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Building 130

January 6, 1986

Dr. Ross Landsman
U. S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, ILL 60137

Dear Ross,

Enclosed please find the final Brookhaven National Laboratory (BNL) report for the technical review of the Midland Surveillance and Maintenance Program conducted by Messrs. T. Burns and W. Gunther during the period October 14 - 18, 1985.

If you have any questions or comments, please do not hesitate to call me at the above number, or Bill Gunther at FTS 666-7961.

Very truly yours,

John H. Taylor, Group Leader
Plant Systems and Equipment Analysis

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BROOKHAVEN NATIONAL LABORATORY

TECHNICAL REVIEW REPORT

SURVEILLANCE AND MAINTENANCE PROGRAM

FIN A 3550 (TASK ORDER 003)

DATE OF REVIEW:	October 14-18, 1985
LICENSEE:	Consumers Power Company
PLANT:	Midland Energy Center Units 1 and 2

BNL Technical Specialists

Thomas Burns — Date: 1/6/86

William Gunther — Date: 1/6/86

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I BACKGROUND AND OBJECTIVES

On July 16, 1984, the Consumers Power Co (CPCo) terminated design, construction, and testing activities at the Midland Energy Center (MEC) and entered a shutdown period. The Midland Energy Center consists of two B&W PWRs which are approximately 85% construction complete. The initial portion of the shutdown period consisted of a demobilization phase during which time surveillance and maintenance objectives were established, activities were identified, and a quality assurance program plan was issued. Approximately six months into the shutdown period, a surveillance and maintenance plan was approved initiating a formal layup program consisting of corrosion monitoring, storage controls, soils monitoring, housekeeping, and corrective maintenance, in addition to preventive maintenance and surveillance testing. This plan established the organizational responsibilities for preserving the permanent equipment and facilities while defining the goals for implementing the Layup and Maintenance Program so as to support a restart option capability.

On October 14, 1985, upon the request of the NRC (Region III), T. Burns and W. Gunther of BNL arrived at the Midland Energy Center to conduct a review of the Midland Surveillance and Maintenance (S&M) Program. The objectives of this review are as follows:

- Verify that the surveillance and maintenance activities are being appropriately implemented from a technical standpoint, and are accomplished in accordance with NRC requirements and licensee commitments.

- Determine that quality assurance policies, plans, instructions, and procedures for extended construction delay activities have been established and are being accomplished in accordance with NRC requirements and licensee commitments.

- Ascertain whether an adequate work force with sufficient resources is available to support the required activities.

In order to achieve these objectives, a comprehensive review of the Midland procedures, records, engineering support documents, and equipment vendor manuals was conducted. Extensive plant walkdowns, including a reactor vessel inspection, and observations of operation, maintenance, and quality assurance personnel work activities were also completed. The results of the review are summarized in the next section and are described in depth in the body of this report.

The ability to address many areas during the course of the week was greatly enhanced by the excellent licensee co-operation. Access was readily provided to pertinent documents as well as the responsible personnel knowledgeable in the areas reviewed.

II. SUMMARY

A program for layup of a nuclear power plant can be divided into several subject areas. These categories consist of the program itself (software), quality control and assurance, engineering criteria for establishing the technical portion of the program, and implementation of the criteria. Each of these areas was reviewed in depth resulting in the following observations.

A. Program Software - In addition to the "Quality Assurance Program Plan" and the "Surveillance and Maintenance Plan" a number of other important program documents were reviewed, including the "System Layup Requirements Manual," the "Preventive Maintenance Requirements Manual," and the "Storage Requirements Manual for Preshutdown Procured Items." Combining the above documents with the thirty-seven Midland Project Shutdown Organization procedures results in a comprehensive program which satisfactorily addresses both installed and stored safety related equipment and materials at Midland.

B. Quality Assurance - Revision 1 of the Quality Assurance Program Plan was approved by the NRC on July 18, 1985. Implementation of this plan, along with the thirteen associated QA procedures, was reviewed and found to be acceptable with the following exceptions.

1. Of the thirty-three (33) nonconformance reports issued since January 1, 1985, nine (9) reports remain open with no apparent mechanism for close out.

2. To date, a QA audit of the Layup and PM implementation has not been performed. The licensee stated that this is planned for 1986 subject to upper management approval.

C. Engineering - The overall effort to develop criteria for layup and preventive maintenance has been completed with revisions being made to both areas as additional information is obtained. With the exception of the following concerns, the engineering segment of the program including modifications control, design control, and technical organization has achieved the program goals.

1. In a number of cases, including the reactor coolant and main steam systems, motors, pumps, and fans, specified layup and/or preventive maintenance requirements are less rigorous than vendor or architect/engineer recommendations. Insufficient technical justification exists for the approach taken.

2. Limitorque motor operated valve operators were not identified in the preventive maintenance program despite specific vendor recommendations for layup and extended storage. The licensee committed to adding these devices to the program, and during the week demonstrated that initial steps to do so had been taken. It should be noted that the Surveillance and Maintenance Plan does not include pump and fan motors less than twenty horsepower (20 HP). This approach reflects a Project Management decision based on the economics of maintaining this equipment versus replacing or testing it in the future.

3. Instrument tubing was not identified in the system layup criteria for several systems such as the reactor coolant and main steam systems which contain safety related instrumentation. The Licensee committed to revise the layup criteria and initiate work orders to implement the changes to assure proper maintenance of the safety related instrument tubing.

4. Although no vendor literature was discovered in the Midland files regarding proper layup criteria for installed valves, Engineering should contact the various valve suppliers to verify that the Midland approach of taking no action is correct. In general, when a vendor recommendation for extended layup does not exist in the literature provided, steps such as contacting the supplier should be taken.

5. Layup and preventive maintenance criteria for safety related electrical components located in the control rooms, several areas adjacent to the control rooms, and the emergency diesel generator enclosures (4) should be reexamined based on the observations that ANSI 45.2.2 Level A requirements are not being maintained in the control room areas and Level B requirements are not being satisfied in the diesel generator rooms.

6. NRC I&E Information Notice 85-56 entitled "Inadequate Environment Control for Components and Systems in Extended Storage or layup" should be dispositioned to ascertain applicability in accordance with Midland procedure EN-005. A commitment for review by October 28, 1985 was provided by the licensee.

7. The corrosion monitoring requirements established are limited to observing and analyzing atmospheric corrosion rates at various indoor and outdoor locations. Periodic equipment inspection requirements are <u>not</u> included. No analysis exists which demonstrates how the external corrosion monitoring relates to corrosion activities internal to heat exchangers, piping, tanks, and other susceptible equipment.

D. Implementation by Operations and Maintenance

The Operations and Maintenance (O&M) Division is responsible for implementing the layup and preventive maintenance criteria developed by the engineering group. The review of O&M activities resulted in a number of positive conclusions with the significant exception being that of implementation progress.

At the time of the audit, the layup for a number of important components and systems had not been implemented. This included the reactor vessel and steam generators as well as the service water and component cooling water systems. Overall, approximately seventy-five (75) percent of the layups have been accomplished. A timely completion of the remaining outstanding work orders is vital to the success of the entire program.

III. PERSONNEL CONTACTED

NAME	TITLE
J. W. Cook	Project Vice President
J. A. Mooney	Executive Manager
Bruce Peck	Site Superintendent
John Christy	Plant Operations & Maintenance Sup't.
D. Johnson	Material Services Supervisor
John Wood	Quality Assurance Engineer
Bob Wheeler	Maintenance Superintendent
Ron Budrick	Engineering Tech. Support Supervisor
Rod Wieland	Soils Section Supervisor
Hank Leonard	Quality Assurance Department Head
Gary Ewert	Services Division Head
Thiru Thiruvengadam	Engineering Technical Support Sup't.
George Smith	Scheduling Supervisor
Roger Rau	Plant Operator
Walter Bird	Licensing (Jackson)
Larry Baker	Electrician
Don Knott	QA Inspector
Rod Krager	Electrician
Jim Balazar	Tech. Support - Elec. Engineer
Peter Papaiounnou	Tech. Support - Mech. Engineer

IV. DOCUMENTS REVIEWED

1. Midland Project Shutdown Organization Procedures (consisting of 37 procedures).

2. Quality Assurance Program Plan for the Surveillance and Maintenance Phase of the Midland Energy Center, Rev. 1, May 9, 1985.

3. Midland Energy Center Surveillance and Maintenance Plan, Rev. 0, January 31, 1985.

4. Report on the Condition of Atmospheric Corrosion Test Specimens Prior to Atmospheric Exposure at the Midland Plant, RP0385-7177A-MP03, March 25, 1985.

5. Report on the Condition of Atmospheric Corrosion Test Specimens AFter Exposure to the Atmosphere for Six Months at the Midland Plant Units 1 & 2, RP0985-0023B-AD01, September 30, 1985.

6. Midland Energy Center - Revised 1985 Audit Schedule and Proposed Audit Schedule for First Quarter 1986, JLW 35-85, August 30, 1985.

7. Storage, Handling, and Maintenance of Permanent Plant Equipment and Materials, FPG-5.000, Rev. 11, June 28, 1984, Bechtel Power Corp.

8. Letter, CPCo - 1878, C.E. Mahoney (Babcock & Wilcox Project Manager) to T. C. Cooke (CPCo Project Superintendent), June 26, 1978.

9. Automation Industries, Inc., "Standard Preparation & Packing Procedure for Industrial Control Equipment," 0423-2781, August 24, 1978. (Safety related electrical and control panel storage requirements.)

10. B&W Construction Company "Long Term Storage Manual - NSS Components BWCC 31610," CPCo 7220-M1.0-113-23, Rev. 1, January 14, 1977.

11. "System Layup Requirements Manual". (Contains layup criteria for all systems.)

12. Electrical Penetrations Instruction Manual, 123-2056, Rev. P, Bunker Ramo Corp.

13. Class 1E Integral HP Induction Motor Instruction Manual, B-3645-1, Reliance Corp.

14. Joy Fan Storage Instruction Specification FF-13310.

15. Chiller Instruction Manual, 7220-M146-36-5, Rev. B, Carrier

16. Control Rod Drive Circuit Breakers; Vendor File M-1.5, J207-75.

17. Storage Requirements Manual for Preshutdown Procured Items for Stored Equipment, Rev. 0, October 11, 1985.

18. Material Periodic Check and Maintenance Requirements Manual for Stored Equipment, Rev. #2, October 11, 1985.

19. Engineering Criteria for Periodic Activity Control System (MEC Surveillance and Maintenance Phase) REv. 0, September 26, 1985.

20. "Outstanding Layup Work Orders" as of October 17, 1985.

21. Work Orders for Layup and PM; Numbers 22500660, August 9, 1985; 22500820, October 10, 1985; 22500648, August 21, 1985; 22500821, October 10, 1985; 22500819, October 11, 1985; 22500649, August 21, 1985; 22400853, March 11, 1985; 225000092, October 2, 1985.

22. "Preventive Maintenance Requirements Manual" (Contains PM criteria for components.)

23. ANSI 45.2 2-1972, Packaging, Shipping, REceiving, Storage, and Handling of Items for Nuclear Power Plants (During the Construction Phase).

24. Inspection and Enforcement Manual. Inspection Procedure 92050, "Review of Quality Assurance for Extended Construction Delay," January 1, 1983.

25. Layup Requirements

P410/411	Rev.2	Decay Heat and Core Flood
P401/402	Rev.1	Reactor Coolant System
P453/462	Rev.0	Containments 1 & 2 HVAC System
P452	Rev.1	Emergency Diesel Fuel Oil
P418/419/420	Rev.2	Service Water
P412/413	Rev.1	Borated Water Storage Tanks

26. Preventive Maintenance Requirements

F10-43	Rev.1	Auxiliary Building Safeguard Chillers and Accessories
F10-258	Rev.0	Emergency Generator Diesel Engines & Associated Mechanical Components & Assemblies
F10-13	Rev.0	Reactor Building Spray Pump
F10-5010	Rev.1	Service Water Pumps and Motors
F10-118	Rev.2	Auxiliary Feedwater Pumps and Drivers
F10-43	Rev.1	Auxiliary Building Safeguards Chillers and Accessories
F10-9	Rev.2	Decay Heat Pump and Motor
F10-12	Rev.2	Makeup Pumps, Motors and Auxiliary Oil System
F10-217	Rev.2	Spent Fuel Pool Safeguards Chilled Water and Condensate Demineralizer Recycle Pumps and Motors
F10-5024	Rev.0	Tank Humidity Checks

27. Work Orders

22400787 for PM requirements of F10-217
22400633 for PM requirements of F10-118
22400580 for PM requirements of F10-43
22400487 for PM requirements of F10-12
22400348 for PM requirements of Diesel Generator
22500531 for PM requirements of F10-5010

22500015 for PM requirements of F10-9
22400789 for PM requirements of F10-12
22500758 for Layup Requirements of Unit 2 Vessel
22400454 for Layup Requirements of Unit 1 Vessel

28. Letter, CPCo 4995 dated May 21, 1985 from Babcock & Wilcox, Nuclear Power Division, Lynchburg, VA to CPCo. Subject: Consumers Power Co. Midland Plant, Units 1 & 2, Recommendations for Long Term Layup.

29. Nonconformance Reports

Q-00002	1/14/85	Procedures for Shutdown
Q-00006	2/11/85	Auxiliary Building Safequard Chillers
Q-00014	3/1/85	Ashcroft Pressure Gauges
Q-00016	5/9/85	Instruments - Various
Q-00020	6/11/85	Unit 2 - Reactor Bldg. Penetration Press. Sys.
Q-00024	7/30/85	Target Rock Check Valve

30. Valve Maintenance and Storage Instructions from the following manufacturer's

a. Henry Pratt Co. - Butterfly Valves	- Bechtel	Spec.	7220-M132-97-2
b. Kerotest Mfg. Co. - Valves (various)	- "	"	7220-M129A-51-1
c. Limitorque Co.	- "	"	7220-M123C-106
d. Westinghouse Corp. - Nuclear Valves	- "	"	7220-M125A-14-2
e. Target Rock Corp. - Valves (various)	- "	"	7220-M125B-17-1
f. Anchor Darling Valve Co.-Valves (var.)	"	"	7220-M125C-63-1
g. Vogt Corp. - Various Valves	- "	"	7220-M127B-107-1
h. Crosby Valve - Safety Relief Valves	- "	"	7220-M333-10-1

V. DESCRIPTION OF REVIEWED AREAS

To determine the adequacy of the Midland Surveillance and Maintenance Program to preserve the integrity of the safety related equipment so as to support a project restart, a detailed review of the Quality Assurance, Engineering, and Operations/Maintenance Sections was performed. This included a review of procedures, personnel qualifications, and specific activities performed within each section. The results of this review along with comments on the physical condition of the plant are described in the following paragraphs.

1. Quality Assurance

The Quality Assurance Program Plan represents CPCo's commitment to comply with Appendix B to 10CFR50, industry standards, and corresponding NRC regulatory guides. It is intended to provide controls to assure identification, execution, verification, and documentation of surveillance and maintenance work, "in a manner which permits that work to be reconciled with the plant design basis in the event of project restart." (From QAPP).

Review of the quality assurance and control at Midland encompassed a number of subtopics including organization, procedures, staffing, personnel qualifications, audits and nonconformance reporting. These areas as described in the following paragraphs.

1.1 Organization

The Quality Assurance (QA) organization at the Midland Energy Center (MEC) consists of ten personnel as follows:

a.(1) QA Department Head
b.(1) Clerk
c.(1) QA Verification Section Head
d.(2) QA Engineers
e.(5) QA/QC Inspectors

The organization is charged with the responsibility for implementation of the quality assurance (and quality control) functions through the MEC Quality Assurance Program Plan (QAPP). A review of the organization structure reveals that this licensee has clearly established the authority and duties in writing of the quality organization. The persons within the QA organization have freedom to identify quality problems and are provided with a reporting chain to a management level which assures their independence from cost and schedule constraints.

This QA organization does not delegate any of its work to other organizations (either internal or external). An organizational chart is in existence and delineates the reporting chain of authority and the interface and relationship between the quality organization and those organizations responsible for the administration, maintenance and layup activities at the MEC. No recommendations are made by BNL in this area.

1.2 QA Activities

The QA activities at the MEC are delineated in fourteen QA Division procedures which were developed as a result of the commitment made by CPCo in Section 2, Quality Assurance Program of their QAPP. These procedures provide specific instruction and establish detail requirements such that the quality function is included in the maintenance activities at MEC. The procedures which were developed are listed in Table 1. Those procedures reviewed by BNL and our comments, if any, are noted in the table. We have noted that CPCo has committed to the cessation of design, construction and testing activities during the S&M phase and that these procedures were developed and reviewed on that premise. No recommendations are made by BNL in this area.

1.3 Staffing

The level of staffing of the quality assurance organization appeared to be sufficient to monitor the activities currently taking place. No recommendations are made by BNL in this area.

1.4 Personnel Qualifications

A review of personnel qualifications revealed that the quality assurance personnel (other than administrative) were qualified in accordance with a detailed qualification and certification procedure (QA-003, Rev. 2 Certification of Inspection Personnel).

A partial examination of the qualification records of four inspection personnel was made to determine compliance with the requirements established in QA-003. Records examined included vision examination, on the job training activities, personnel qualifications questionnaire, capability demonstration results and the personnel certification form. The records were found to be complete for all individuals selected for examination. The required evaluation of capabilities had taken place for each individual, qualifications were verified and certifications issued. No recommendations are made by BNL in this area.

1.5 Audits/Surveillances

The QA section has completed six of the eight audits it has scheduled for 1985, adequately addressing most aspects of the Midland Surveillance and Maintenance Program.

Of particular interest was Audit 85-05 which was reviewed in depth and discussed with the responsible QA personnel. This audit focused on the Engineering and Licensing aspects of the plan and was conducted in September 1985. The audit was comprehensive and the inspector observations demonstrated reasonable insight into the areas reviewed. The inspector noted in the report that QA follow-up on the preventive maintenance measures indicated in the layup criteria for certain equipment, including the steam generators and the component cooling water pumps, could not be performed since the specific PM procedures had not been issued. Based on this limitation a concern was raised to the QA people that this item

should be tracked to verify that the PM criteria are properly implemented.

Licensee response was that an audit of the entire PM Program, including implementation, was a QA objective for 1986 and that upon management approval of the objectives, the audit schedule for 1986 would be developed.

It is recommended that a QA audit of this area be accomplished in early 1986. Independent, internal verification of all aspects of the Surveillance and Maintenance Program, particulary PM implementation, is vital to the viability of the QA program.

1.6 Nonconforming Activities and Conditions

A system for the identification and control of nonconformances is established and functioning at the MEC. This activity is accomplished through the implementation of QA 006, Rev. 2, Nonconformance Control and Reporting.

All nonconformance reports (NCR) issued since January 1, 1985 were reviewed to ascertain the type, extent and disposition of nonconformances being identified. A total of thirty three nonconformance reports had been generated to date. Sixteen nonconformance reports had been dispositioned (closed) and seventeen remained open. Of those remaining open:

a. 3 were open for more than a week.
b. 5 were issued (open) within the last week.
c. 9 were open and closure was not expected or planned (open for as long as nine months).

CPCo has made clear in their QAPP, Rev. 1 Section 15: Nonconforming Items, Para. 1.2 and procedure QA006, Rev. 2, Nonconformance Control and Reporting, Item 1.2 that it was their intent to "process further" only those NCR's that were required to support shutdown activities. In the event this project were to be revived, it was the intent of CPCo to address the NCR's outstanding at that time. In this manner, valuable resources would not be expended in providing NCR dispositions which were judged (by CPCo) as not essential to the shutdown activity. The decision to allow an NCR to remain "open" was being made by the QA organization. It is recommended that the disposition of nonconformance reports be finalized in a timely manner. "Timely" may vary with the complexity of the nonconformance, however, a reasonable period of time should extend no more than four to five months.

2. Engineering

The Engineering Technical Support Section responsibilities include establishing the layup and preventive maintenance criteria for all systems and components, administering the corrosion monitoring program, processing NRC documents, and controlling modifications. This section consists of engineers versed in the various engineering disciplines including electrical, mechanical, materials science, and soils, with additional onsite support provided by engineers from the CPCo General Office on a part time basis.

2.1 Procedures

The activities of the Engineering Division (ED) are established and outlined in nine ED procedures. The procedures developed to govern the activities of the ED are listed in Table 1. These procedures were reviewed by BNL and comments, if any, are noted in the table. BNL has made recommendations regarding procedures EN-002, Rev. 1, Corrosion Monitoring, EN-004, Rev. 1, Design Control, and EN-009, Rev. 1, Engineering Criteria for Preventive Maintenance which are described in Section 2.3.

2.2 Staffing

The Engineering resources available at the site and provided on a part-time basis from the CPCo General Office in Jackson appear to be sufficient to monitor the activities currently taking place. No BNL recommendations in this area are made.

2.3 Development of Layup and Preventive Maintenance Criteria

The Engineering Technical Support Section is responsible for generating, revising, and releasing engineering criteria required to support preventive maintenance and storage. The development of layup and preventive maintenance criteria has been completed, although revisions to some systems and components are being processed as additional vendor or architect/engineer information is obtained. The "System Layup Requirements Manual" and the "Preventive Maintenance Requirements Manual" are the two primary documents which describe layup requirements for each of the approximately eighty systems and PM requirements on a component basis, respectively.

Procedures EN-009, "Engineering Criteria for Preventive Maintenance" and EN-004, "Design Control," describe the methodology that should be used to establish these criteria including utilizing vendor recommendations as a reference source.

Ten specific components were selected for review of this attribute. Vendor manuals and architect engineer (Bechtel) documents were obtained and reviewed. This information and subsequent discussions with the responsible engineer led to the following conclusions:

1. For large (> 20 HP) motors, fans, and pumps, periodic shaft rotation is recommended by vendors. The recommended frequency of rotation is as often as monthly for Westinghouse AC motors, every ninety days for Joy fans, or every six months for Reliance motors. Midland has established an annual rotation frequency for these components. This deviation from vendor recommendations was not documented although some "informal guidelines" were stated to exist from which the annual frequency was derived. No technical justification was provided.

   It is recommended that whenever Engineering develops layup or preventive maintenance criteria different from that of the reference sources, i.e., vendor or architect/engineer, a formal approval cycle be enforced which results in a documented technical approach to the conclusions reached.

2. Limitorque motor operators were not included in the Surveillance and Maintenance Program despite specific Limitorque recommendations for long term storage. The Licensee concurred with this finding and initiated steps to incorporate the vendor recommendations into the PM program. There are approximately two hundred (200) safety related Limitorque valve operators per unit which will be addressed in the near future.

3. CPCo has adopted a uniform approach to valve protection and preservation which is that no particular activity or action is required other than what is specified in the layup procedure for the individual system. In discussions with CPCo engineering personnel it was revealed that the rationale used to arrive at this position was the result of a review of manufacturer's literature supplied with the individual valves. A cursory review of storage requirements provided with valves supplied by the following manufacturers was made:

   - Westinghouse
   - Target Rock
   - Anchor Darling
   - Henry Pratt
   - Vogt
   - Babcock & Wilcox (B&W)
   - Crosby Valve

   It was noted that each manufacturer did provide storage requirements although some did not specifically define the term (long or short and what the actual time span would be). However, the instructions provided are written such that the manufacturer is clearly giving the instruction as applicable to the pre-installation period. Therefore, the instructions are limited to a few steps such as:

   - keep the valve(s) wrapped
   - dry
   - free of dirt
   - provide for air circulation
   - minimum temperature variation

   No instructions are provided by the manufacturer which address the valve maintenance or storage after installation and during systems layup. Presumably, preventative maintenance procedures should then become effective after installation and upon operation of the system. It was not apparent that valve manufacturers were contacted for their advice on what steps should be taken to preserve and protect this equipment during a layup phase after installation. Since the systems in which these valves are installed are considered by CPCo to be of "Level B" storage area, it was the CPCo position that no further action was necessary. The presumption that the equipment is satisfactorily preserved and protected based on the system layup procedure is not adequate. The valve protection and preservation program at MEC requires further action. Valve manufacturers should be contacted to supply more definitive instructions on long term layup requirements.

4. Due to the obvious importance of the reactor vessel, particular attention was applied to the evaluation of the layup procedure developed by the engineering group. Also, the internal surface of the vessel was examined through the access hatch. Entry into the lower portion of the vessel was planned, but due to time constraints this was not completed. The interior (down to the support platform) could be examined from the access hatch such that a meaningful observation could be made. The vessel was found to be free of debris and foreign material, sealed from entry, protected from moisture (with desiccant) and a humidity (40-50-60%) indicator installed in the temporary access hatch. The inside surfaces of the vessel and the outlet nozzles appeared clean and dry. The humidity was indicated to be in excess of 50% but not yet 60%.

   Several items of concern were brought to the attention of the licensee. The items of concern were:

   - The vessel manufacturer's (B&W) recommendations had not yet been placed into effect (15 months after shutdown). However, while at the MEC, the work orders for this activity were being prepared. The work orders were prepared and presented for review on October 18, 1985

   - CPCo layup procedure did not specify frequency of humidity check (B&W recommended every 30 days).

   - Humidity indicators had not been installed on the vessel internals.

   - Humidity indicator on reactor vessel was installed on the top manway cover adjacent to the basket of desiccant.

   - The entire amount of desiccant for the reactor vessel was placed in one basket which was suspended about 1-2 feet below the temporary reactor pressure vessel cover.

   The activity undertaken to preserve and protect the vessel needs to be accelerated rapidly, such that the reactor vessels are afforded the protection recommended by the manufacturer. The current protection plan does not completely agree with the action recommended by B&W, and no additional data is provided to justify variation. These differences should be resolved to assure that these important components are preserved.

5. In reviewing the various system layup critria, it was discovered that the layup of safety related instrumentation tubing was not specified in several systems including the reactor coolant and main steam systems. Further investigation revealed that a substantial amount of stainless steel tubing existed which was an integral part of the pressure boundary for those systems. As a minimum, it was expected that these lines should be drained as was specified in other system layup criteria.

The licensee concurred, and agreed to incorporate into the system layup procedures the requirements to drain and vent instrument lines. In addition, the revised system layup criteria would be implemented through the issue of new work orders.

6. The layup criteria for the reactor coolant and main steam systems including the vessel and steam generators, and the service water and component cooling water systems calls for the installation of large air handling units (22,000 scfm) to circulate filtered dry air through the system piping. One of the air handling units has been placed in the service water intake structure, however, none have been connected to their respective systems. The adequacy of the air flow through these large systems remains unknown. This is an important aspect of the Surveillance and Maintenance Plan which should be reviewed following implementation.

2.4 Corrosion Monitoring

The MEC corrosion monitoring program is based on monitoring and analyzing the corrosive action on representative samples of four different low alloy and carbon steels existing in structural steel, piping, vessels, and bolting at the Midland facility. Test coupons have been located in the areas most conducive for supporting material corrosion, with the assumption made that the maximum effects due to corrosion on the installed equipment will be known by monitoring the test specimens.

In February 1985, a total of 430 test coupons were mounted at six locations around the Midland site including the bottom level of the auxiliary building which is approximately sixty feet below ground level, the service water intake structure, the containment building equipment level, and an outside location adjacent to the Emergency Diesel Generators. These coupons are mounted on accessible racks which were inspected as part of the overall plant physical inspection.

In July and August 1985, approximately sixty coupons were removed for analysis which was performed at CPCo headquarters in Jackson. On September 30, 1985, a report was issued (Ref. 5) which concluded that "corrosion is considered to be minimal." Samples are scheduled to be analyzed at six month intervals so that corrosion rates may be calculated.

The activity of corrosion monitoring and control is considered a vital activity by BNL. During the shutdown phase, it is anticipated that significant deleterious effects can occur as a result of corrosion activity. Of particular concern are those systems and components which have been:

- wetted
- located in humid atmospheres
- subjected to stagnant atmospheres
- subjected to condensation
- subjected to airborne contaminants

As a result of the review of ED procedure EN-002, Rev. 1, Corrosion Monitoring, BNL has concluded that the current procedure is not adequate. This procedure has addressed only the external aspects of corrosive attack.

External corrosion is an area of concern, however, of even greater concern is the action of corrosion mechanisms in closed (or, near closed) systems and components.

Due to the advanced state of construction when shutdown occurred, the number of components installed and systems completed is substantial and, exceeds by far the number remaining to be completed. CPCo has adopted this course of action due to its presumption that the implementation of the layup practices will provide the necessary protection to internal surfaces. Unfortunately, to date, a number of important layup practices have yet to be accomplished (15 months since shutdown).

The corrosion monitoring program is thorough, complete and technically a sound program for the determination of the effects of external corrosion activity. However, BNL recommends that specific attention be directed to a program which will assure that internal corrosion mechanisms are reduced or eliminated or, as a minimum, a program is initiated wherein CPCo will have some measure of the corrosion status or activity within closed systems and/or components. The presumption that corrosion within closed systems and/or components is sufficiently inhibited through the maintenance of a class "B" storage facility and relative humidity level of 60% or lower is unfounded and, further justification or action should be required.

2.5 Response to NRC Documents

NRC requirement for holders of a nuclear power reactor construction permit include responding, as required, to NRC communications such as Bulletins, Information Notices, and Generic Letters. The Engineering and Licensing Section has a procedure EN-005, Rev. 1 entitled, "Processing NRC Bulletins, Notices, and Generic Letters" which provides a standard method for processing such documents.

During 1985, two NRC Information Notices were issued which related to Midland's present status, Notices 85-30: "Microbiologically Induced Corrosion of Containment Service Water System" issued on April 19, 1985 and 85-56 "Inadequate Environment Control for Components and Systems in Extended Storage or Layup" which was issued on July 15, 1985. A review of the processing of these documents indicated that 85-30 requires no action by the licensee due to the dry method of layup being utilized. This was properly documented and approved on July 5, 1985. IE notice 85-56 had not been processed at the time of the review, however, the licensee provided an October 28, 1985 scheduled completion date.

BNL concurs with the analysis of 85-30 and recommends follow-up on the licensee's response to 85-56.

2.6 Modification Control

One of the six principles of the Layup and Maintenance Program as described in Section 3.3 of the Midland Surveillance and Maintenance Plan is to "maintain configuration control such that in the event of construction restart the documented modifications made during the Surveillance and Maintenance Phase can be dispositioned."

The Engineering Technical Support Section is responsible for assuring plant modifications are documented. A review of their log (EN-3-1, Rev. 0) and several selected station modification packages, including SMN 21-85 dealing with the auxiliary lube oil pump motor to the Unit 1 makeup pump and SMN 20-85 associated with the control switch to the unit 2 makeup pump, revealed that the procedure EN-003, "Plant Modification Control" was being properly implemented. No recommendations are made in this area.

3. Operations and Maintenance (O&M)

The review of the Operations and Maintenance Sections included a review of their procedures, a determination of layup and PM status, the organization and availability of manpower, a review of completed work orders and operator logs, and observation of operator and electrician jobs in progress.

3.1 Procedure

Four procedures were developed by CPCo to govern the activities of the Operations and Maintenance Department (O&M). These procedures are listed in Table 1 of this report. OM-001, Rev. 2, Control of Work Performed on Permanent Plant Equipment is the essential document which controls the accomplishment of work from the initiation of the work order to the proper dispositioning of the resultant records when the work has been completed.

The ability of this instruction to adequately cover the control, status and documentation of work being accomplished was verified by examination of ten work orders delineating the preventive maintenance requirements for safety related components. Also, five safety related systems were selected at random to ascertain the status of the layup activities for each system. CPCo personnel were able to retrieve the selected work orders within a reasonable period of time (1-2 hours) and were able to identify work completed to date on each system. There were no comments or recommendations regarding the O&M procedures except as indicated in Table 1.

3.2 Layup and Preventive Maintenance (PM) Implementation

A review of the licensee's planning and scheduling documents and work orders, and discussions with responsible O&M supervision revealed that layup implementation is approximately 75% complete. Of concern, however, is that a number of important systems and components have not been completed including systems such as service water, chilled water, component cooling water, main steam, and makeup purification; and components such as the reactor vessels and the steam generators. As of October 17, 1985, 284 of the 345 written work orders for implementing the layup criteria had been completed. Several additional work orders were being written or were scheduled to be written to address layup criteria received from Engineering.

An outstanding work order summary was provided to BNL. As of October 17, 1985, forty-one (41) of the fifty-eight (58) work orders listed were Q-safety related. Several were outstanding for as long as ten months. While it is understood that systems such as service water and component cooling water require a significant effort to implement the layup criteria, delays of several months between issue and implementation of the layup criteria is unsatisfactory.

3.3 Staffing

The Operating Section maintains around the clock coverage with a minimum of two plant operators per shift. In addition, the day shift generally has two assistant shift supervisors and one shift supervisor as well as one or two extra plant operators. Responsible for performing the valve manipulations associated with all of the system layups, Operations also performs equipment tagouts to support corrective and preventive maintenance, equipment rounds to verify proper operation of energized equipment, and certain preventive maintenance tasks such as periodic humidity and temperature readings at selected locations. Based on the observed delay in implementing the layups, it is concluded that manpower in the Operations area is insufficient. Once layups are completed, the Operations work load may decrease. However, monitoring the large air handlers which will circulate filtered air through the service water and component cooling water systems, the reactor vessel, and the steam generators will require Operations support. The extent of manpower required is not finalized at this time since the circulating air units have not been placed in service.

The O&M Division also includes mechanics, electricians, and technicians. These personnel are primarily involved with corrective and preventive maintenance. Based on the fact that there was no unusual backlog in either area at the time of this review, it is concluded that staffing in this area is adequate.

3.4 Work Performance Review

Observations of work in progress as well as audit of completed work records were performed during the week to verify the program for accomplishing work was in compliance with the approach specified in the Surveillance and Maintenance Plan. Positive observations in this area included the following:

- Observation of electricians (accompanied by a QA inspector) performing required preventive maintenance on the unit 1 closed loop cooling water pump; P-73A. This annual PM was completed satisfactorily in accordance with the provided work procedure (work order 22500820).

- Accompanying a plant operator on an Operations PM to measure and record the humidity and temperature at various plant areas including the diesel generator buildings, auxiliary building, and service water building. This PM is performed every two weeks and requires Engineering notification if limits are exceeded (work order 2250 0092).

- A review of the daily operator log sheets for September 1985. These sheets contain the important readings to be taken by the operator during his rounds. Limits are provided on certain parameters such as the nitrogen pressure reading to the containment electrical penetrations. Recorded readings were within specifications.

- Inspection of the physical plant including equipment such as the electrical switchgear, station batteries, and several large motors. Despite limited lighting and obstacles such as scaffolding, the plant physical appearance was reasonably good, with housekeeping zones and

rodent controls being satisfactorily enforced. Switchgear air filters had been changed, the battery rooms were clean, and motor space heaters were energized.

- The ability to access and recall work information from the records system was very good. An on-line computer assisted maintenance management program enabled supervision to quickly obtain hardcopy records on individual components or systems. The continued use of this system should result in a complete equipment history being available for review at the time of restart.

On the negative side, however, was an observation of work practices which could (and did) bypass QA requirements. A random selection was made of work orders prepared for the performance of preventive maintenance (PM) activities on safety related (Q-listed) components. Of the ten selected for this review it was identified that a potential existed for work orders to be prepared on safety related items and proceed to release for work without the benefit of QC review. This is a very likely possibility since the QC review occurs when the PM master work order is prepared. The master work order is signed by the QC reviewer and this document is then used to control the future PM activities at the scheduled interval. The potential for difficulty is that QC is then out of the review cycle after indicating concurrence on the master work order. The QC function is brought back into this cycle only if a change to the original PM requirements is made by the engineering organization. There was not a specific mechanism evident to assure QC would be notified in the event of a change. This work order was #22500531.

A second discrepancy was discovered when a safety related component PM work order (#22500015) was examined. This item was equipment #P-60A, decay heat removal pump. Although this is a safety related component, the work order indicated the item was not Q listed, no QC was required and QC review of the work order was not required. This work was completed without quality control participation. The reason why this particular incident occurred was not apparent.

The remaining work orders examined were found to be complete and accurate in providing the equipment safety classification, work to be performed, priority, location and appropriate "sign off" action.

The method of work accomplishment by use of the work order needs programatical change to assure that work specified on safety related components is reviewed by the quality organization (QC or QA). A "master copy" of work details should not be signed by the quality organization without a method to assure that changes and/or revisions of engineering requirements are not overlooked.

VI. RECOMMENDATIONS

The following list summarizes the recommendations described in the report and references the subparagraph where more detailed information is available.

1. Conduct a QA audit of the Preventive Maintenance (PM) Program implementation in early 1986 (1.5).

2. Modify the means of QA nonconformance reporting and dispositioning to preclude reports remaining open for extended periods of time (1.6).

3. Deviation from vendor and/or architect/engineer layup or PM requirements should be technically justified, formally approved, and documented (2.3).

4. Incorporate Limitorque motor operators into the Surveillance and Maintenance Program (2.3)

5. Contact valve manufacturers to verify that present storage and layup practices are acceptable (2.3).

6. Engineering activity to preserve and protect the vessel needs to be accelerated rapidly to address the manufacturer's recommendations. (2.3)

7. Incorporate instrument tubing layup criteria into the system layup procedures where this was omitted. (2.3)

8. Follow-up on the implementation of the layup of remaining systems including the reactor vessel, steam generators, service water and component cooling water (2.3).

9. Modify corrosion monitoring program to include monitoring/inspection of piping and equipment internals (2.4).

10. Responded to IE Information Notice 85-56 scheduled to be completed on October 28, 1985 (2.5).

11. Expedite completion of layups for outstanding systems and equipment (3.2).

12. Review adequacy of Operating Section manpower level (3.3).

13. Modify work order processing procedure to insure that bypass of QA responsibilities is prohibited (3.4).

TABLE 1: SUMMARY OF PROCEDURE REVIEW

Procedure Number and Title	Rev.	Date	Comments
1. PR001-Preparation and Control of Procedures & QAPP	1	7/9/85	None
2. PR-002-Procurement of Materials and Services	0	1/30/85	None
3. PR-003 Indoctrination	2	5/6/85	None
4. CD-001 Requirement for Remedial Soils Work	2	8/16/85	None
5. CD-002 Material Receipt, Storage, Issue & Return	2	9/27/85	Should reference "Material Periodic Checks and Maintenance Requirements Manual for Stored Equipment," Rev. 2
6. CD-003 Housekeeping	1	6/4/85	None
7. OM-001 Control of Work Performed on Permanent Plant Equipment	2	8/23/85	Section 5.2.3 should provide a means for insuring QAD review of all safety related work orders. Sign off by QA of "Master" work order should be allowed only if mechanism is provided for QA re-review whenever engineering criteria are changed.
8. OM-002 Calibration Facility Control	0	12/17/84	None
9. OM-003 Control of Measuring and Test Equipment	2	8/13/85	None
10. OM-004 Control of Welding Electrode and Wire	1	8/9/85	None
11. QA-001 Qualification Evaluation	2	6/12/85	None
12. QA-002 Inspection	2	6/12/85	No tie between OM-001 which discusses QA involvement in work implementation and QA-002 which discusses "hold points" and "witness points."
13. QA-003 Certification of Inspection Personnel	2	7/2/85	None

Table 1 (cont'd)

Procedure Number and Title	Rev.	Date	Comments
14.QA-004 Audits	2	6/12/85	None
15.QA-005 Certification of Audit Personnel	2	6/12/85	None
16.QA-005 Nonconformance Control and Reporting	2	6/12/85	Guidelines for insuring timeliness of dispositioning nonconformances is necessary.
17.QA-007 Management Corrective Action	2	6/12/85	None
18.QA-008 Review of Instructions, Procedures, Design, and Procurement Documents	2	6/12/85	None
19.QA-010 Use of Measuring and Test Equipment	2	6/12/85	None
20.QA-011 Trend Analysis	2	6/12/85	None
21.QA-012 Activity Hold	2	6/12/85	None
22.QA-013 Allegations	1	6/12/85	None
23.QA-014 Reportability Determination	2	6/12/85	None
24.EN-001 Engineering Calculation	0	1/21/85	None
25.EN-002 Corrosion Monitoring	1	9/25/85	See Corrosion Monitoring Program comments in 2.4.
26.EN-003 Plant Modification Control	1	9/25/85	None
27.EN-004 Design Control	1	9/25/85	Should include requirement to document cases where layup criteria developed differs from vendor or architect/engineer recommendations. (see sect.2.3)
28.EN-005 Processing NRC Bulletins, Notices & Generic Letters	1	9/6/85	Commitment to responding in a "timely" fashion should be indicated.
29.EN-006 NRC Communications	0	1/21/85	None

Table 1 (cont'd)

Procedure Number and Title	Rev.	Date	Comments
30.EN-007 Non-Nuclear & Non-radiological Environmental Licensing Activities	0	1/23/85	None
31.EN-008 Correspondence & Commitment Management	1	6/24/85	None
32.EN-009 Engineering Criteria for Preventive Maintenance	1	9/25/85	Procedure should describe an approval process to be implemented whenever vendor recommendations are not followed - "formal guidelines" are necessary.
33.RD-001 Controlled Document	1	6/4/85	None
34.RD-002 Inactive Records Collection	1	7/9/85	None
35.RD-003 Active Records Management	1	9/3/85	None
36.RD-004 Inactive Records Storage and Maintenance	1	7/9/85	None
37.RD-005 Safeguards Information	1	2/28/85	None