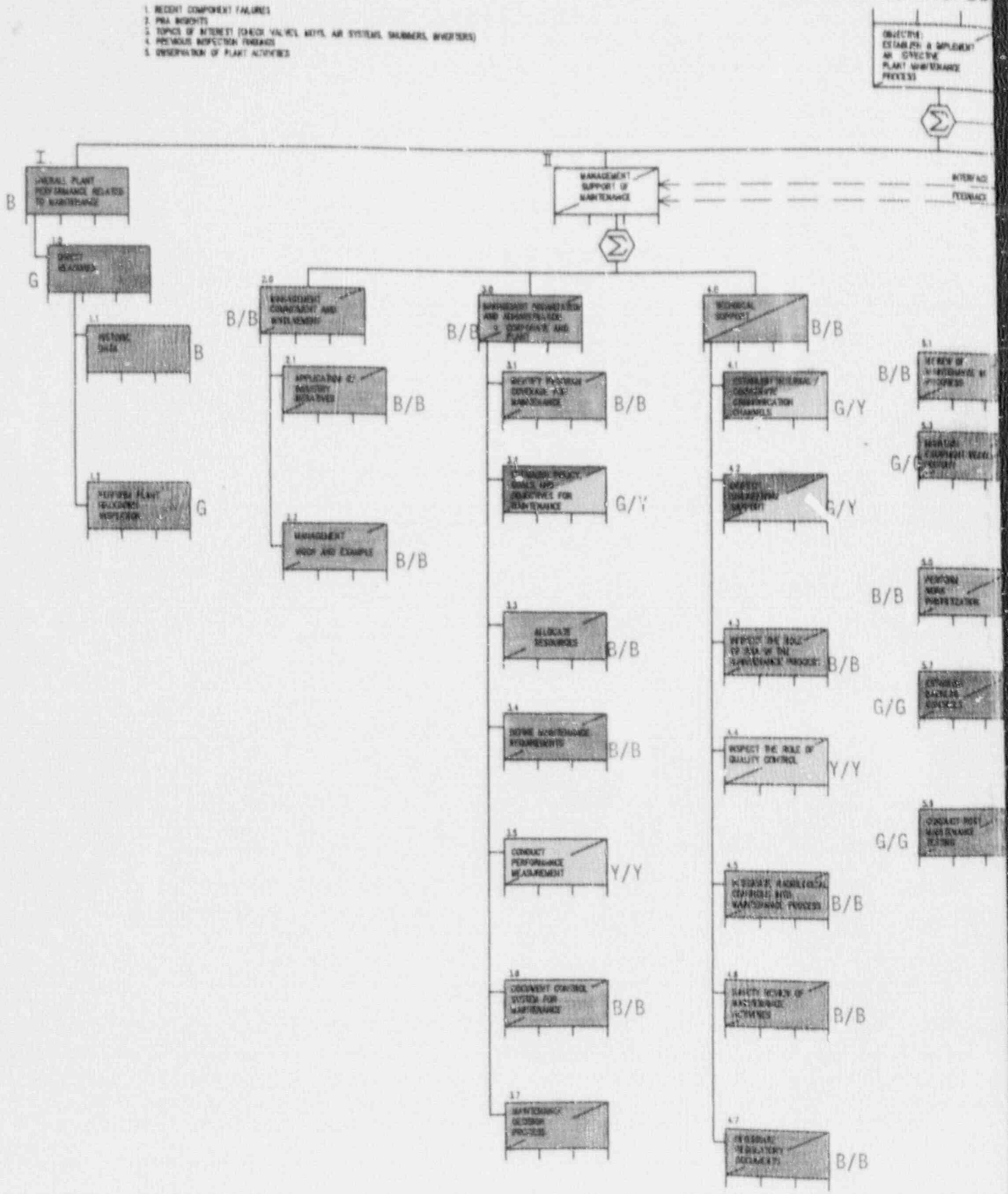
The inspectors met with Mr. W. G. Gates and other members of the licensee's staff at the conclusion of the inspection on December 20, 1990. Persons attending the exit meeting are identified in paragraph 1 of this report. The inspectors summarized the scope of the inspection and presented the preliminary inspection findings. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

The color-coded presentation tree (Attachment A) was used as a visual aid during the exit meeting to depict the results of the inspection.

TREE INITIATORS

1. RECENT COMPONENT FAILURES
2. PRA INSIGHTS
3. TOPICS OF INTEREST (CHECK VALVES, MOTS, AIR SYSTEMS, SNUBBERS, INVERTERS)
4. PREVIOUS INSPECTION FINDINGS
5. OBSERVATION OF PLANT ACTIVITIES

PRESENTATION
MAINTENANCE INSPEC



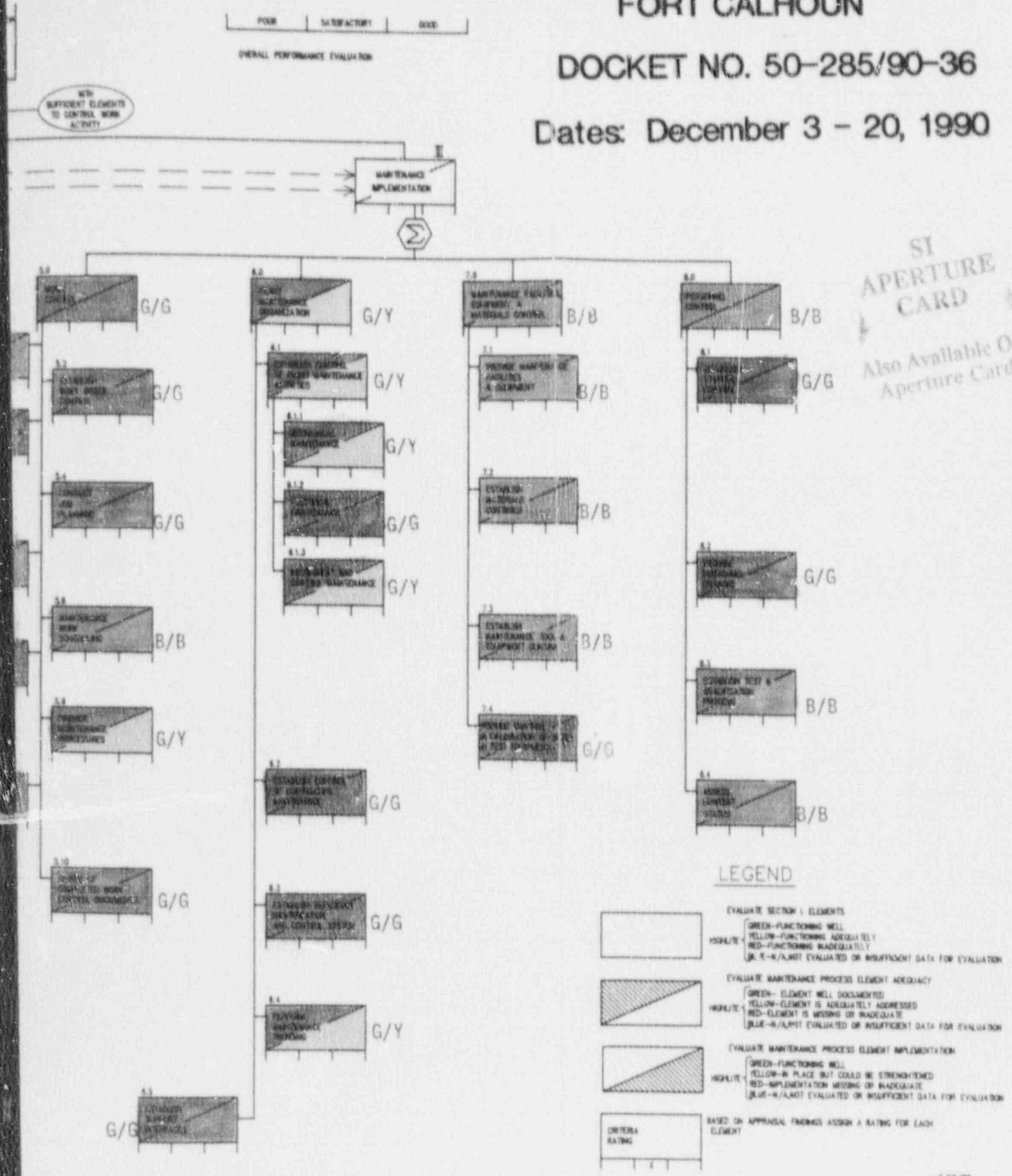
NOTE: THIS DWG. IS USED IN CONJUNCTION WITH 425801, 425802, 425803, 425804, 425806, 425807 & 425808.

MAINTENANCE TEAM RE-INSPECTION

FORT CALHOUN

DOCKET NO. 50-285/90-36

Dates: December 3 - 20, 1990



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