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CONSTRUCTION PROJECT EVALUATION OF CONSUMERS POWER COMPANY MIDLAND ENERGY CENTER PROJECT UNITS 1 AND 2

Evaluation Performed By

Management Analysis Company

Corrective Action Supplied By

Consumers Power Company

With Input From Bechtel Power Company

January 31, 1983

EXECUTIVE SUMMARY

This report represents the results of the construction evaluation performed by Management Analysis Company (MAC) on Consumers Power Company (CP Co) Midland Energy Center Project, Units 1 and 2. Included in this report are the corrective actions for each finding which were provided by CP Co with input from their architect/ engineer, Bechtel Power Company (BPCo).

This evaluation was conducted using the format developed by the Institute of Nuclear Power Operation (INPO) where performance is measured against the specified Performance Objectives. The level of effort applied in planning and evaluation is comparable to the guidelines proposed by INPO in the methodology workshops conducted in Atlanta, Georgia. Due to the team's experience in conducting previous INPO evaluations, training was not necessary and the investigation could proceed immediately after the orientation sessions.

During this evaluation, full cooperation was provided by CP Co project and field staff, by the Bechtel Power Company (BPCo) project and field staff and by subcontractors used by each organization. The evaluation team was provided overview presentations in all major activity areas to familiarize them with the project and identify key contacts for follow-up. In addition, supporting documentation was made available upon request in all cases.

The scope of the INPO evaluation covers all major disciplines of work, i.e., management, design, construction, project support, quality control, testing and training. It was also directed at evaluating the work in progress at that time. To comply with the scope, over three weeks were spent observing and examining work in progress at the site, at CP Co Corporate Offices in Jackson and at Bechtel's main offices in Ann Arbor. Every major work activity was observed and the performance noted used as the primary basis for this evaluation. In addition, over 75 project and field staff were formally interviewed and informal discussions took place with numerous personnel during observations and walk-throughs. Approximately 150 documents and extensive supporting material were also reviewed to assess if project activities were sufficiently documented. Where appropriate, statements made during interviews were confirmed in writing.

The following summarizes the major strengths and weaknesses identified in this evaluation. These major weaknesses were primarily associated with the administrative controls being applied and not the quality of the workmanship being performed. Specifics associated with each finding are addressed in the body of the report including corrective action for each weakness.

Major Weaknesses

- Considerable effort is required in identifying and retrieving design criteria documentation.
- There has not been sufficient consideration given for constructability, maintainability and inspectability.
- Work instructions to the field are sometimes incomplete and conflicting.
- Construction inspection procedures and criteria for acceptance are not always clearly defined.
- Inadequate planning coordination of QA inspections with construction activities.
- QA/QC requirements for acceptability are not clearly defined and documented.

Major Strengths

- The space control program for interface checking prior to release of design changes is excellent.
- The program for scheduling and tracking testing activities is comprehensive and well staffed.

As a result of this evaluation it is the consensus of the team that the management of the Midland Plant has instituted a positive program for designing and constructing a quality plant. Although weaknesses were identified which require corrective action, most are of a minor nature. A number of good practices were noted that the evaluation team strongly urges be continued. Through continued attention to the weaknesses disclosed in this report and the implementation of current project programs, a high quality plant should result.

TABLE OF CONTENTS

LIST OF TABLES

1.0 PLANT DESCRIPTION

The Midland Plant, Units 1 and 2 is an electric power generation facility being constructed on the south side of the Tittabawassee River, opposite the Dow Chemical Company (Dow) Plant and the City of Midland, Michigan.

The facility consists of two units with a total combined capability of approximately 1,300 MWe and 4×10^6 pounds per hour of process steam. The process steam will be supplied to Dow's system and the electricity supplied to CP Co's system.

The containment for the Nuclear Steam Supply System (NSSS) is a post-tensioned, reinforced concrete structure with a steel liner to provide leak tightness. The containment is designed and constructed by BPCo.

The NSSS is a pressurized water reactor type (PWR) manufactured by Babcock & Wilcox Company (B&W).

The reactor core is rated for an output of 2,452 MWt, which is defined as the rated output in the licensing application. When the reactor coolant pump heat input of 16 MWt is added to the core output, the resulting NSSS-rated output is 2,468 MWt. The expected maximum core output is 2,552 MWt with an expected NSSS output of 2,568 MWt. Analysis of possible offsite radiological consequences of postulated design basis accidents uses an assumed core power of 2,552 MWt.

The Unit 1 turbine generator is rated for operation at the NSSS-rated output of 2,468 MWt with a corresponding electrical output of 505 MWe gross. Under normal operation, low-pressure steam is provided to Dow by using extraction steam from the high-pressure turbine with high-pressure steam to Dow supplied from the main steam header. The Unit 1 turbine generator has a maximum calculated design capacity of 595 MWe gross, assuming an input of 2,468 MWt with a corresponding steam flow to Dow of approximately 2.0×10^6 pounds per hour of low pressure and 0.4×10^6 pounds per hour of high-pressure steam. Approximately 3.6×10^6 pounds per hour of low pressure and 0.4×10^6 pounds per hour of high-pressure steam can be provided to Dow at the Unit 1 turbine generator rated level of 505 MWe gross.

The Unit 2 turbine generator is rated for operation at the NSSS-rated output of 2,468 MWt with a corresponding electrical output of 852 MWe. The Unit 2 turbine generator has a maximum calculated design capability of 886 MWe assuming an input of 2,568 MWt, which is approximately 104 percent of the rated steam flow.

The plant's major structures are the containment buildings, common (shared) auxiliary building and waste processing facility, service water pump structure, circulating water pump structure, diesel generating buildings, combined control rooms, turbine building, process steam evaporator building, auxiliary boiler building, fuel handling buildings, cooling tower, ultimate heat sink cooling pond and outage building.

2.0 PROJECT STATUS AND ACTIVITY SUMMARY

During this evaluation period the following major construction activities were underway. All activities with any significant manpower application were observed for performance compliance.

- Containment Areas:
  - Pipe hanger and restraint installation/rework
  - Cleaning of core flood tanks
  - Video system for reactor vessel support bolts
  - Insulation application
  - Installation of instrument sensing lines
  - Small bore pipe installation
  - H & V system component installation
  - Fuel handling component installation and check-out
  - Preservice inspection
  - Weld preheat/post heat
- Auxiliary Building:
  - Hydrostatic testing of systems
  - Pipe, hanger and restraint installation/rework
  - HVAC installation
  - Electrical termination
  - Cable pulls/cable precutting and coiling
  - Instrument and instrument rack installation
  - Cable tracing
  - Grouting and reinforcement of block walls (Q class)
  - Watertight door installation
  - Coating repair and painting
- Turbine Building:
  - Lube oil flush
  - Chemical flush preparation
  - Pipe/hanger rework
  - Pump/motor alignment
  - Instrumentation tubing installation
  - Conventional insulation
  - Systems flushing
  - Post weld stress relief

TABLE 1

PROJECT STATUS SUMMARY

Activity Area	Approximate Percentage Complete
Civil	
Excavation and Backfill	99
Concrete Placement	96
Cadwelding Rebar	100
Structural Steel Rigging, Bolting, Welding	97
Masonry Seismic Wall Installation	100
Application of Coatings	85
Mechanical	
Pipe Erection, Large Bore	98
Pipe Erection, Small Bore	95
Installation of HVAC Ductwork	84
Instrumentation System Installation	60
Reactor Internals Installation	100
Equipment Erection	82
Electrical	
Cable Tray Installation	100
Cable Pulling	92
Cable Terminations	80
Conduit Installation	91

3.0 PROGRAM IMPLEMENTATION

CP Co management decided to perform their self-initiated evaluation of Midland Units 1 and 2 using an outside company that could assemble an evaluation team independent of CP Co/BPCo personnel. In addition, they only considered companies who were experienced in conducting evaluations of nuclear plants under construction. MAC was selected to provide this evaluation based upon MAC's involvement at INPO in developing performance objectives and criteria and their extensive staff of senior personnel who could be made available for this evaluation.

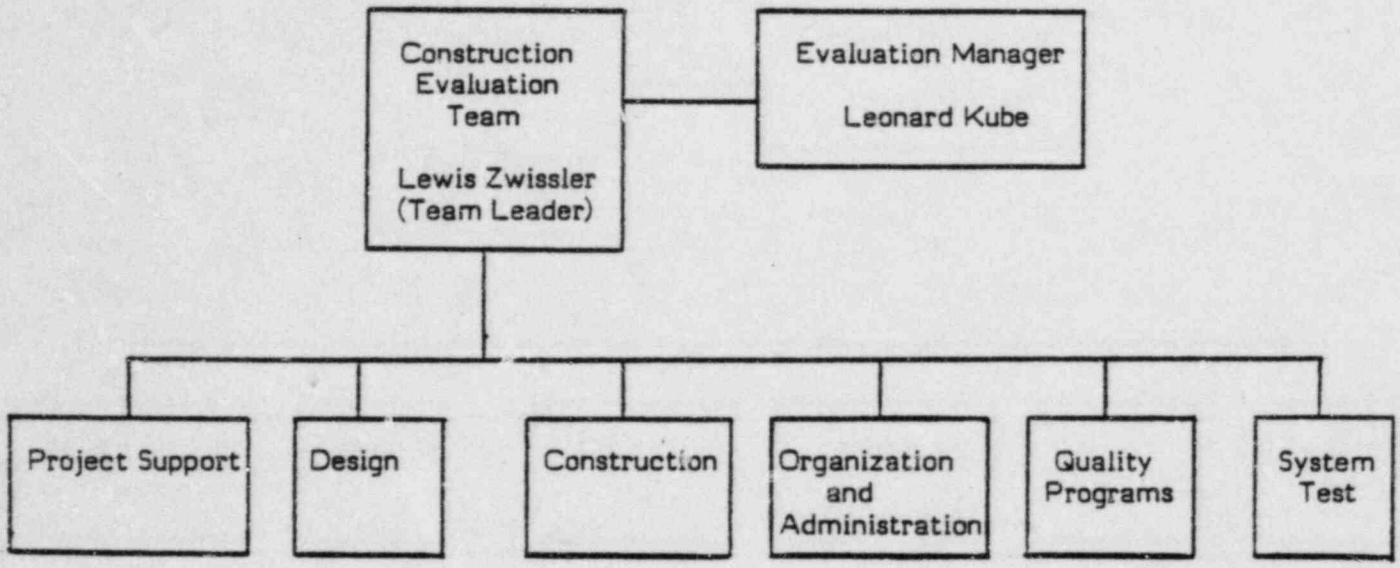
When assigning MAC personnel to this evaluation, one of the key considerations was an experience base compatible with the current status of work in process. As an example, since civil construction was basically completed (except for underpinning which was not in process during the evaluation period), it was not emphasized. However, system completion and turnover is a key activity area and personnel experienced in this area were selected.

The resulting team organization is displayed in Table 2 and resumes of all participants are presented in Appendix A. Most of the team members had already participated in one or more self-initiated construction project evaluations. In addition, all team members had previous experience in diagnostic (or investigative type) evaluations of nuclear plants under construction. These diagnostic evaluations were directed at identifying problems and recommending solutions in areas such as administration, design, construction and project management.

Following the selection of MAC to perform the INPO construction evaluation, a schedule was jointly developed by MAC and CP Co. However, due to manpower availability and commitments associated with the Midland Construction Completion Program, the evaluation schedule was extended (see Table 3).

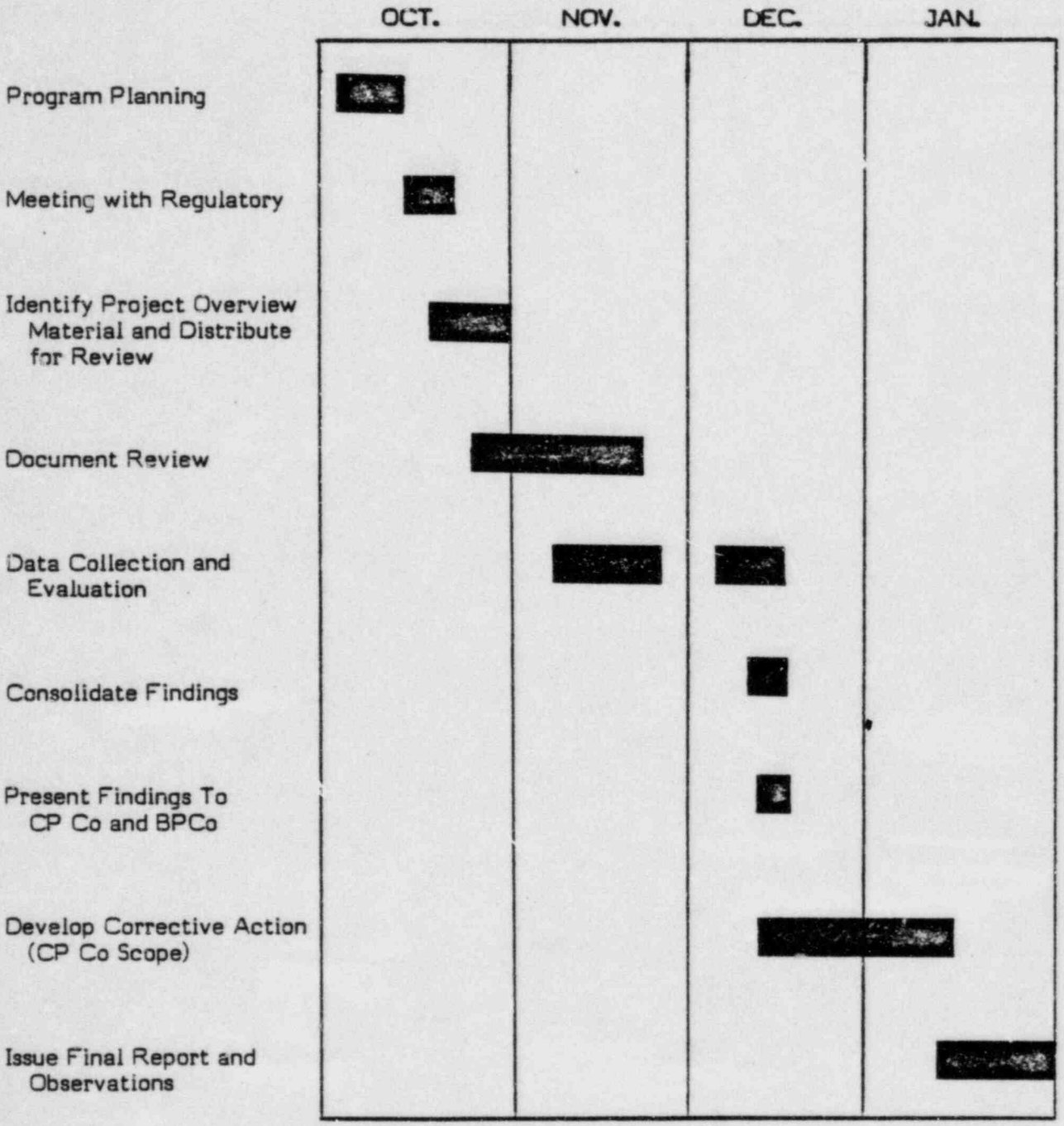
TABLE 2

MIDLAND CONSTRUCTION PROJECT EVALUATION TEAM



Project Support	Design	Construction	Organization and Administration	Quality Programs	System Test
J. Briskin	K. Horst	V. Johnson	J. Briskin	J. Copley	D. Hubbard
D. Hubbard	L. Kube	R. Kelley	L. Kube	W. Friedrich	A. Robeson
	R. Lee	L. Kube	L. Zwissler	L. Zwissler	
	E. Schlinger				

TABLE 3
MIDLAND CONSTRUCTION PROJECT EVALUATION SCHEDULE



4.0 PERFORMANCE EVALUATION RESULTS

EVALUATION TABLE OF CONTENTS

EVALUATION TABLE OF CONTENTS (Continued)

EVALUATION TABLE OF CONTENTS (Continued)

EVALUATION TABLE OF CONTENTS (Continued)

ORGANIZATIONAL AND ADMINISTRATIVE

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Organizational Structure Objective No. OA.1

Evaluator(s) L. Zwissler/J. Briskin/L. Kube

I. Performance Objective

The owner's corporate organization and all other project organizations responsible for the design, engineering, planning, scheduling, licensing, construction, quality assurance and testing of a nuclear plant should provide an organizational structure that ensures effective project management control.

II. Scope of Evaluation

The evaluation of performance is based upon interviews with the upper level managers and the review of policies and procedure manuals describing the responsibilities of organizational components. Input was received from all team members. The primary evaluation consumed approximately 30 man-hours.

III. Conclusion

The utility and the A/E organizations meet the overall requirements of this performance objective. One weakness was noted related to the clarity of the Project Office Charter.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Organizational Structure Objective No. OA.1

Evaluator(s) L. Zwissler/J. Briskin/L. Kube

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (OA.1-1) The defined responsibilities in the Midland Project Office Charter have not been updated in the Midland Project Procedures Manual to reflect current functions, responsibilities and accountabilities of the project staff.

Corrective Action: For the major assignments in the revision memorandum for the Midland Project Office Charter, the Midland Project Procedures Manual will be updated to specifically assign responsibility to PMO members so there will be clear definition of authority and responsibility relationships within the Consumers Project. This will be completed by March 1, 1983.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Organizational Structure (title) Objective No. OA.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

(OA.1-1) 1. A Midland Project Office Charter revision memorandum was issued November 5, 1982, to show how the Project office will function. There is evidence that in some activity areas, the Charter does not clearly define authority and responsibility between Project office and functional organizations.

2. Construction completion coordinator demonstrated his knowledge of job responsibilities and the interrelations with other organizations involved in construction completion, design and testing.

3. The Vice President, Projects, Engineering and Construction (VP, PE&C) was clearly recognized as the utility spokesman on all key project issues.

(OA.1-1) 4. Project office personnel are responsible to the VP, PE&C for day-to-day operations. In addition, they are assigned projects which cut across organizational lines.

5. The CEO plays an important role which includes advice, consultation and direction.

6. Relation of Project to Corporate is defined in the General Orders which prescribe management and operational practices.

7. The CEO visits the site for a briefing and walk-through on alternate Mondays.

(OA.1-1) 8. Line managers report to the executive managers in the Project office.

9. There are monthly project meetings with CP Co and Bechtel. In addition, close communication with Bechtel is maintained on day-to-day problems.

10. System turnover responsibilities are defined in the Management Systems Agreement Manual. Working interface agreements are described fully.

11. The Bechtel Site Manager is familiar with the policies and procedures covering the organization and responsibilities.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Compny
Midland Plant

1. **Performance Area** Organizational Structure (title) Objective No. OA.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

12. Bechtel generic position descriptions were available. Site specific descriptions are used as necessary by supervisors.

13. CP Co management maintains close contact with project activities and maintains his awareness of project status.

14. The CP Co Project Manager has worked directly, on occasion, with BPCo corporate management to influence operations in the project.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Management Involvement and Commitment to Quality Objective No. OA.2

Evaluator(s) INPO Team

I. Performance Objective

Senior and middle managers in the owner's corporate office, designer's office and at the construction site who are assigned functional responsibility for matters relating to the nuclear project should exhibit, through personal interest, awareness and knowledge, a direct involvement in significant decisions that could affect their responsibilities.

II. Scope of Evaluation

The evaluation was performed by reviews of policies and procedures. Each team member included in his interviews an evaluation of the performance objective. It is estimated that 50 hours were expended in this portion of the evaluation.

III. Conclusion

Senior and middle level management assigned to the Midland Project are taking a personal and active role in day-to-day activities to design and construct the plant. However, it was noted that insufficient time was spent in identifying basic causes of recurring problems.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Management Involvement and Commitment to Quality Objective No. OA.2

Evaluator(s) INPO Team

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (OA.2-1) Corrective action on some problems is not being sufficiently investigated by cognizant production personnel to identify basic causes and develop corrective action to prevent recurrence.

Corrective Action: There are two distinct administrative procedures within the Consumers and Bechtel QA programs which address taking corrective action to prevent recurrence.

The Consumers procedure presently requires that MPQAD provide their assessment of root causes and their recommendation for part and process corrective action. It also requires that the organization responsible for corrective action provide the actual root cause if different from the MPQAD assessment. Analysis of the current practice indicates that too often the production organization has not conducted their own corrective action and root cause analysis to prevent recurrence. Therefore, the current Consumers procedure and forms for Nonconformance Reports (NCRs) will be modified to place this responsibility upon the production organization with MPQAD approving of the corrective action. This will be completed by March 1, 1983.

The Bechtel QA program utilizes a Management Corrective Action Report (MCAR) to identify and respond to major problems to ensure appropriate management attention is given to the problems and that appropriate corrective action is taken to preclude recurrence. NCRs written by the Quality Control organization are routinely analyzed by MPQAD for adequacy of part and process corrective action. The project is currently reviewing:

a. Whether the Bechtel procedures will be modified to require the production organization to assess the root causes and recommend process corrective action to prevent recurrence or;

b. Whether it is more appropriate to require Bechtel and Consumers to utilize a single nonconformance procedure.

A decision on this will be reached by March 1, 1983.

The Consumers trend program description will also be modified to specifically state the current practice of MPQAD not only evaluating trends for root causes for whether affected work should be stopped, but also to define the system for causing corrective action to be taken to reverse rising trends and to reduce unacceptable levels of nonconformances in a given category.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Management Involvement and Commitment to Quality Objective No. OA.2

Evaluator(s) INPO Team

IV. Areas of Weakness and Corrective Action; Good Practices (Continued)

The Quality Action Item List (QAIL) will be reviewed and management attention will be given to the reasons why there are some items over two years old. There will be continuing management attention given to closing open items.

In addition, the project has recently initiated an expanded project quality meeting, now held weekly instead of monthly. This meeting is attended by supervisory personnel in the Quality organization and an expanded list of project management personnel. The purpose of the meeting is to bring any significant project issues regarding quality to upper management attention in order to obtain an integrated and timely resolution of the issues as well as a collective review of root cause and generic implications. As part of this effort, the project has established goals and routinely tracks the work-off of quality open items, both in total and with respect to longevity of items being unresolved. It is expected that this process will continue for the balance of the job and will result in improved project performance.

For additional corrective action, see Corrective Action, DC.4-2.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Management Involvement and Commitment to Quality (title) Objective No. OA.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. There are many meetings attended by responsible personnel to review schedules, planning, quality and operating problems. (See PS.2.)

2. Quality trending data does not have adequate base data to enable significant trends to be identified. (See QP.4.)

(OA.2-1) 3. The activity for resolving corrective action often is given low priority in favor of immediate problems affecting construction.

(OA.2-1) 4. Often corrective action is directed toward fixing what is wrong but not identifying basic cause and action to prevent recurrence.

5. The QA/QC organization has authority to issue a stop work order when conditions adverse to quality exist.

6. A review of the many procedures manuals indicates that responsibilities for the various activities are defined.

7. Many individuals are not familiar with specific job descriptions. There is on-the-job training for lower level positions. (See OA.3.)

8. Some of the superintendents and supervisors issue goals and objectives and ask the lead personnel to expand and be measured against the goals.

9. BPCo Construction management is aware of areas affecting quality and emphasizes the need to construct work right the first time at staff meetings.

10. Both BPCo and CP Co senior and middle management emphasize quality and give appropriate attention to items that affect quality. This involvement was observed during management's participation in quality review meetings.

11. The Quality Improvement Program (QIP) provides visible management support to producing quality work.

12. Mechanisms are available to stop or delay work when warranted.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Management Involvement and Commitment to Quality (title) Objective No. OA.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(OA.2-1) 13. Corrective action is considered not very effective as evidenced by the following:

- Nonconforming material installed and not inspected at receiving inspection
- Nonconformance detected after installation
- Source surveillance did not identify nonconformance at source
- Corrective action at vendor initiated by CP Co - MPQAD after installation and inspection

(OA.2-1) 14. It was apparent after auditing several meetings and reviewing procedures as well as discussions with various levels of QA, that the meaning of corrective action was interpreted as "fixing" the immediate problem. There was a lack of indepth investigation into root causes.

(OA.2-1) 15. In reviewing Specification 7220-M-204, it was noted that there were 15 Field Change Requests (FCRs) and 2 FCNs issued against this document. These date from November 10, 1982 back to January 24, 1980.

16. A weekly quality meeting chaired by the CP Co Manager has been initiated to review and determine action necessary to close out open quality items.

(OA.2-1) 17. The QAIL contains a very large number of open items. Some are over two years old.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area The Role of First Level Supervisors and Middle Management

Objective No. OA.3

Evaluator(s) L. Zwissler/J. Briskin

I. Performance Objective

The project first line supervisors and middle managers should be qualified by verified background and experience and have the necessary authority to carry out their functional area responsibilities.

II. Scope of Evaluation

The evaluation was performed by interviews of supervisors and middle managers. Craft and Inspection personnel were interviewed to obtain their reactions to supervision. The entire INPO team participated during their interviews and use of their results were factored into the evaluation. Approximately 80 hours were expended on this objective.

III. Conclusion

Middle managers and first line supervisors were, in general, found to be qualified to carry out their assigned responsibilities. An area of weakness was identified related to documented position descriptions.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area: The Role of First Line Supervisors and Middle Management

Objective No.: OA.3

Evaluator(s): L. Zwissler/J. Briskin

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (OA.3-1)

There is a general lack of approved project position or job descriptions available to individuals which clearly define roles, responsibilities and authorities.

Corrective Action:

The Bechtel organization has generic position descriptions but they have not been tailored to the specific Midland organization and there is inconsistent use of descriptions across the job. Therefore, Midland project position descriptions will be generated for positions at and above group supervisor's level or equivalent level in the organization. Individuals below this level work under the close supervision and direction of more senior project personnel and, therefore, do not require project position descriptions. Such descriptions may, however, be generated at the discretion of individual first line supervisors and middle managers.

The project position descriptions for positions at and above group supervisor or equivalent level will be placed in a Midland Project Procedures Manual Supplement with individual copies distributed to the position incumbents.

Consumers Power Company has position descriptions which are defined in the Midland Project Procedures Manual.

This corrective action for Bechtel position descriptions will be implemented by March 31, 1983.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** The Role of First Line Supervisors and Middle Management (title) Objective No. OA.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Some supervisors use goals and objectives and require their personnel to define their goals and objectives. Performance is measured against these objectives.

2. First line supervisors and middle managers are aware of job responsibilities and procedures that govern their jobs.

3. Most training is on-the-job. There are training courses given periodically.

(OA.3-1) 4. Some supervisors use detailed job descriptions and performance measurement criteria but this is not a universal practice.

5. In some cases, detail checklists were available for specific job tasks.

(OA.3-1) 6. Many individuals reported that they had never seen a job description. This appeared to be a general situation.

(OA.3-1) 7. Some individuals had seen the Bechtel generic job descriptions but they were generally in a manual in their supervisor's office.

(OA.3-1) 8. Most of the job knowledge relating to authorities and responsibilities were obtained through on-the-job training.

(OA.3-1) 9. The BPCo Site Manager has position descriptions for all positions available in his bookcase. Review indicated these were Bechtel generic. He indicated that site-specific job descriptions would be in a manual controlled by the Project Field Engineer. Personnel questioned in the Project Field Engineer's office indicated they had no knowledge of site-specific job descriptions and suggested that they might be found in the Personnel Department.

10. Many BPCo middle managers and first line supervisors interviewed had never seen any job descriptions for their positions.

(OA.3-1) 11. Bechtel, Ann Arbor Engineering Project Group supervisor's functions are described in a project procedure document. Job functions of group leaders are defined at the discretion of the group supervisor. For example, the Control Systems Group uses the Systems Assignment List and Nuclear Group uses a handwritten sheet that is not widely distributed.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** The Role of First Line Supervisors and Middle Management (title) Objective No. OA.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

12. Bechtel, Ann Arbor Engineering Group supervisors have individual methods for orienting new employees to group practices and keeping their staffs informed of assignments and work requirements. Good supervisory practices are followed in this area by each group supervisor.

DESIGN CONTROL

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Input Objective No. DC.1

Evaluator(s) K. Horst/R. Lee/E. Schlinger

I. Performance Objective

Inputs to the design process should be defined and controlled to achieve complete and quality designs.

II. Scope of Evaluation

Design inputs were reviewed to determine that applicable requirements are documented and controlled, and are readily known and available for design personnel. The review was accomplished through interview of both engineering and supervisory personnel as well as a review of selected design input documents and applicable procedures. Approximately 135 hours were applied to this review.

III. Conclusion

The performance objective is generally met. The project has defined the design requirements in controlled documents and utilizes a system which identifies the design requirements applicable to drawings and specifications, including revisions. Several weaknesses were identified which require corrective action to provide proper control of design inputs. One good practice was also noted.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Input Objective No. DC.1

Evaluator(s) K. Horst/R. Lee/E. Schlinger

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (DC.1-1) The design requirements pertaining to accessibility and maintainability for equipment and piping systems are defined in terms which are general and not specific.

Corrective Action: As the plant is constructed, options for space become limited. Changes required by regulatory agencies, state-of-the art changes, vendor information changes, construction problems and design evolutionary changes combine to impact accessibility and maintainability. These factors require that accessibility and maintainability be addressed on a case-by-case basis. Accordingly, project engineering has reemphasized in writing to the responsible design personnel the importance of ensuring that consideration is given in future design for accessibility and maintainability.

The two factors primarily considered are (1) the physical removal or access space, defined in vendor drawings or maintenance manuals, and (2) the additional space required for physical access to perform the required operation, maintenance or equipment removal. The former is very specific, being defined by vendor-submitted documents. The latter is based upon education, training and experience of the assigned personnel, supplemented by design guides, including knowledge of system operations and required frequency of access.

For example, the Plant Design group uses the Engineering Design Guide for Plant Design, particularly Section 2-4, in considering access passageways, vertical access shafts, component removal space and maintenance areas. Where appropriate, these guides are specific and quantitative, such as the guidelines for forklift passageways, personnel walkway width and head room clearances.

Consumers will evaluate the effectiveness of this corrective action by conducting periodic audits.

Finding: (DC.1-2) No single document identifies or references all the applicable design requirements which have been applied to the design of a specific plant system. This requires considerable effort to identify which design requirements govern the design.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Input Objective No. DC.1

Evaluator(s) K. Horst/R. Lee/E. Schlinger

IV. Areas of Weakness and Corrective Action; Good Practices (Continued)

Corrective Action: The Midland Project records show that the system being used for identifying or referencing of all applicable design requirements was developed through discussions and agreements with CP Co, Bechtel and the NRC. This system utilizes a Design Requirement Verification Checklist (DRVC), as described by Project Engineering Procedure, PEP 4.1.1. In addition, CP Co will review its needs for transfer of design information from the various design organizations. This CP Co program for configuration control will be completed by the end of 1983.

Finding: (DC.1-3) The effectiveness of the Bechtel management systems for (1) evaluating the impact of industry experiences, and (2) deciding what corrective action, if any is required, should be improved.

Corrective Action: The effectiveness of the management system has been improved by making a review of the status of the current backlog of Bechtel departmental responses to the Bechtel Generic Corrective Action Report. With respect to Performance Evaluation Detail Item 10 concerning the overdue responses in the mechanical staff area, action is underway to close out the current backlog of overdue items by June 30, 1983. The other departments were found to be satisfactory with regard to response backlog. Expediting of responses will continue in the future.

Bechtel has several management systems to facilitate evaluating industry experiences. These include, in part, a corporate-wide Problem Alert System and a Licensing Information System. The documents generated by these various systems are distributed to each of the various Bechtel offices.

Bechtel's Generic Corrective Action Program (GCAP), was implemented in June 1981 and provides for a coordinated review of various documents (eg, NRC I&E Circular/Bulletin/Information Notices, Deficiency Evaluation Reports, Problem Alerts, 50.55(e) Reports, Management Corrective Action Reports, etc.) which identify problems which could be applicable to projects within the Ann Arbor Power Division (AAPD). The results of the review and any further actions which may be required are identified, implemented and documented.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Input Objective No. DC.1

Evaluator(s) K. Horst/R. Lee/E. Schlinger

IV. Areas of Weakness and Corrective Action; Good Practices (Continued)

In addition, Consumers checked the effectiveness of their management system for evaluating the impact of industry experiences (NRC Bulletins, Circulars and Information Notices as well as Operational Information Reports). The system was found to be effective.

Finding: (DC.1-4) The following good practice was noted:

The inclusion of applicable design requirements and inputs on the calculation cover sheet for large pipe hangers and small pipe HELBA restraints clearly identifies the applicable codes, standards, design guides and load inputs.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Input (title) Objective No. DC.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. The design requirements are defined in controlled documents. Procedures are in place to control the design requirement documents and their revisions.

2. Procedures require that a Design Requirement Verification Checklist (DRVC) be prepared for each drawing and specification, including revisions. The checklist identifies the particular design requirement documents which are applicable to a given drawing or specification. Several design requirement verification checklists were reviewed which gave evidence of identifying relevant design requirement documents, including the applicable revision number or date.

(DC.1-1) 3. The documentation of design requirements for HVAC unit coolers was reviewed with respect to selected categories of requirements covered by Section 3 of ANSI N45.2.11. The selected areas focused on design requirements pertaining to environmental conditions, redundancy, diversity and separation requirements, test requirements, accessibility, maintainability, repair, inservice inspection, fire protection, handling, storage and shipping requirements. This review identified that the design requirements in these areas are defined in controlled documents. However, it is noted that requirements for accessibility, maintainability and repair are general in definition. Specific design requirements are not defined. A similar situation exists for the piping design with respect to design requirements for accessibility, maintainability and repair.

4. The design criteria for concrete structures do not cover the type of embedments which involve a combination of tension anchor and shear lug. Approximately 1500 of this type of embedments are installed in the plant. Neither the civil design criteria (7220-C501, Rev. 12 May 11, 1982) nor the civil discipline design guides (1974) address this type of embedment. Effort is under way to define design criteria and evaluate the design adequacy of the installed embedments.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Input (title) Objective No. DC.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(DC.1-2) 5. The design requirements for a specific plant system are defined in many different types of documents. No single document compiles or references all the designs requirements which have been applied to a given system, making them difficult to readily identify. When asked to identify the design requirements applied to the particular system (HVAC), special effort was required to compile the design requirement documents. This raises questions about the adequacy of the design requirements definition procedures to readily make available such information to the engineering staff.

(DC.1-2) 6. The management directives regarding documentation of criteria permit the criteria to be documented in many different types of documents without the need for a central reference. (MED 4.1 - Revision 10, November 22, 1982, PEP-4.1, Revision 0, October 4, 1982.)

(DC.1-2) 7. There is some evidence that responsibility for defining design requirements is not clearly understood. For example, the responsibility for defining the requirements for accessibility and maintainability for HVAC coolers upon initial inquiry was said to belong to BPCo's mechanical group. Later, it was thought to be a CP Co responsibility; finally BPCo's plant design group.

(DC.1-3) 8. Bechtel has several management systems for reviewing the results of industry experience for potential application to the project. These include the generic corrective action reports, review of changes to industrial standards and regulatory requirements and review of regulatory bulletins.

(DC.1-3) 9. An industry standard (ACI-349) was issued in 1979 which includes requirements for concrete embedments, including the anchor (tensile)/shear lug combination type. The management system for review of changes did not adequately assess the potential impact of this standard on the project. Recently, attention has been focused on this problem.

(DC.1-3) 10. The Generic Corrective Action Report shows a large number of responses overdue, particularly in the mechanical discipline.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Input (title) Objective No. DC.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(DC.1-4) 11. The design requirements for small bore piping HELBA restraints are defined in controlled documents including 7220-C-122 (Q), Revision 4 - Design criteria for Pipe Whip Restraints and Jet Impingement Barriers, and BN-TOP-2 (a Bechtel document addressing criteria for high energy line breaks). Design loads and location requirements are defined in load sheets which are identified by number and are retreivable for future reference. These requirement documents are referenced in the calculation documents which, in turn, are referenced on the restraint drawings. See Calculation No. 900-5799(a) for restraint FSK-M-1EBB-1-1-PR-160(a), Revision 0.

12. The design requirements for large bore hangers are referenced on the calculation cover sheets. Calculation No. C1-632-8, Revision 0 November 21, 1980 for hanger H-632 SH8 DP 360 references B31.1, AISC Manual of Steel, document 7220M-480 (Q) and 481 (non-Q) and the Pipe Support Design Manual, Vol. 1, August 1980.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Interfaces Objective No. DC.2

Evaluator(s) R. Lee/K. Horst/E. Schlinger

I. Performance Objective

Design organization external and internal interfaces should be identified and coordinated to ensure a final design that satisfies all input requirements.

II. Scope of Evaluation

The evaluation included a review of the definition of design engineering responsibilities and authority, methods to control and transmit design information from one organization to another and the consideration of system interaction. The evaluation was performed through interviews and review of applicable procedures and documents. Approximately 135 hours were applied to this review.

III. Conclusion

The performance objective is met. The control of interfaces and flow of design information is generally good. Design information is externally and internally transmitted via documents. Procedures are in place to control these documents and systematic lines of communication have been established. However, several weaknesses were identified which require correction.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Interfaces Objective No. DC.2

Evaluator(s) R. Lee/K. Horst/E. Schlinger

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (DC.2-1) An adequate description of the information/data flow and discipline interface is not available for several key current design/redesign efforts.

Corrective Action: The "Midland Project Engineering Design Work Process Flowcharts" binder depicts overall processes involving all key intra and inter-discipline activities, as well as interfaces with off-project Bechtel and non-Bechtel entities, making extensive reference to the procedures mentioned in the last paragraph.

The schedule for issuance of the remaining flowcharts (listed in Performance Evaluation Detail 4) is as follows:

Subject	Flowchart Number	Forecast/Issue Date
Design Requirements Verification Checklist	G-011	Rev. 0 Issued, 12/27/82
FCR/FCN	G-023	Forecast 2/28/83
Design Drawing (Civil, Electrical, Plant Design	G-022B	Forecast 2/28/83
Seismic Qualification of Components	C-40	Forecast 2/28/83
Piping/Pipe Supports	PD-022	Forecast 2/28/83
	PD-023	Issue, Currently Rev. 1
	PD-024	Forecast 3/15/83

There are no discipline specific flowcharts for the mechanical group as their work processes generally involve calculations, drawings, specifications and other generic activities which are adequately covered by the flowcharts under the "General" section.

Additional flowcharts will be prepared as deemed appropriate by Bechtel Engineering, based upon complexity of the issues.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Interfaces Objective No. DC.2

Evaluator(s) R. Lee/K. Horst/E. Schlinger

IV. Areas of Weakness and Corrective Action; Good Practices (Continued)

The Bechtel Engineering Department Procedures (EDPs), supplemented by Engineering Department Project Instructions (EDPIs) and the Midland Project Engineering Procedures (PEPs), provide the basic directions and descriptions of the discipline interface and information/data flow for the review, approval, interface and distribution of design documents.

Finding: (DC.2-2) Data transmittals within a project discipline group are not necessarily included in a readily retrievable document control system.

Corrective Action: Intradiscipline group memoranda which provide design information are retained in discipline technical subject files. These technical subject files are periodically microfilmed by Project Administration in accordance with EDP 5.32, Engineering Records Management.

The design information contained in these intragroup memoranda is made a part of the design input as follows:

1. Engineering Department Procedures (eg, EDP 4.37/MEL 4.37-0, Design Calculations) require that "each calculation shall list or reference the applicable . . . references". Applicable references include, where necessary, data transmittals made by intradiscipline group memoranda. Accordingly, there are provisions for memoranda within a project discipline group to be included by reference in a controlled document (the calculation).

2. With regard to specifications and drawings, PEP 4.1.1, Preparation of the Design Requirements Verification Checklist (DRVC), addresses this issue. PEP 4.1.1 provides for documentation of incorporation of design inputs in the preparation of design output documents and changes thereto. One of the line items on the DRVC is "correspondence (letters, TWXs, memos)". This requires specific identification of any data transmittals made by memorandum, including those written within a design discipline, that contain significant design information used as input to the design document for which the DRVC is being prepared. The DRVC is a controlled document.

   As part of the Consumers' plan to develop a Configuration Control System, Consumers will evaluate whether an improvement in the ease of retrievability is necessary.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Interfaces (title) Objective No. DC.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Pipe stress calculations for the decay heat removal system were reviewed:

   a. Input data is requested by the plant design group from nuclear group on a Request for Piping Stress Analysis (RPSA) which specified the system to be analyzed by piping isometric drawing number. Data requirements and formats are determined from past practice or agreement between Plant Design and Nuclear Group engineers.

   b. In a recent data package transmittal from nuclear to plant design it was necessary to request clarification to interpret the supplied data. The transmitted clarification did not receive the same level of checking as the original data. (Lack of a checklist may be a contribution - see DC.3-1.)

   c. Agreement was reached at the group leader level to provide future nuclear data in a format that matches input formats for the stress calculation.

(DC.2-1) 2. A work process flow chart for pipe stress calculations is available in the "Midland Project Engineering Design Work Process Flow Charts" binder. The data transmittal interface defining data requirements and format described in 1., above, is shown on the chart but is not controlled by a procedure or instruction.

(DC.2-1) 3. The work process flowcharts that are available for specific analysis provide the only clear description of working interfaces between project discipline groups for analyses including more than one group. These flow charts identify the controlling procedures for each calculation element. Some elements shown on the charts are not controlled by procedures or instructions.

(DC.2-1) 4. The work process flow charts for several key multi-discipline analyses are incomplete or not included in the Work Process Flow Chart. Flow charts have not been prepared for the key following processes: FCR/FCN, design drawings (civil, electrical, plant design), seismic qualification, Piping/Pipe Supports and Design Review verification checklist. There are none for the mechanical discipline.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Interfaces (title) Objective No. DC.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

5. Data for performing seismic and LOCA analyses are transmitted between the A/E and NSSS supplier using controlled documents. The A/E uses Bechtel Input Document (BID) and the NSSS supplier uses Analytical Input Requirement Specification (AIRS). These documents are controlled by procedures.

(DC.2-2) 6. Data transmittals between discipline groups become part of the document control system at the time of transmittal. Within a discipline, design data used in the design process are transmitted from one group to another in memos which are not included as part of the document control system unless they are included as part of some other chronologically numbered documents.

7. A group within the licensing and safety function of Project Engineering has recently been established to consider system interactions. This group is coordinating plant walk-downs relating to seismic proximity, 2-over-1, HELBA, missiles and fire protection for safe shutdown.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Process Objective No. DC.3

Evaluator(s) R. Lee/K. Horst/E. Schlinger

I. Performance Objective

The management of the design process should result in designs that are safe, reliable, verifiable and in compliance with the design requirements.

II. Scope of Evaluation

Interviews were held with personnel at the BPCo and resident engineering offices and the CP Co project group.

Project procedures, calculations, deficiency reports and other documents defining, controlling and reporting results from the design process were reviewed and examined.

A total of 135 hours were applied to this objective.

III. Conclusion

In general, the performance objective is met. The design process is planned and scheduled. Responsibilities for controlling each function of the design process are identified clearly in the design work process flow charts. The design procedures provide for documentation of design analysis and design reviews. One weakness and one good practice were noted.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Process Objective No. DC.3

Evaluator(s) R. Lee/K. Horst/E. Schlinger

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (DC.3-1) The practices for performing design reviews emphasize, in some cases, checking correctness of numbers with lesser emphases on such areas as assumptions, methods and meeting of design criteria.

Corrective Action: The requirements contained in the following Engineering Department Procedure related to design reviews were reemphasized in writing to engineering personnel performing those functions to heighten their awareness of and compliance with the procedural requirements:

EDP 4.37	Design Calculation
EDP 4.34	Off-Project Design Review (Design Control Checklist and Design Review Notice)
EDP 4.26	Interdisciplinary Design Review
EDP 4.46	Project Drawings
EDP 4.49	Project Specifications
EDP 4.55	Project Material Requisitions

Compliance with these procedures will be reviewed periodically by scheduling a series of audits to evaluate how thoroughly the project is performing design reviews. These audits will be conducted by MPQAD.

Finding: (DC.3-2) The following good practice was noted:

The Midland Project Engineering Design Work Process Flow Chart Manual documents the flow of information and defines discipline interfaces for a number of key design analysis processes. This document provides a single understandable description of discipline responsibilities and interfaces for the processes covered.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Process (title) Objective No. DC.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Plans and schedules for design work are produced for each engineering discipline. The schedules are maintained by each discipline group supervisor and reviewed by the Assistant Project Engineer - Coordinator.

2. Engineering Department procedures control the preparation of calculations in each discipline. Discipline standards provide calculation procedures in some areas. Where the standards are missing, each project group develops its own standard. For example, selected nuclear calculations performed on the project for the first time are sent to the Nuclear staff for review and subsequently are used as a standard, such as HELBA.

3. The procedure controlling project specifications (EDP 4.49) does specifically involve ANSI N45.2.11 requirements.

(DC.3-1) 4. The performance of design calculations is controlled by a procedure (EDP 4.37). This procedure provides for independent checking of calculations. The checking emphasis (as described by staff engineers and supervisors) is on correctness of the numbers used and actual calculation details with lesser emphasis on such areas as assumptions, methods, and meeting of design criteria.

(DC.3-1) 5. Calculation checkers are assigned by group supervisors on the basis of experience. In general, areas to be checked are identified in the procedure. An exception noted is the Plant Design Stress Group which uses a checklist that is limited to specific problem areas in this type of calculation.

6. Calculations examined show the checker's initials acknowledging verification of the calculations.

7. Uniform procedures are being followed for documentation of calculations on current work. Calculations examined in nuclear and plant design stress analysis are sufficient to allow a technically qualified person to understand the calculation.

8. Controlled and verified computer codes are used in calculations examined in civil, nuclear, and plant design disciplines.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Process (title) Objective No. DC.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(DC.3-2) 9. The Midland Project Engineering Design Work Process Flow Charts Manual provides a clear description of the design analysis elements and interdiscipline interfaces for many of the major analysis. Those parts of the design process controlled by procedures are clearly identified. It is noted under DC.2 that several current key analysis areas are either incomplete or not included.

(DC.3-1) 10. The Design Review Notice (DRN) is used to submit calculations, specifications, and other project design output to the discipline chief for review in accordance with the Design Control Check List (DCCL). The DRN is signed indicating review completion but the extent and content of the review and the quantitative results are generally not documented unless problems are identified.

11. Interdisciplinary Design Review (EDP 4.26) is required for 16 final design activities defined by the Project Engineer. These reviews are documented showing how the design review elements are met. A similar documented review was produced for several systems identified by the Nuclear Safety Task Force.

12. The requirements, including the elements chosen for a specific review, are specified by Procedure EDP 4.26 for interdisciplinary design review.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Output Objective No. DC.4

Evaluator(s) K. Horst/R. Lee/E. Schlinger

I. Performance Objective

Project design documents should specify constructible designs in terms of complete, accurate and clear design requirements.

II. Scope of Evaluation

Interviews were held with the Bechtel engineering staff at the Ann Arbor and resident engineering offices at the site. In addition, walk-throughs were conducted through the plant and interviews were held with field engineers and construction staff to obtain further input relating to completeness and accuracy of the design output. Design documents and supporting information were reviewed. Approximately 135 hours were applied to this objective. The evaluation addressed the quality of the design output.

III. Conclusion

In general, the performance objective is met. The design output documents are issued and kept current using controlled processes. Management attention is being given to improving the quality of the design output through the quality improvement program. Three weaknesses were identified which require corrective action, plus two good practices.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Output Objective No. DC.4

Evaluator(s) K. Horst/R. Lee/E. Schlinger

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (DC.4-1) The congestion being experienced in many areas of the plant requires that more attention be given to constructibility and maintainability in the design output.

Corrective Action: The ability to design optimum constructibility and maintainability into the Midland Plant is a significant challenge, given the limited space available and the evolution of regulatory requirements.

With regard to maintainability, Project Engineering has reemphasized the importance of ensuring that consideration is given in future design for maintainability. See Finding DC.1-1 for additional corrective action being taken. Constructibility in the design is provided by the assigned personnel using their education, training and experience and using the normal design process, which includes internal design interface coordination. As the plant is constructed and options for space become limited, changes required by regulatory agencies, state-of-the-art changes, vendor information changes, construction problems and design evolutionary changes combine to impact constructibility. These factors require that constructibility be addressed on a case-by-case basis. This situation has required major project attention, discussed as follows.

During the period from late 1979 through early 1981, special efforts (then referred to "room task forces") were taken to deal with particularly congested rooms. This effort primarily stemmed from design changes resulting from the Three Mile Island experience and related issues. In the latter part of 1981, a Space Control Group (SCG) was established to further assist in the dealing with plant congestion. The success of the SCG, based on its initial effort, has led to an expansion of current activities and includes (1) a rereview of all issued but not installed design. This review will be made to assure that all items are constructible, (2) the inclusion of a physical walk-down by Field Engineering prior to issuing the design for construction, (3) the issuance of sketches for all currently field-run commodities (eg, conduit and tubing), with these sketches being processed through the SCG prior to installation, and (4) broadening the scope of work for this group's review to all areas of the plant.

Within construction, additional attention will be given to installation sequence planning in advance of construction forwarding the design to craft personnel. This planning, conducted by system completion teams, will consider constructibility.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Output Objective No. DC.4

Evaluator(s) K. Horst/R. Lee/E. Schlinger

IV. Areas of Weakness and Corrective Action; Good Practices (Continued)

Supervisory attention is being directed to the specific examples provided and corrective action will be taken as appropriate. This action will be completed by February 28, 1983.

Finding: (DC.4-2) The root causes of the large number of field-requested changes have not been systematically evaluated to determine in what specific manner the design output is contributing to the field changes and what corrective action is required to improve the quality of the design output accordingly.

Corrective Action: Project actions in this area have been expanding and will continue to do so in the future.

Within project engineering, an ongoing program, required by EDPs 4.46 and 4.47, occurs during the course of group supervisor and project engineering reviews of field-requested changes to design documents. Reviewers look for recurring problem areas and, when within engineering control, initiate corrective action. To provide more objective evidence of the process, since October 1982 Midland Resident Engineering (MRE) has been reviewing FCRs/FCNs given interim approval by MRE. The review categorizes FCRs/FCNs such as those resulting from apparent design problems and those resulting from construction or vendor activities. Then, further analyses of causes and corrective actions are initiated.

Project Engineering has initiated development of an expanded program of review and analysis of field-requested changes. This program will more systematically evaluate the root causes of FCRs/FCNs and identify potential areas of improvement for followup corrective action. Field Engineering will participate in this process. It is forecast to be in effect by mid-March 1983.

Within construction, additional attention will be given to installation sequence planning in advance of construction forwarding the design to craft personnel. This planning, conducted by system completion teams, should improve understanding of the design requirements as well as provide improved communication with Design Engineering, thereby minimizing the number of FCRs/FCNs.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Output Objective No. DC.4

Evaluator(s) K. Horst/R. Lee/E. Schlinger

IV. Areas of Weakness and Corrective Action, Good Practices (Continued)

The large number of field-requested changes is not solely reflective of the quality of the design output. FCRs/FCNs are issued by field construction to project engineering for several reasons, examples include:

a. Interferences with a field-routed commodity or with reinforcing steel, precise locations of which design engineering was unaware at the time the new design was issued

b. Unavailability of specified material at the time of installation, resulting in a request for substitution

c. Vendor-supplied items not in conformance with the vendor prints on which the design was based

Finding: (DC.4-3) Engineers are working with drawings which are neither controlled nor identified as uncontrolled, indicating the drawing control system needs to be evaluated.

Corrective Action: The Project does use somewhat different drawing control systems, one for Midland jobsite resident engineering and another for the Ann Arbor office. Resident engineering processes its drawings in accordance with field procedures where it is customary to stamp drawings controlled or uncontrolled upon issuance. This field practice is principally due to the close proximity of construction crafts and intended as a "flag" to help prevent them from inadvertently using out-of-date drawings. It should be noted that this practice does not preclude the possibility of a designer using an out-of-date drawing. The checks and balances mentioned below are still required.

In processing a design change, all engineers are required to refer to the document control register to determine the current revision and write the change against that revision. The normal checks and balances built into the system provide for the correct revision being used. These checks and balances include verification by the checker during the checking function, verification by project administration during the logging of the change and during the coordination cycle with those disciplines affected by or involved with the change.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Output Objective No. DC.4

Evaluator(s) K. Horst/R. Lee/E. Schlinger

IV. Areas of Weakness and Corrective Action; Good Practices (Continued)

The procedure covering project drawings (EDP 4.46) requires that "each discipline maintains a stick file containing a copy of the current numbered or lettered revision of each drawing originated by the discipline. The stick file copy is the official working copy." Mechanical drawings are generated by the plant design discipline, therefore, in accordance with EDP 4.46, the stick file of mechanical drawings is maintained by the plant design discipline.

The Project Engineering Manager has also directed in writing that Midland personnel ensure they are using current revisions of documents in the design process.

Project Engineering has initiated a review of the Ann Arbor drawing control system to determine whether there would be a substantial advantage to be gained for the project in having a system more like that used by MRE. This activity will be completed by the end of April 1983.

Finding: (DC.4-4) The following good practice was noted:

The quality improvement programs are steps taken by management during the past year to improve the quality of the design output.

Finding: (DC.4-5) The following good practice was noted:

Referencing the calculation number on the HELBA restraint drawings provides good traceability of design output with design input and supporting analysis.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Output (title) Objective No. DC.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

(DC.4-1) 1. Piping arrangement and valve locations have caused some problems for maintenance of valves. There are problems removing some valve top works. Some MOV covers cannot be completely removed. For example, see large solenoid valve, 1-SV-2139, located at tank 1T-41B, boron recovery system, EL614. The cover interferes with MOV-2123. Also note majority of air operated actuators in demineralizer rooms, Auxiliary Building, EL634, Room Nos. 434 and 438 for Unit 1 and 435 (A, B, C) for Unit 2.

(DC.4-1) 2. Impact of a design change on other systems is not always adequately addressed (example: change in steam line support for process steam line in steam tunnel).

(DC.4-1) 3. Continuous welding of plate to embedment without proper control of temperature has caused spalling of concrete (see embedments for restraints CA-57-1-H2 and H4 near reactor coolant pump, EL 625).

(DC.4-2) 4. The number of FCNs/FCRs for October was 1779 and 1981 respectively and 1639 and 1229 respectively for September.

(DC.4-2) 5. Systematic evaluation of root causes of FCNs/FCRs has not been performed by either PE or QA. PE has a program underway to evaluate root causes. Further instructions are being prepared for issue.

(DC.4-3) 6. Engineers in project engineering were noted working with drawings which are neither controlled nor identified as uncontrolled. The practice in the Ann Arbor office is to provide stick files at specified locations which contain controlled drawings. However, the drawings distributed to engineers are neither controlled nor identified as uncontrolled. Furthermore, the mechanical and nuclear groups located on the sixth floor do not have a controlled stick file on that floor. A spot check indicated an engineer had an out-of-date drawing which was not identified as being superseded. Drawing status reports are available which identify the current status of drawings. The practice in the project engineering resident engineering office is to distribute drawings to engineers identified as being uncontrolled. Engineers are said to check the status of drawings with Document Control before performing design work.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Output (title) Objective No. DC.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

7. Project composite drawings have not been updated for approximately two years. However, this does not appear to be a significant problem at this time.

(DC.4-4) 8. The Quality Improvement Program instituted approximately a year ago includes goals and measurements addressing the quality of the design output.

(DC.4-5) 9. Drawing for HELBA restraint, small bore piping (FSKC-M-IEBB-1-1-PR-160(a) Revision 0 references the calculation number. The calculation cover sheet in turn references design input (requirements, standards, loads) thereby providing good traceability from design input to design output.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Changes Objective No. DC.5

Evaluator(s) R. Lee/K. Horst/E. Schlinger

IV. Areas of Weakness and Corrective Action; Good Practices (Continued)

When a drawing is reissued by Project Engineering in the Ann Arbor office, appropriate communication with the cognizant resident engineering group is maintained to ensure that outstanding redlines are identified and have been incorporated.

The Project Engineering Change Notice Register will be annotated to include instructions requiring the cognizant engineer to ensure that outstanding redlines are identified and have been incorporated. This will be completed by February 15, 1983.

It should be noted that Engineering has embarked on a program for the incorporation of all Engineering-approved redlines outstanding as of December 31, 1982 into their base drawings. This program will be completed within the next few months.

Finding: (DC.5-3) The following good practice was noted:

The space control program for interference checking initiated approximately nine months ago is being applied over and above the formal design change coordination requirements. Expansion of this program could make it more effective.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Changes (title) Objective No. DC.5

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Design change engineering documents are interim revisions to the base document. The following design change documents are used on the project.

- DCAR (Design Change Authorization Request)
- DCN (Drawing Change Notice)
- FCR (Field Change Request)
- FCN (Field Change Notice)
- Redlines
- FCR-IDCN (Interim Drawing Change Notice)
- FCN-IDCN
- Redline - IDCN
- SDCN (Start-up Drawing Change Notice)

2. Design changes are initiated via a DCAR. The request is reviewed, taking into account the reasons for the change and the impact on project completion. Design work on the change is not initiated until the authorization request is approved by management.

3. The design work on the change is processed according to the same engineering procedures employed for the original work regarding control of design inputs, analysis, review and approval. The changes to drawings and specifications are reviewed by affected disciplines.

(DC.5-1) 4. The deadline for incorporation of redlines into the base or parent design document is not clearly specified because the various project, project engineering and field engineering procedures are either not clear or consistent.

Procedure	Incorporation
PEP 4.46.9 - "Project Engineering Review of Redlines"	All redlines must be incorporated when drawing is reissued. . . but at least before stress walk-down or system hydro.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Changes (title) Objective No. DC.5

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

Procedure	Incorporation
PEP 4.47.1 - "Design Changes Affected by Turnover"	EDPI (PEP) 4.46.9 regarding use and engineering approval of redlines. . . is applicable to IDCNs. Redlines to IDCNs will be incorporated in the applicable drawing when the affected IDCN is incorporated. IDCNs are incorporated after work is complete.
FIP 1.110 - "Field Marking of Work Prints - Small Pipe"	Redlines incorporated prior to final installation check.
FIP 1.112 - "Field Marking of Material Supports"	Redlines incorporated prior to stress walkdown.
FII 1.130 "Field Marking of Work Prints - Installation"	Redlines incorporated ten days prior to system turnover.
PPM IV-6 "Project Turnover and FPT-1.000 Procedure for Functional System Turnover"	Redlines not identified. FCRs, FCNs, DCNs and NCRs are identified.

5. Except for the logs maintained by the cognizant resident engineering group, project engineering's design document list, which indicates the latest drawings, revisions and their outstanding change documents, does not identify outstanding redlines against the base documents.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Changes (title) Objective No. DC.5

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(DC.5-3)

6. Space Control is an interference checking organization within resident engineering, set up approximately a year ago. Its main purpose is to identify space conflicts. It does not necessarily resolve conflicts or redesign. Space Control works to procedures which are over and above the official coordination review process for the project. Design changes are reviewed; however, those previously released but not yet implemented in the field are not reviewed to determine if any space problems exist.

7. Field revisions by field engineering of HELBA support drawings are no longer allowed. Resident engineering currently makes all drawing revisions. Field engineering procedures have not been revised to discontinue this practice.

8. It was not clear procedurally how the change process for turnover (i.e., IDCNs, FCR-IDCNs, FCN-IDCNs, Redline IDCNs) tie in with existing change process.

9. Implementing procedures (field engineering and engineering) for FCRs, FCNs and Redlines do not indicate any requirements relating to the Design Change Authorization Requests (DCAR) identified in the Project Procedures Manual IV-7. CP Co has an internal project procedure addressing this requirement for CP Co initiated changes.

10. CP Co also uses a Corrective Action Report (CAR) as a design change request document.

11. Construction procedures for FCR/FCNs indicate that FCRs may be used, after release of work to QC, as a deficiency document. This has led to some confusion concerning the use of FCRs versus NCRs and vice versa.

12. Bechtel's GSO group does construction work after turnover. It is not clear how their equivalent of "field engineering" interfaces with resident engineering regarding changes. There is no clear identification of which implementing field engineering procedures are to be used.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Design Changes (title) Objective No. DC.5

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

13. The Quality Engineering section of resident engineering monitors the design change process. Monitoring reports are scheduled for different areas (about one a week). To date Quality Engineering has been meeting their plan or schedule.

14. There is difficulty with the timely processing of changes involving subcontractors. By the time changes have been processed, field conditions have changed.

15. Several problems associated with the changes are addressed under DC.3.

CONSTRUCTION CONTROL

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Construction Engineering Objective No. CC.1

Evaluator(s) V. Johnson/R. Kelley/E. Schlinger/K. Horst/D. Hubbard/L. Kube

I. Performance Objective

Engineering and design performed under the authority of the construction organization should be controlled as to consistency with the basic design criteria to ensure compliance with applicable codes, standards and regulatory commitments.

II. Scope of Evaluation

The scope of this evaluation included review of the responsibility and authority of the field engineering organization, the procedures being used to control its engineering and design processes and its relationship to the project construction organization and project engineering. Particular attention has been paid to the field engineering group because of quantities of changes in design and the interferences caused by these changes.

The evaluation was conducted by interviews at various levels in and out of the organization. In addition, numerous tours and observations were made throughout the site. Observations of field engineers and construction personnel engaged in their work were made when the opportunity was presented. Overall, it is estimated that 75 man-hours were spent in this area which also included review of documents and procedures and analyzing and preparing the results of the evaluation.

III. Conclusion

The construction engineering organization meets the basic requirements of the performance objective. However, some weaknesses were noted. The strength of field engineering as a function of their work load and responsibilities was a concern. Correcting this situation by more thorough review of construction documents would be advantageous.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Construction Engineering Objective No. CC.1

Evaluator(s) V. Johnson/R. Kelley/E. Schlinger/K. Horst/D. Hubbard/L. Kube

IV. Areas of Weakness and Corrective Action; Good Practices (Continued)

Finding: (CC.1-1) Field engineering support appears insufficient in some discipline areas to handle assigned workload.

Corrective Action: Field engineering is heavily loaded with field change-related assignments and as a result, there are times when some disciplines cannot provide sufficient support. The Construction Completion Plan will address this issue and additional staff with appropriate experience and will be added as required for implementation.

Finding: (CC.1-2) In some instances design/construction packages received insufficient interference analysis, inspection definition and procedural engineering input prior to their release.

Corrective Action: Corrective action has been initiated in that work now issued to the craft is issued via a work plan prepared by the responsible field engineer and craft superintendent. The purpose is to assure that the craftsman is provided with all of the information required to perform a given task. The work plan is prepared prior to the start of the work and includes such things as description of the work to be performed and denotes applicable design drawings, drill permits, excavation permits, material locations, etc.

This program is outlined in the following Administrative Guidelines:

C-12.00 (Civil), issued December 13, 1982

E-6.00 (Electrical), issued December 13, 1982

I-2.00 (Instrumentation), issued December 9, 1982

M-7.00 (Mechanical), issued December 9, 1982

G-1.00 (General), issued December 7, 1982

A process is being developed to further minimize interferences. This process is an expansion of the current Space Control Group (SCG) activities and includes:

1. A rereview of all issued but not installed design for space-takers. This review will be made to provide additional assurance that items are constructible.

2. The inclusion of a physical walk-down by field engineering prior to forwarding the design to the crafts for construction.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Construction Engineering Objective No. CC.1

Evaluator(s) V. Johnson/R. Kelley/E. Schlinger/K. Horst/D. Hubbard/L. Kube

IV. **Areas of Weakness and Corrective Action; Good Practices (Continued)**

3. The issuance of sketches for all currently field-run commodities (eg, conduit and tubing), with these sketches being processed through the SCG prior to installation.

4. Consideration is also being given to broadening the scope of this group's reviews to areas other than the auxiliary building and the containment building as necessary.

For action taken by project engineering, see DC.4-1.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Construction Engineering (title) Objective No. CC.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Field procedures and instructions FPG 23, Rev. 0 describes the basic responsibilities within field engineering.

(CC.1-1) 2. The number of experienced field engineers in some disciplines, as noted from several interviews and investigations, were found to be below that desired to handle the work load.

3. Procedures for field changes of project design exist.

(CC.1-1) 4. Modifications, design changes and additional equipment are being installed in the same physical structure causing interference, rework and significant additional work by field engineering.

5. Field engineering follows procedures for preparation of FCN, FCR, NCRs and other design control mechanisms.

6. Field engineering is the principal technical support service to construction supervision.

7. Field engineering may authorize FCNs to be installed. However, final approval is required from project engineering.

8. Document control procedures are being followed.

9. Field engineering component strength approximates the following:

Mechanical	-	77	
Electrical	-	99	
Instrumentation	-	27	
Welding	-	25	
Civil	-	27	(Numbers include on-loan and contract personnel)
Office Services	-	55	
Night Shift	-	33	

10. Interpretation of design requirements for construction and interfacing with the resident project engineer is a field engineering responsibility.

(CC.1-1) 11. A number of experienced engineers have been transferred from the principle construction organization to GSO, weakening the construction organization.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Construction Engineering (title) Objective No. CC.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

12. Field engineering may generate Field Sketches (FSK). FSKs are permanent records and are not incorporated into drawings.

13. Basis for the design (criteria) are not shown on FSKs or other separate documents.

14. Redline drawing control procedure responsibility is being transferred from field engineering to the document control organization.

15. Field engineering prefers to use the redline approach for pipe hangers rather than the FCN. The redline approach is an expedited FCN/FCR which can acquire rapid response from redline group in project engineering or from just field engineering for certain changes.

16. Drawing "holds" notification from project engineering may be on 8 1/2 x 11 paper with single drawing hold per sheet or may show on the drawing itself.

(CC.1-2) 17. Generation of FCNs in field engineering is largely due to discrepancies on design documents and lack of anticipation by designer. An example is: no vents and drains for hydrostatic test.

(CC.1-2) 18. It was noted that many times FCRs are required due to changes in specification and interference.

19. Documentation volume shows 796 FCRs generated during the month of October. In September 753 FCRs were generated and in August 666.

(CC.1-1) 20. Each FCN, FCR must pass through the field engineering approval chain prior to approval by project engineering. This provides good control but is very time consuming because of the volume of changes.

(CC.1-1) 21. Field engineering time spent on FCRs, FCNs, Redlines and FSKs is a large sector of available engineering man-hours.

(CC.1-2) 22. In some cases it was observed that procedures, limits, specifications, codes and standards were not supplied in work instruction packages released by field engineering.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Construction Engineering (title) Objective No. CC.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

23. The "Work Print" supported by field engineering prepared documents such as concrete drill permits, excavation permits, welding permits, etc., make up the instruction packages to crafts.

24. Field engineering services crafts by area and by systems responsibility assignments to engineer.

25. Field engineering has responsibility for designing of non-critical small pipe/hangers. Critical piping definition is in Specification 7220-M-48.

(CC.1-1) 26. Craft general foremen were observed being used to perform work normally done by engineering assistants.

27. Field engineering is involved with the disposition of IPINs and NCRs and maintains records for each craft discipline.

28. Field engineering has taken action against two of their personnel for nonperformance of duties. They were placed on a one-year official reprimand.

29. Field engineering has as its responsibility the document control group.

30. Redlining is not used in electrical design. FSKs are used for field runs.

31. Receiving inspection for materials and equipment by field engineering is generally a visual inspection.

32. Engineers' work is normally scheduled to systems turnover priority lists.

33. The lead superintendents of civil and electric crafts stated that the construction lead superintendent is responsible for content of the instructions for work performance given to crafts (i.e., work instructions).

34. Off-normal terminations or cable pulls require an FER (Field Engineering Report) to be prepared which is subsequently signed off by the lead electrical superintendent.

35. Field engineering analyzes future work loads systems, areas, et al.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Construction Engineering (title) Objective No. CC.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(CC.1-2) 36. Lead field engineers indicated that more coordination work could be performed on design packages prior to their receipt in the field.

37. Field engineering is now preparing Administration Guides on the subjects of work instructions and inspection criteria.

(CC.1-1) 38. Field engineering staffing levels had decreased at the start of summer (1982) but action is now underway to add people.

39. A training program for new hires exists in each field engineering discipline. A continuing project-related program does not exist except for specific problem areas.

(CC.1-2) 40. Civil field engineering described the installation of watertight doors on the plant turbine generator and auxiliary buildings as an example of poor coordination and analysis with resultant generation of excessive numbers of FCRs and FCNs due to interferences.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Construction Facilities/Equip Objective No. CC.2

Evaluator(s) R. Kelley

I. Performance Objective

Construction facilities and equipment should be planned for, acquired, installed and maintained consistent with project needs to support quality construction.

II. Scope of Evaluation

Both on-site and off-site construction facilities were reviewed which included warehouses, laydown, trailer complexes, tool rooms and fab shops.

Assistance was provided by two CP Co and three BPCo personnel. Two construction team members spent approximately 16 hours conducting interviews and performing observations of the construction facilities and the construction equipment being used.

III. Conclusion

Construction facilities and equipment are planned and controlled in a manner that adequately supports the construction activities. Only one area of weakness was found with the lack of bulk storage laydown near the site. There is no corrective action for this situation. All other performance criteria are met and one good practice was noted.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Construction Facilities/Equip Objective No. CC.2

Evaluator(s) R. Kelley

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (CC.2-1) There is insufficient bulk laydown area near the plant creating smaller isolated/scattered areas on site.

Corrective Action: It is recognized that there is insufficient bulk laydown area near the plant. The power block area is relatively small and the cooling pond area was initially used as a laydown area. The pond had to be filled several years prior to its need date in order to be compatible with water use limitations imposed by the State of Michigan. Because of the status of the plant at this time, including the need for having space near the power block area to house the large numbers of field engineering, testing, resident engineering and other field personnel, it is not deemed feasible nor economically justified to move these personnel or purchase more land to have a centralized close in bulk laydown area.

Finding: (CC.2-2) The following good practice was noted:

The central control and inventory of all rigging equipment in the "rigging loft" where daily inspections are performed prior to issuance to crafts. An official weekly inspection and preparation of reports for all motor vehicles and mobile cranes.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Construction Facilities/Equip (title) Objective No. CC.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. The main craft tool rooms are adequately organized and controlled to support the project. Several smaller tool cribs are located in key areas of the plant.

(CC.2-1) 2. Because of the number of personnel on site and the multiple organizations, there appears to be insufficient bulk laydown near the plant. The bulk laydown area is well removed from the plant proper generating smaller isolated areas at the plant site to control. Added to this, subcontractors' laydown areas are scattered.

3. Motor vehicles (trucks) used on site appear to be near retirement. CP Co supplies the vehicles and the prime contractor performs maintenance.

4. The mobile equipment maintenance shop was observed to be adequate for supporting all equipment on site.

5. CP Co construction personnel approve the purchase and lease of all equipment, location of temporary facilities and maintain a good key plan of the facilities.

6. The main warehouse is centrally located, well organized and controlled.

(CC.2-2) 7. The majority of the rigging is controlled in one location called the "rigging loft". Daily inspections (visual) are performed. Activities in this area were observed and found to be well organized and controlled. This is a good system.

8. Temporary plant gases are well distributed throughout the plant.

9. The NSSS supplier/contractor has to relocate its facility due to the installation of the permanent security fence showing weak initial planning.

10. Standish fabrication facility is located off-site and used for fabricating hangers/supports. The facility adequately supports the plant needs.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Material Control Objective No. CC.3

Evaluator(s) V. Johnson/R. Kelley/L. Zwissler/W. Friedrich

I. Performance Objective

Material and equipment should be inspected, controlled and maintained to ensure the final, as-built conditions meet design and operational requirements.

II. Scope of Evaluation

The evaluation of the material and equipment control process included a review of the receiving inspection program; the control, identification and maintenance of stored material and documentation within the warehouse and laydown areas; and receiving and withdrawal methods. The maintenance and inspection program for installed equipment and its implementation was reviewed.

Some 25 hours were spent conducting interviews, reviewing procedures and documents and making observations within the facilities of the construction activities being exercised to control material and equipment. Results are documented in the performance detail.

III. Conclusion

The material and equipment control programs meet the performance objective requirements. Up through installation, implementation was found to be in compliance. After installation, however, several areas of weakness were noted related to maintenance and protection of the installed equipment.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Material Control Objective No. CC.3

Evaluator(s) V. Johnson/R. Kelley/L. Zwissler/W. Friedrich

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (CC.3-1) Instances occurred where pre-turnover procedures for maintenance/inspection of installed equipment were not followed.

Corrective Action: The Construction Completion Program provides for preparing the plant for determination of system status and inspection verification, layup and maintenance of items.

Results from this effort will determine if any equipment requires special maintenance or if procedural control must be enhanced. Normal storage and maintenance inspections will continue in the interim. Walk-downs to define any special lay-up requirements will be completed by February 28, 1983.

Finding: (CC.3-2) Degradation/damage of installed equipment has occurred in the turbine and auxiliary buildings.

Corrective Action: The instances cited by the INPO Evaluation Team have been corrected and a further review of the installed equipment is continuing. The review will be completed by February 8, 1983 and will determine if similar instances are evident.

Based on the review, corrective action will be initiated as appropriate. In the interim, normal storage and maintenance inspections will continue.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Material Control (title) Objective No. CC.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. The inventory control system at Site Warehouse No. 1 produced correct information concerning bin contents from randomly selected locations.

2. Site Warehouse No. 1 has class A storage which meets ANSI Standard 45.2.9.

3. Warehouse No. 1 was clean and environmentally controlled.

4. Site receiving inspection is performed on all incoming construction materials and equipment at Warehouse No. 1 or at Poseyville laydown area. Procedures exist and were observed being followed.

5. In-storage maintenance and inspection program is intact and was found to be performed according to procedures and records generated for both Q and Non-Q material.

6. It was confirmed that segregation areas exist for nonconforming items and items on hold.

7. An installed equipment maintenance program exists. Responsibility for implementation is assigned to field engineering.

(CC.3-1) 8. Randomly selected installed equipment, pumps PO 3A and B were found to have incomplete records of maintenance per FPG 5.000.

(CC.3-1) 9. Observing equipment installed in plant under both Bechtel and CP Co responsibility, it does not appear that reasonable and prudent care is always being exercised in the maintenance/inspection of this equipment.

10. Processing of material and equipment into storage is performed on a timely basis.

11. Installed equipment is identified by attached metal tags. This tagging requirement was observed to be followed.

12. In-storage equipment is identified by purchase order number on bins.

(CC.3-2) 13. It was observed that rework, additions and interference construction activities has resulted in degradation of installed plant equipment in the turbine generator and auxiliary buildings.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. Performance Area Material Control (title) Objective No. CC.3

2. Provide Factual Information That Supports the Performance Evaluation Summary (Continued)

14. Efforts have been made and were noted to protect installed environmentally sensitive instrumentation within the control room and its support areas.

(CC.3-2) 15. Welding slag was observed dropping on unprotected SS pipe from sheet metal contractor's personnel.

16. Partially used weld rods were observed on the floor of the containment building. This was an isolated incident.

17. Careful attention to specification requirements for material preparation was noted.

18. Inventory of material in warehouse and laydown area is performed on set frequencies or more often to fulfill specific requests.

19. A sack of No. 648 grout stored in Warehouse No. 1 was torn, allowing spillage on the floor and dispersal by forklift in vicinity of Q class SS storage. The sack was subsequently taped.

(CC.3-2) 20. Auxiliary F.W. Pumps 1 and 2 P-05B at El 584 auxiliary building were in a deterioriated condition. Conditions noted included bent and broken governor control tubing, construction debris around pumps, miscellaneous pump parts lying loose and unidentified and control panels open.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Control of Construction Process Objective No. CC.4

Evaluator(s) R. Kelley/D. Hubbard/J. Briskin/V. Johnson/A. Robeson/L. Zwissler

I. Performance Objective

The construction organization should monitor and control all construction procedures to ensure the project is completed to design requirements and that a high level of quality is achieved.

II. Scope of Evaluation

Six team members expended a total of approximately 70 man-hours during this performance evaluation.

The scope of this evaluation covered approximately 23 planned observations and plant walk-throughs to provide a clear and complete understanding of construction process. In addition, some interviews were conducted to provide an insight as to the qualification and competency of the construction organization responsible for controlling the process.

Numerous work activities were reviewed for work instruction planning, content and performance.

III. Conclusion

In general, the construction work on Midland is being controlled and is in compliance with this performance objective. One important weakness was noted in the insufficient level of work instructions being issued to the field.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Control of Construction Processes Objective No. CC.4

Evaluator(s) R. Kelley/D. Hubbard/J. Briskin/V. Johnson/A. Robeson/L. Zwissler

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (CC.4-1) In some cases work instruction details released to construction were insufficient or conflicting for crafts to perform work.

Corrective Action: The responsibilities of construction supervision in the assembly of work instructions to crafts will be redefined and issued in support of the Construction Completion Plan. As a result, there will be an integrated plan to develop all necessary instructions (also see Corrective Actions for DC.4-1, CC.1-2 and CC.5-2).

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Control Construction Processes (title) Objective No. CC.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

(CC.4-1) 1. Observed concrete chipping in process to expose rebar to allow installation of water tight door. The chipping permit, which is required to be posted nearby, was not present at the work site. Marks on the wall were used to indicate limits for excavation.

(CC.4-1) 2. Observed grouting operation for installation of reinforcing bolts in Q concrete block walls. Only the drill permit and work prints were available for the work. No further instructions or requirements were provided.

3. A letter had been issued from the lead superintendent to the foreman, general foreman and engineers specifying requirements for cable termination quality. As a result, workmanship improved and nonconformance was reduced.

4. Work instructions for the civil group were observed to be generally in the form of a concrete drill permit, access removal permit or contractor work request for painting or coating. Instructions from field engineering are usually carried on the permits accompanied by the work print. In some cases, sketches with no engineering approval are used directly on the permits. This is permitted by procedure.

5. Obstructions encountered during drilling or chipping requiring changes must have field engineer change permit or be initialed before proceeding. Compliance with this requirement was confirmed.

6. Paint/sand shop was observed to work to combo shop work requests. Copies are sent to field engineering and QC so an inspection report may be prepared. The foreman calls QC when material is ready for inspection. The shop facility appeared to be adequate for the project needs.

7. The paint shop foreman was cognizant of applicable specifications from which he got information on paints or coating to use on specific applications for systems or areas within the plant. It also provided film thickness requirements and temperature limits.

8. Instructions for cable pulling are received from project engineering and packaged for routing. Field engineers check constructability on the VIA's card. Rework is handled the same way.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Control Construction Processes (title) Objective No. CC.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

9. Rework packages are routed through the electrical systems group for determination of energized cables.

(CC.4-1) 10. Work instruction packages for components/systems scheduled for turnover are being emphasized. As a result, minimal instructions are being provided for craft work on other areas which are still in process and need to be completed.

11. Termination engineers issue instructions to the electrical field superintendent.

12. Termination inspections have three levels of inspection (craft, field engineering, quality control).

13. Electrical engineering preplanning for changes was found to be effective, keeping interface problems at a minimum.

14. No redlining of electrical drawings is done, all use FSKs (according to procedure).

15. CP Co construction personnel monitor construction activities but do not monitor construction processes unless on special projects. This is consistent with contractual responsibilities/accountabilities.

16. CP Co Rooms Task Force studies space requirements and new changes on a multi-discipline approach.

17. A typical turnover package contains:

a. Scoped drawings.

b. Turnover exception items.

c. Equipment maintenance requirements.

18. Hanger drawings use red-line process to expedite changes in the field (consistent with procedure).

19. Some specific work instructions contain enough data to complete the work activities such as drill permits and weld data sheets.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Control Construction Processes (title) Objective No. CC.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

20. The contractor issues letters of instruction to craft to "jack-up" work quality.

21. CP Co home office project cost/schedule supervisor is developing work package plan by project milestone and start-up system to predict impact of all engineering, purchase and construction on start-up system construction turnover dates.

(CC.4-1) 22. In some cases it was observed that procedures, limits, specifications, etc., were not supplied in work instruction packages. As a result, construction supervision had to assemble the missing information to complete instructions to crafts.

23. Unstamped vendor drawings were observed being used during several mechanical activities. This was found to be acceptable by procedure.

(CC.4-1) 24. Large bore pipe installation instructions state that the longitudinal erection tolerance is ± two inches. However, the pipe hanger tolerance is specified as ± one-fourth inch in their installation packages. As a result, rework is often encountered for compliance.

(CC.4-1) 25. Pipe fit-up was observed in which the job instruction package was not comprehensive.

(CC.4-1) 26. A welding instruction package was observed which did not contain all required information. The work was delayed for two weeks awaiting this information.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Construction Quality Inspection Objective No. CC.5

Evaluator(s) V. Johnson/R. Kelley/W. Friedrich/L. Kube/L. Zwissler

I. Performance Objective

Construction inspections should verify and document that the final product meets the design and quality requirements.

II. Scope of Evaluation

Input from all evaluation team members was included for the evaluation of the construction quality inspections.

Individuals contacted during this evaluation included craftsmen, foremen and general foremen, superintendents of construction, engineers and their supervision, and field engineering inspectors, as well as quality control inspectors. Field observations of craft at work, inspections in progress and of stored and installed equipment condition and inspection techniques were also made. Reviewed were NCR, IPIN logs and analysis methods, QAIL reports, inspection records and procedures and NRC open items list. Work instruction procedure and detail were examined in field contacts.

Some 50 man-hours were spent in observations. Some time was also spent in interviewing, reviewing files and procedures and documenting results.

III. Conclusion

Construction quality inspections are being performed and the results appropriately documented in compliance with the requirements of this performance objective. However, two weaknesses were identified which require corrective action. The primary concern was lack of clearly defined acceptance criteria prior to initiating construction work.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Construction Quality Inspection Objective No. CC.5

Evaluator(s) V. Johnson/R. Kelley/W. Friedrich/J. Copley/L. Zwissler

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (CC.5-1) Inspection procedures and criteria for acceptance are not always being clearly defined nor included in work instructions/packages.

Corrective Action: The work plans prepared prior to the start of work in Phase 2 of the Construction Compliance Plan will be reviewed for compatibility with the PQCI's to be used by quality control to conduct the acceptance inspections.

Checklists used by the field engineers for verification of the work will list the QC inspection points and either reference or include acceptance criteria.

As an alternative to a checklist, field engineering may use an information copy of the PQCI.

See also Corrective Action to Finding CC.1-2.

Finding: (CC.5-2) Inconsistencies in inspection schedules have resulted in loss of productivity and turnover delays.

Corrective Action: Construction Completion Teams are being developed, some specifically for the inspection updating of Q-systems and ultimately the completion of these systems. The activities (inspections, etc.) for these systems will be planned, performed and monitored as part of each team's planning and scheduling process. This is part of the Construction Completion Program.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Construction Quality Inspection (title) Objective No. CC.5

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Reviewed Quality Control Instruction No. 7220/C-1.60, Rev. 5 (PQCI) entitled Concrete Drilling and Cutting Reinforcing Steel. The procedure and acceptance criteria is clear.

2. Inspection of core drilled holes by a PQCE was observed utilizing PQCI No. 7220/C-1.60. The inspector was qualified to perform the inspection.

3. NCR and IPIN logs were reviewed for the electrical craft. It was observed that electrical field engineering performed a generic and trend analysis, the results of which are supplied to electrical construction superintendant for corrective action.

4. The inspection process utilized by all crafts on completed work is inspection by the foremen, then by field engineers and subsequently QC.

5. The NRC has performed random inspections of work quality. These results are logged and those not corrected are carried as corrective action items.

6. Inspections of in-storage materials and equipment and installed equipment are performed according to specific schedules and procedures.

7. Guidelines for inspection M 6.00 have been prepared for use by mechanical field engineering.

8. Field engineering inspection of cable terminations is recorded by the field engineering inspector signing the appropriate termination card.

9. A PQCE inspector was observed inspecting a non-tension Q cable pull. The inspection was timely, the IR was properly prepared for the pull. The IR was filled out properly by the inspector as the pull progressed.

10. Records of inspection for damage of temporary and permanent crane hooks were reviewed and found to be satisfactory.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Construction Quality Control (title) Objective No. CC.5

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(CC.5-1) 11. Field engineering is developing inspection criteria for use by their engineers which is to be included in the Engineering Guides. Engineering Guides are an informal system of directions to engineers utilized within the field engineering organization.

(CC.5-2) 12. Situations were observed where crafts were waiting for inspection at hold points resulting in loss of craft time.

(CC.5-2) 13. Multiple inspections of the same work by different inspectors occurs on numerous occasions. This often causes delay or multiple setups by the craft, i.e., a requirement to open closed equipment or cabinets for inspection.

(CC.5-1) 14. Written inspection procedures/criteria are generally not provided by field engineering. In some cases an FER is generated to document a result or condition.

15. Calibration of construction test equipment is performed in a well organized calibration laboratory. Activities performed in this laboratory were observed and found to be satisfactory.

16. Quality control inspectors PQE are separate from the construction craft organization.

(CC.5-1) 17. A mismatch occurred between acceptable installation tolerances on pipe and its hangers. As a result, a pipe installation can be initially accepted and then later rejected because of an out-of-tolerance condition.

(CC.5-2) 18. In some cases late inspection by field engineering has delayed QC inspections.

(CC.5-2) 19. NCRs generated on in-process work has caused unnecessary delays.

(CC.5.2) 20. In some cases, final QC inspection has been delayed for a significant period of time (up to two years). This hampers construction planning and requires work arounds.

21. Quantity of open NCRs has held essentially level since June 1982.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. Performance Area Construction Quality Inspection (title) Objective No. CC.5

2. Provide Factual Information That Supports the Performance Evaluation Summary (Continued)

22. Field engineer was observed inspecting wire terminations in control room instrument cabinets. This was a complete inspection prior to QC inspection.

(CC.5-1) 23. Permits and their attachments including welding, concrete drilling, access closure, excavation, et al are many times providing the only instructions for quality acceptance in a work instruction package.

(CC.5-1) 24. With multiple inspections of completed work occurring and the criteria for quality acceptance not clearly defined, there exists a situation where acceptance compliance is subject to interpretation. As a result, NCRs are many times being issued on previously accepted work.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Construction Corrective Action Objective No. CC.6

Evaluator(s) V. Johnson/R. Kelley/D. Hubbard/K. Horst/L. Kube

I. Performance Objective

The construction organization should evaluate audits, inspections and surveillances; process replies and follow-up; and take corrective action to prevent recurrence of similar problems.

II. Scope of Evaluation

The evaluation of the Construction Corrective Action objective included a review of audits and surveillances performed on the project and the response of the construction organization to those findings. A similar review was performed for nonconformance reports and IPINs. Also, the technique by which the construction organization analyzed the data for generic conditions or trends was reviewed.

Twelve man-hours were spent conducting interviews, reviewing the results of audits, logs, NCRs and surveillance reports. Results are documented in the performance evaluation details.

III. Conclusion

The Construction Corrective Action process meets the performance objective. Results from audit and surveillance efforts are received on a timely basis and corrective action initiated. NCRs and IPINs are tracked and analyzed for generic problems and moved to rework as soon as restraints are lifted.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Construction Corrective Action Objective No. CC.6

Evaluator(s) V. Johnson/R. Kelley/D. Hubbard/K. Horst/L. Kube

IV. Areas of Weakness and Corrective Action; Good Practices

No findings.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Construction Corrective Action (title) Objective No. CC.6

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Construction took prompt action to correct deficiencies described on NRC Open Items List, Rev. 2 dated November 22, 1982.

2. A generic interpretation of items on the NRC Open Items List was performed by CP Co (November 29, 1982) and made available to construction forces for their use.

3. NCR and IPIN logs are maintained which give the status of each outstanding NCR or IPIN, the organization and individual to which it is assigned and the restraints holding up its closure. It also shows net additions and closures.

4. The NCRs are moved into rework category and entered on work schedules as soon as the restraints are lifted.

5. Field engineering monitors the generation and type of NCR for trends and comparable basic causes and recommends corrective action to construction forces.

6. The Product Improvement group provides the construction and field engineering organization with assistance in analysis of NCR and IPIN causes.

7. Effort is made to have nonconforming items corrected on a timely basis.

8. Consideration is being given to phasing out IPINs and using NCRs when deficiencies are noted.

9. Field superintendents have been instructed to initiate NCRs on deficiencies they observe in any area or discipline.

10. The construction contractor took action to shut down a subcontractor's Q work when deficiencies were discovered in Q weld certification requirements. MPQAD audit report M 01-336-2 and subsequent audit review provided the findings for this action.

11. The construction contractor, MPQAD, and subcontractor have taken action to provide a timely response to audit M-01-336-2 with a tentative plan to assess the extent of the deficiency, a method for resolution and a schedule for completion.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Test Equipment Control Objective No. CC.7

Evaluator(s) R. Kelley/V. Johnson

I. Performance Objective

Measuring and test equipment should be controlled to support construction testing effectively.

II. Scope of Evaluation

Included in the scope of this evaluation were observations of work activities in the plant and a review of the construction calibration facility and personnel. Two construction team members expended approximately five hours completing this performance objective.

III. Conclusion

The performance objective and associated criteria are being met. The contractor maintains an excellent system to support construction and as a result this was identified as a good practice.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Test Equipment Control Objective No. CC.7

Evaluator(s) R. Kelley/V. Johnson

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (CC.7-1) The following good practice was noted:

The contractor has an excellent facility and system to identify, control, track, calibrate and repair test equipment.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Test Equipment Control (title) Objective No. CC.7

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

(CC.7-1) 1. Reviewed procedures covering each unique instrument and tool. All were adequately covered.

(CC.7-1) 2. Approximately 3,000 pieces of equipment were well identified, controlled and tracked.

(CC.7-1) 3. Reviewed documentation tracking out-of-tolerance equipment. All appeared very organized.

(CC.7-1) 4. Reviewed retest procedure and recall system. All were in order.

5. Certification of applicable test equipment conforms to national standards.

6. Temperature and humidity are controlled and recorded for monitoring and auditing on strip chart recorders.

(CC.7-1) 7. Reviewed test equipment list, calibration certificates and record cards for checkout. All were in good order.

(CC.7-1) 8. Personnel assigned to the test equipment area were found to be very competent.

9. Routine checks in field found all test equipment to be within calibration. Examples include:

a. Temperature gauge - surface
   - BPC - 3597
   - Calibrated September 20, 1982
   - Expires March 20, 1983

b. Dry film thickness gauge
   - BPC - 1506
   - Calibrated August 30, 1982
   - Expires November 30, 1982

c. Hydro test instrumentation

d. Crimping tools

e. Dial indicators

f. Stress relieving recorders

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Test Equipment Control (title) Objective No. CC.7

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

10. An observation of hanger attachment stress relieving indicated all recorders were calibrated, properly connected, monitored and strip charts signed off.

11. Cable termination in a transformer panel was observed and the equipment being used was properly calibrated.

PROJECT SUPPORT

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Industrial Safety Objective No. PS.1

Evaluator(s) R. Kelley/L. Kube

I. Performance Objective

The construction site industrial safety program should achieve a high degree of personnel safety.

II. Scope of Evaluation

Included within the scope of the evaluation were interviews with the contractors site safety supervisor, discipline supervisors and craftsmen.

Input was also provided from virtually every planned observation and each plant walk-through.

Two team members spent approximately 25 hours performing interviews and observations.

III. Conclusion

The construction safety program meets the requirements for this performance objective and these good practices were noted. In the implementation of the safety program, two areas of weakness were found; the use of non-fire retardant wood planking and area congestion due to scaffolding. Some specific areas requiring personnel safety and housekeeping attention were noted (see Detail 1) but were considered minor considering the project status, restrictive work areas and and level of activity.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Industrial Safety Objective No. PS.1

Evaluator(s) R. Kelley/L. Kube

IV. **Areas of Weakness and Corrective Action; Good Practices**

Finding: (PS.1-1) The use of non-fire retardant wood for scaffolding and flooring expose permanent plant equipment to a possible loss from fire.

Corective Action: The majority of lumber utilized for scaffolding, etc, by contractors and subcontractors is fire-retardant material. We are removing as much non-fire retardant lumber as possible. Instead of lumber, metal scaffolding is being utilized wherever practical and we plan to continue to utilize fire retardant lumber and/or metal for future scaffolding on the job.

Finding: (PS.1-2) The following good practice was noted:

Enforcement of good industry safety practices was exemplified by accident trending indicating frequency rates only 12 percent of home office established goals.

Finding: (PS.1-3) The following good practice was noted:

Lifting and rigging equipment received above normal attention from the contractors Louisville office and weekly site inspections.

Finding: (PS.1-4) The following good practice was noted:

A very good tagging program exists with both construction activities and client interface as evident by a good double tagging procedure.

Finding: (PS.1-5) Some areas of containment number two were observed as being congested, preventing safe access and regress.

Corrective Action: We recognize that this is a problem and the actions already taken or being taken, as described below, should minimize the problem from occuring in the future.

The withdrawal of "construction aid" material, ie, scaffolding, material, etc, as part of the Construction Completion Program has helped eliminate some of the identified congestion temporarily. In addition, the Construction Completion Program has alleviated the congestion by reducing the number of people simultaneously working in the most congested areas of the containment.

While congestion will occur periodically as installation activities resume, constant monitoring by Safety and Craft supervision to ensure minimizing congestion/proximity and providing safe working area has and will continue to be an ongoing function in all areas of the job.

Accessibility within the reactor buildings and other buildings from both a traffic volume and safety standpoint will continue to be monitored.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Industrial Safety (title) Objective No. PS.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. The following housekeeping and safety practice concerns were observed during plant walk-throughs:

A. Walk-through Unit #2, Turbine Building:

1. Turbine lube oil conditioner Unit #2;

a. Oil flush in progress, waste drum overflowing with combustibles. Room has only one small ABC fire extinguisher.

B. Walk-through, containment #2, area 2C RCP.

(PS.1-1)

1. Combustible scaffolding around 2C RCP Volute.

2. Construction debris (paper, grind wheels, trash), inside motor frame, and around work area.

3. Reactor shield wall penetration for the pressurizer surge line is accumulating rags, paper, and debris.

C. Bay #2 Diesel Generator Room.

1. Diesel generator control panels are open allowing dust accumulation. The rear panel door and top entries are open.

2. MAPP gas bottle unsecured with no cap, last inspection stamp October 1956.

3. Multiple lamp extension cord tagged "condemned" November 8, 1982, with open sockets still in use.

4. Housekeeping is generally good except for specific locations.

(PS.1-1)

5. Samples of scaffold planking were tested and shown to support combustion.

D. Room #425:

1. Multiple lamp string in use with exposed sockets. Not tagged by safety.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Industrial Safety (title) Objective No. PS.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

E. Turbine Building Unit 1 & 2, EL. 614:

1. DC current MCCs at Col. KC-4 has open panel, rags on floor; housekeeping could be improved.
2. MCC 1B-31-23 is energized, cover off.
3. Unit 1 and two battery rooms:
   a. Unit #1 - Permanent eyewash station inoperable.
   b. Unit #2 - Ditto-room unmarked.
   c. Unit #1 has safety precautions marked on door.
4. Overall housekeeping looks good.

F. Unit 2, seal oil unit:

1. Generally most unsafe scaffolds and other unsafe conditions show evidence of safety department application of "condemned tags". Example: Col. P-J11 El. 614, bandsaw condemned because of no upper guard.

G. Area #2, Col. KC-7 & Col. "L-8"

1. Energized temporary lighting panel at Col. KC-7, EL. 614; turbine area has no cover.
2. Col. L-8 - Pipe threading machines adjacent to switchgear:
   a. Cutting oil on floor/oily rags.
   b. Both stationary and portable machines left energized after end of Saturday day shift.

H. Turbine Unit #1, EL. 614:

1. Turbine area EL. 614 at MCC 1D11 - Temporary lighting panel has no cover.
2. Temporary 220v feed #LPP6B, no cover.
3. Switch gear 2A05 and MCC 2B17 (pressurizer heater controls) breaker 2A05-03 removed completely. Appears to have been out for a long time.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Industrial Safety (title) Objective No. PS.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

I. Battery Room #353, 352, 356:

1. Door open, no lock available.
2. Sign on door, "Battery charge in progress."
3. Note on door, "Controlled access."
4. Portable eyewash system adjacent to energized battery charger.
5. Doors cannot be closed because of temporary vent duct in door.

J. Personnel Hatch to Containment #2:

1. Housekeeping in the cable tray area at this location was poor.

K. Reactor building, elevation 593'6", next to steam generator:

(PS.1-1)

1. Extensive use of wood scaffolding from this elevation and up.
2. In the same general area, two fire extinguisher stations were noted that did not contain extinguishers.
3. In the same general area, two fire hoses were noted that were blocked by miscellaneous steel and wood piled against them making access nearly impossible.

(PS.1-2) 2. The last reporting period without any loss time accidents reached over 800,000 MHs. Four previous periods reach 1,000,000 MHs, with two of the same periods running back-to-back.

3. Field procedures for Personnel safety, welding and burning, fire protection, and fire brigades are generic and generated at corporate offices. All are very professional in nature. Special site procedure and instructions are prepared to account for specific requirements that are identified.

(PS.1-2) 4. Loss data trending is reported in a very good procedure. The OSHA frequency rates are set by the San Francisco office. The CP Co project has been averaging approximately 12 percent of their target rate.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Industrial Safety (title) Objective No. PS.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(PS.1-3) 5. Lifting and rigging get special attention from BPCo's Louisville office which meets and exceeds OSHA rules.

6. Biweekly fire brigade training is performed.

(PS.1-3) 7. A weekly report is generated for inspection of all lift equipment and motor vehicles.

(PS.1-4) 8. Several activities were observed where craft work involved "turned-over" equipment to CP Co. In all cases, the procedure for double tagging was used; ie, BPCo/CP Co.

(PS.1-5) 9. Access to the area of the 2C reactor coolant pump motor took a long time because of the various scaffolds, platforms, and construction equipment used. There was significant activity in this area and emergency evacuation would be difficult.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Project Planning Objective No. PS.2

Evaluator(s) D. Hubbard and J. Briskin

I. Performance Objective

Project plans should ensure completion of the project to the highest industry standards by identifying, interrelating, and sequencing the tasks of the project organizations.

II. Scope of Evaluation

This assessment was performed through personnel interviews, meetings and documentation reviews.

Personnel interviews were conducted with: CP Co and BPCo project management; CP Co (home office) project planning; BPCo (home office) project and engineering planning; BPCo field construction planning; BPCo construction completion coordination group; BPCo field system turnover coordination group; CP Co schedule/quantity area turnover planning; and CP Co test planning; BPCo/CP Co soils planning and scheduling; BPCo resident engineering planning and scheduling; and BPCO GSO planning and scheduling.

Documents reviewed included the CP Co Midland Project Procedures Manual; CP Co Test Program Manual; BPCo Project Procedures Manual; BPCo project unique field procedures; the BPCo Midland Management System Agreement; BPCo completion coordination group's instructions; and various system plans and schedules.

The formal and informal interfaces among the various elements of the project plan, and the various BPCo and CP Co planning groups were also reviewed.

Meetings attended included the mini-schedule review meetings, construction punch list review meetings, the daily test planning meetings, and the monthly project status meeting.

Approximately 30 man-hours were expended evaluating this objective. The results are documented in the Performance Evaluation Details.

III. Conclusion

The plans and planning process, methods, interfaces, operations, procedures and techniques evaluated under this performance objective were generally satisfactory. However, the planning organization, documentation, and process are somewhat fragmented.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Project Planning Objective No. PS.2

Evaluator(s) D. Hubbard and J. Briskin

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (PS.2-1) There is no formal written overall management plan or hierarchy of existing project procedures for implementing planning and scheduling.

Corrective Action: There is a need to revise the project schedule hierarchy as planning of the CCP continues. This revision will affect some of the procedures and instructions listed below:

Midland Project Procedures Manual

- Project Organization
- Division Project Functions
- Division Detailed Procedures
  - Midland Project Turnovers
  - Project Status Reports
  - Project Schedule Change Notices

Management System Agreements

- Advanced Master Punchlist
- Functional Turnover Process
- Area and Nontestable Turnover Process

Completion Coordination Group Instructions

Engineering Planning and Control Instructions

System Planning Instructions

Midland Project Schedule Hierarchy and Matrix

Various Procedures in the Construction General Services Organization

The revised hierarchy will identify the interrelationships of procedures and will be published as a revision to the existing Midland Project Schedule Hierarchy and Matrix. The hierarchy revision is scheduled to be completed by May 1, 1983.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Project Planning Objective No. PS.2

Evaluator(s) D. Hubbard and J. Briskin

IV. Areas of Weakness and Corrective Action; Good Practices (Continued)

Finding: (PS.2-2) The planning and scheduling process has some duplication, some lack of coordination and produces non-integrated plans and schedules.

Corrective Action: Functions and activities performed by various project groups are closely related and do result in some overlap and duplication. In many cases, this overlap and duplication is required for communication between these groups and production of summary or special schedules.

Many of the scheduling tools used on the project are punchlists for a specific aspect of the work and are updated at different frequencies and cutoff dates. This has resulted in schedules being insufficiently integrated at the detailed level.

In recognition of this situation and other changes on the project (ie, formation of system teams, Construction Completion Plan, etc) a revised project schedule hierarchy is being developed.

This revised project schedule hierarchy will eliminate unnecessary duplication, produce an integrated set of schedules and result in increased coordination between and within project groups. See Corrective Action to PS.2-1.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Project Planning (title) Objective No. PS.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

(PS.2-1 1. It was stated by BPCo that its field planning and scheduling groups do not formally recognize the BPCo corporate planning and control manual for use on the Midland project.

(PS.2-1) 2. The CP Co Project Procedures Manual, CP Co Test Program Manual, BPCo Project Procedures Manual, BPCo Management Systems Agreement Manual, BPCo Completion Coordination Instruction Manual, and the BPCo Field Procedure/Instruction Manual duplicate each other in describing and defining the turnover process and do not agree on some points of detail. There is no statement in the documentation stating which procedure controls what.

(PS.2-1) 3. There is no formal or official statement on the hierarchical relationship among the various manuals, procedures and instructions issued by CP Co, BPCo, and various subcontractors for the Midland site.

(PS.2-2) 4. BPCo cost/schedule groups recreate or redraw some of the schedule documents provided by CP Co resulting in redundancy and conflict of information.

(PS.2-2) 5. There are four separate CP Co groups, six separate BPCo groups, and various subcontractors performing planning and scheduling functions.

(PS.2-2) 6. One CP Co group, various subcontractor groups and up to three BPCo groups can all be responsible for attempting to simultaneously schedule work in the same plant areas.

7. The soils program planning and scheduling is independent of all other CP Co and BPCo planning and scheduling. It produces and utilizes its own integrated plan and schedule.

8. CP Co home office project planning and scheduling's prime activity is monitoring BPCo engineering planning and producing plans and schedules for special licensing issues.

9. The BPCo field construction planning and scheduling group is only responsible for planning and scheduling construction activities prior to the remaining work being entered into the construction completion punch list. From that point planning, scheduling, and coordination becomes the responsibility of BPCo's start-up coordination group.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Project Planning (title) Objective No. PS.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(PS.2-2) 10. The construction completion coordination group produces a limited number of hand drawn schedules for key items of work remaining to complete a system. The construction activity durations and logic in the plans are not agreed to by BPCo construction supervision. The plans are used only as guides by BPCo construction planning and scheduling.

11. Craft manpower utilization is predicted and monitored by craft supervision. Craft manpower loading by area, for any time period, is independently assessed by each responsible discipline within each BPCo or CP Co performing organization.

12. Subcontractors submit a project construction schedule to the Subcontract Administrator within 30 days of award and update it monthly. Major subcontractors submit a six week schedule every two weeks.

(PS.2-2) 13. BPCo field construction planning and scheduling utilizes area (non-testable item) planners to plan and schedule area turnovers. These planners do not plan or schedule system work in their areas.

14. BPCo field construction planning and scheduling utilizes system planners to plan individual systems across plant work areas. They interface with craft supervision responsible for that system across plant areas. However, typically craft supervision works by area.

15. Craft supervision, in conjunction with construction planning, prepares the six week schedule of work. This schedule shows the next two weeks by day and the following four weeks in summary. This "Daily Construction Schedule" is updated and issued every other week by BPCo field planning and scheduling for the crafts.

16. At a specified time prior to system turnover, the scheduling is converted from an area/bulk method to a formal individual mini-schedule for that system by remaining bulk. This conversion is performed by the BPCo field construction planning and scheduling group. The schedules are updated and issued every other week.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Project Planning (title) Objective No. PS.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

17. At a specified time just prior to system turnover the scheduling is converted from the system mini-schedule process to a construction punch list (CPL) process. This conversion is performed by the BPCo start-up coordination group. These CPLs are updated and issued every other week.

18. The BPCo CCG discusses, suggests, and coordinates "work arounds" (temporary wiring, piping), with CP Co test engineers to allow system turnover and test where support pieces of a system are missing or construction is incomplete.

19. Individual system test plans are prepared jointly by the test planners and applicable test engineers. The plans are developed into schedules which include all key test activities, required test procedures, restraints (such as other systems required to support that system), open turnover exceptions, system turnover milestones and plant start-up milestones. The schedule logic for the various elements of each individual test schedule are also included.

20. Individual test plan schedules are integrated into an overall logic network schedule, using an automated CPM schedule processor. This produces a single network of about 7,600 activities, including required test procedures, construction turnover milestones, project test and start-up milestones, and other restraints and system turnover exceptions that affect system testing. Three schedule reports are routinely produced from this data base:

a. Project test and start-up milestone schedule.

b. Short-term planning schedule showing two months from most current data date.

c. The daily working schedule. A two-week look-ahead schedule which is statused daily and formally updated and reissued weekly.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Project Planning (title) Objective No. PS.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

21. A daily meeting is held on the CP Co "Daily Working (test) Schedule" to review and status test procedure preparation, system turnover, testing and turnover exception work progress and completions. Also covered are the plan and schedule for system/equipment outages to support testing, rework and turnover exception work. Attendees include test planning, test scheduling, test turnover scoping, affected test engineers, BPCo construction support, B&W construction, and operations and maintenance.

(PS.2-2) 22. The field engineers sometimes fail to keep current the data in the various BPCo mini-schedules, causing erroneous construction scheduling.

23. Key subcontract schedule information is reviewed and data exchanged at the monthly construction review meeting held by the BPCo site construction manager. Subcontract schedule status is also provided by BPCo subcontract field engineers attendance at mini-schedule review meetings and system punch list status meetings.

24. An "Area Punch List (APL) is used to plan, schedule, and monitor plant areas (non-testable items) prior to area turnover.

25. Soils program has an automated network schedule of about 2,700 activities which are primarily construction. The schedule is updated weekly and unofficially reissued. The schedule is formally issued monthly by CP Co.

26. Soils program uses and supplies data to the "Daily Construction Schedule".

(PS.2-2) 27. The BPCo home office engineering department uses the engineering department Remaining Work Schedule (RWS) to plan and schedule their work. The RWS data is selectively entered into the Advanced Master Punch List (AMP) system, which is used to supply engineering planning and scheduling information that affects construction. BPCo site resident engineering planning uses both the RWS and the AMP system to plan and schedule their work. The AMP data is in one-to-one relationship with the RWS data for Resident Engineering.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Project Control Objective No. PS.3

Evaluator(s) D. Hubbard and J. Briskin

I. Performance Objective

Project scheduling and work planning and coordination should ensure that the objectives of the project plan are met through effective use of project resources.

II. Scope of Evaluation

This evaluation was performed primarily through personnel interviews, review of documentation, attending some meetings and facilities walk-throughs.

Personnel interviews were conducted with CP Co and BPCo project management; BPCo engineering and procurement; BPCo field planning and control; BPCo system turnover coordination; BPCo construction completion coordination; BPCo craft supervision; CP Co technical and test group; CP Co project planning and control; CP Co/BPCo soils planning and scheduling; and BPCo GSO planning and scheduling.

Facility walk-throughs were conducted in the site CP Co planning and control, BPCo field system turnover, construction completion, and planning and control areas.

Project level and working level meetings were attended.

Planning and control documentation reviewed included request for and transmittal of planning and control data between BPCo and CP Co; CP Co Project Procedures Manual; BPCo Midland Field Procedures Manual; CP Co Test Procedures Manual; BPCo Management Systems Agreements; and BPCo Completion Coordination Group Instructions.

Other reviews covered the manual and automated planning and control tools; resource planning, monitoring and control methods; and project status reports.

Approximately 30 man-hours were expended interviewing personnel, reviewing documents and attending meetings in this evaluation. The results are documented in the Performance Evaluation Details.

III. Conclusion

The current control methods, processes, procedures, and systems evaluated under this performance objective were considered generally satisfactory to provide control of project scope, schedule, and cost. However, there were weaknesses identified which indicate a need to improve the flow of schedule, status, and action information to maintain a realistic schedule which could lead to more efficient resource utilization.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Project Control Objective No. PS.3

Evaluator(s) D. Hubbard and J. Briskin

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (PS.3-1) The current milestone schedules used on the Midland Project cannot be achieved under present conditions and need to be revised.

Corrective Action: Based on the project status in the fall of 1982, the project recognized that the project schedule was not obtainable and publicly announced that its schedule was being revised. However, it was stated that this schedule revision could not be completed at that time because of the status of the auxiliary building underpinning work. The auxiliary building underpinning work is unique to nuclear power plant construction and at that time was currently not released for implementation by the NRC. It was felt necessary to have a few months of actual implementation experience with this unique work in order to have a valid basis for a schedule review. The project is currently carrying out the schedule review and the new schedule will be completed and announced in the second quarter of 1983.

Finding: (PS.3-2) The flow of information for the project control process is not clearly defined and documented.

Corrective Action: As mentioned in the response to finding PS.2-1, recent project developments indicate a need to revise the project schedule hierarchy and several project procedures and instructions that govern the planning process. In these procedures the flow of project control information will be further detailed and documented.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Project Control (title) Objective No. PS.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. The BPCo subcontract administration group is responsible for and coordinates the planning and scheduling interfaces between subcontractors. They work with both BPCo construction area or lead superintendent and subcontractors to resolve construction interfaces and work area/equipment interferences between BPCo constructon and subcontractor.

2. CP Co construction control production section monitors BPCo bulk installation status and prepares weekly reports for CP Co site management.

3. The test and start-up program schedule, status and progress is routinely provided to project management for information and action.

4. BPCo produces a formal comprehensive engineering and construction "summary status report" for the project each month.

5. CP Co produces a "Monthly Resume and Schedule Summary Report" covering the CP Co project activities.

6. Monthly project management team meetings were observed where the critical items, schedules status, system completion status, trends manpower and staffing, quality assurance, and licensing were presented and discussed. The meeting is attended by both CP Co and BPCo project management and upper level project/engineering/construction supervision and provides a forum for the interchange of project status information.

7. A summary of significant testing activities is issued daily providing an overview of the results of the daily CP Co test section planning meeting.

8. A "quality tracking system" is used to plan, track and trend bulk quantity data.

(PS.3-1) 9. Functional system turnovers have consistently fallen behind schedule during the last 16 months. The number currently scheduled (about 762) and the number actually turned over (about 509) is diverging. A total of 850 start-up/test subsystems are planned for turnover.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Project Control (title) Objective No. PS.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(PS.3-1) 10. Functional area (non-testable item) turnovers have been falling behind. The number currently scheduled (about 113) and the number actually turned over (about 31) is constantly diverging. The plant has been broken down into 347 areas for purposes of turnover.

11. The CP Co construction control production section establishes and monitors the area (non-testable item) turnover schedule.

12. CP Co periodically provides BPCo with a revised CP Co required construction completion turnover date for each plant area and each test/start-up system.

(PS.3-1) 13. The forecasted system turnover dates generated by the BPCo construction planning and start-up coordination groups are, in many instances, different from those predicted by the BPCo completion coordination group (CCG). Neither meet the CP Co required date per the CP Co system turnover schedule, revision 11.

14. The CP Co test support section utilizes the system turnover date forecast supplied by the BPCo CCG, to analyze the impact on testing and project milestones. This analyzed data is routinely reported to CP Co project management.

15. The individual plans and schedules being developed by the BPCo CCG are being used to some degree by subcontractors. The activity duration and logic in these plans are not reviewed and approved by the BPCo discipline superintendents or the BPCo field cost/schedule supervisor.

(PS.3-1) 16. Scheduling documents do not currently reflect the schedule impact of the engineering HELBA and LOCA analyses now being performed.

17. System functional turnover package documentation review and personnel interviews show that the packages are complete and being handled in accordance with the written procedures.

18. The BPCo CCG produces the composite turnover exception list which includes all turnover exceptions from construction, engineering and planning.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. Performance Area Project Control (title) Objective No. PS.3

2. Provide Factual Information That Supports the Performance Evaluation Summary (Continued)

(PS.3-1) 19. All system turnover exceptions are maintained and statused in a CP Co controlled Master Punch List (MPL). All design changes, temporary systems alterations, or nonconformances issued after a system is turned over are added to the list. The MPL currently contains about 15,000 items of which about 8,000 are open.

(PS.3-1) 20. Systems currently being turned over are being accepted with a very large number of turnover exceptions.

21. Required completion dates for turnover exception items (TOEs) in the CP Co MPL are provided by a manual system interface with the CP Co automated test schedule. This is done by system, by schedule category/milestone affected (ie, system completion, fuel load, flushing, etc).

(PS.3-1) 22. There have been about 1,200 Design Change Packages issued against systems turned over.

(PS.3-2) 23. The plant area turnover milestones are not integrated into the automated CP Co system test and start-up milestone schedule.

(PS.3-1) 24. Given the current level of construction completion and the number of unincorporated design and field changes, the current official CP Co project milestone schedule, system turnover milestone schedule and area turnover milestone schedule are not achievable. CP Co/BPCo are currently reviewing these schedules and preparing updated revisions.

(PS.3-2) 25. There is no overall document showing the flow of information for planning, scheduling, status reporting, progress reporting, variance, etc.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Perfcrmance Area Project Procurement Process Objective No. PS.4

Evaluator(s) J. Briskin/D. Hubbard

I. Performance Objective

The project procurement process should ensure that equipment, materials, and services furnished by suppliers or contractors meet project requirements.

II. Scope of Evaluation

The evaluation of the project procurement process objective included an overall review of both the BPCo home office (Ann Arbor) and field purchasing functions. Interviews were conducted with purchasing department management, supervision and buyers and with the CP Co production design manager.

Fourteen man-hours were spent conducting interviews, reviewing procedures, reviewing files and documenting the results. Results are documented in the Performance Evaluation Details.

III. Conclusion

The Project Procurement Process meets the performance objective. The BPCo and CP Co procurement organizations were cognizant of their duties and performed their functions in a professional manner.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Project Procurement Process Objective No. PS.4

Evaluator(s) J. Briskin/D. Hubbard

IV. Areas of Weakness and Corrective Action; Good Practices

No findings.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Project Procurement Process (title) Objective No. PS.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Design engineered equipment is purchased by the Ann Arbor purchasing group.

2. Field purchasing buys all tools, bulk consumables, non-Q valves, plate, structural steel, rebar, bulk Q steel, fabricated steel (Q), and both Q and non-Q fittings and hardware.

3. Currently, the major activity for both Ann Arbor and field purchasing is changes and add-ons to existing Purchase Orders.

4. Both BPCo and CP Co provide an approved bidders list for project use. BPCo corporate organization has a system for providing updates to bidders lists and a supplier warning bulletin system to provide data on latest status of vendor qualifications. CP Co production design group coordinates review and approval of bid lists for all Ann Arbor purchase orders. This list was observed and found to be in order.

5. The field purchasing group uses BPCo generic list of approved bidders as source of bidders.

6. BPCo Project Procedures Manual is based on, and references, the corporate BPCo manual which is used throughout BPCo.

7. Major subcontracts are procured by BPCo Ann Arbor purchasing and turned over to the field subcontract group for administration. All subcontract changes are issued by the field subcontract group.

8. Field material requisitions and all purchase orders over $1,000 are sent to CP Co construction for approval. On purchase orders for Q material, the field material requisitions and purchase orders are reviewed by MPQAD. ASME related field material requisitions and purchase orders must be reviewed by BPCo QA.

9. CP Co approves all purchase orders over $25,000 and all changes over $10,000. Otherwise, they receive a record copy. CP Co procurement covers purchase order terms and conditions, commercial aspects, and bid tabulation. Engineering covers technical requirements.

10. Terms and conditions require vendors to "pass-on" quality requirements and in some cases establish QC hold points for subvendors/suppliers.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Project Procurement Process (title) Objective No. PS.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

11. A number of purchase order packages were reviewed. Correspondence indicated thorough review and negotiations to ensure inspection hold points and quality requirements.

12. In field purchasing "Q" purchase orders are placed in red folders to differentiate them from others. These were observed during plant tours.

13. QC signs off material receiving reports only after all Q documents are on hand, QC then sends documents to vault.

14. BPCo has standard specifications for Midland that covers document supply for Q items. The specifications were reviewed and found to be complete.

15. Ann Arbor purchasing is audited by:

    a. BPCo San Francisco procurement
    b. QA BPCo Ann Arbor
    c. CP Co
    d. Procurement functional manager
    e. Internal auditing - Ann Arbor

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Contract Administration Objective No. PS.5

Evaluator(s) J. Briskin/D. Hubbard

I. Performance Objective

Methods for administering and controlling contractors and suppliers and for managing changes to their contracts should ensure effective control of performance.

II. Scope of Evaluation

The evaluation of the contract administration function was performed through review of corporate and project procedures and interviews with subcontract administration and subcontractor personnel.

Eight man-hours were spent reviewing procedures and files, conducting interviews and documenting results.

III. Conclusion

The results of this evaluation indicate that the procedures, personnel and implementation of the program satisfy the requirements of this objective. Changes are properly prepared, approved and controlled. Contractor's scope of work was found to be well defined and interfaced between contractors controlled.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Contract Administration Objective No. PS.5

Evaluator(s) J. Briskin/D. Hubbard

IV. Areas of Weakness and Corrective Action; Good Practices

No findings.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Contract Administration (title) Objective No. PS.5

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Subcontract group works to BPCo Subcontract Administration Manual (gray book). This is supplemented for Midland by field issued Midland specific "Guideline Supplements".

2. Subcontract group document control clerk distributes drawing revisions to contractors via a "D" series subcontract change notice. This amends the contract, Exhibit E. Subcontracts are instructed that if in their opinion a change in work scope is involved, affecting either cost or schedule, they are not to proceed until they have submitted a proposal or received written authorization.

3. In cases where obvious changes in scope are involved, BPCo Subcontract Administrators transmits changes via Subcontract Change Notices (SCNs) requesting a proposal from the subcontractor.

4. Subcontract group handles technical interfaces and work interferences between subcontractors; to resolve construction interfaces and work area/equipment interferences between BPCo construction and subcontractor, they work with both BPCo construction area superintendent or lead superintendent and subcontractor.

5. The group's office engineers handles basically the commercial aspects of the subcontract, while the field engineers handle the technical and schedule aspects. Field engineering backs up subcontract verbal direction with written direction. Field engineering can initiate Field Change Requests (FCRs) and Field Change Notices (FCNs) but can not do design work.

6. Two key subcontract logs are kept:

   a. Drawing transmittal (basis for subcontract exhibit E)
   b. Scope subcontract change notices

7. Most subcontracts are fixed price or unit price.

8. Each subcontract administration team handles all aspects for controlling the subcontractor during construction. This includes office engineering (commercial) and field engineering (technical, construction direction and supervision, planning and scheduling, and interfaces with BPCo force account work).

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Contract Administration (title) Objective No. PS.5

2. **Provide Factual Information That Supports the Performance Evaluation Summary** (Continued)

9. Subcontractor is responsible for his own QA/QC. BPCo QA does oversite/ overview inspection plus hold point inspection.

10. Subcontractors (under subcontract condition #8) submit a project construction schedule to the subcontract administrator within 30 days of award and update monthly. Major subs submit a six week schedule very two weeks.

11. Schedule submittals are informally transmitted from subcontract administrator to the field cost/schedule supervisor as they are received.

12. It typically takes a minimum of seven days lead time for subcontractors to perform interface work.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Documentation Management Objective No. PS.6

Evaluator(s) J. Briskin/D. Hubbard

I. Performance Objective

The management of project documentation should support the effective control and coordination of project activities and provide a strong foundation for the documentation/information requirements of the plant's operational phase.

II. Scope of Evaluation

Evaluation of the documentation management objective included an overall review of both the Ann Arbor and field document control functions.

Eleven man-hours were spent conducting interviews, performing facilities walk-throughs, reviewing procedures, reports and files and documenting the results.

III. Conclusion

The evaluation of the documentation management performance area showed the program to be generally satisfactory. However, there was one weakness identified that indicates a need to strengthen certain aspects of the process.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Documentation Management Objective No. PS.6

Evaluator(s) J. Briskin/D. Hubbard

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (PS.6-1) Not all drawing stick files are adequately maintained in an up-to-date mode.

Corrective Action: Historically, there have been a low number of deficiencies found during the normal stick audits, which are conducted monthly by document control personnel. This has also been confirmed by external audits. Therefore, this finding is believed to not represent a significant deficiency in the system.

In order to assure timely correction of stick file audit findings, document control personnel conducting the audits have been instructed to follow through to ensure deficiencies noted are corrected as opposed to only listing them.

This new policy will be implemented in the January 1983 stick audit and will be continued through the duration of the job.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Documentation Management (title) Objective No. PS.6

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

FIELD DOCUMENT CONTROL

1. The Field Document Control Center (FDCC) maintains all engineering related documents, reproduces and distributes same to all field organizations, including CP Co.

2. The FDCC distributes to some 79 distribution points, controls five distribution points and audits three others (civil, electrical and mechanical superintendents). These three in turn control their own "sticks" in various places throughout the plant.

3. Field superintendents were observed to control drawings for their areas by keeping the number of workprints in the area to a minimum. Usually only one of each work print is put on field sticks in the required area.

4. Construction superintendent assistants maintain logs of drawing distribution and periodically audit the assigned stick files.

5. Changes are taped or clipped to back of drawings, depending on size, and noted on face of drawing.

6. Large pipe hanger drawings are controlled by field engineers who do their own logging, distribution and retrieval.

(PS.6-1) 7. The audit report for August 1982 indicated that drawing C2079Q, sheet 1, Revision 3 was on stick. Should have been Revision 4. Audit report for November 1982 indicated that Revision 3 was still on stick, should have been Revision 5.

8. FDCC was recently noted for taking seven days to get revised documents into field. Now there is a procedure which was observed that states field engineering is to complete their review within two days; after two days, FDCC will process documents, with or without field engineering review, and note:

   a. Which FCN, DCN, IDCN, FCR have been incorporated and which have not.
   b. Should one time deviations still be appended to drawing.
   c. Should incorporated FCR or FCN written against many drawings, and incorporated in the drawings, still be included on other drawing change stamps.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Documentation Management (title) Objective No. PS.6

2. Provide Factual Information That Supports the Performance Evaluation Summary (Continued)

9. Original field sketches (FSKs) and field vendor prints (FCRs and FCNs) are kept as the "record copy". Both Q and non-Q FSK drawings are kept in cabinets.

10. Latest revision of all documents in the FDCC is reflected on a computer printout which is updated daily and backed up by a manual index system.

(PS.6-1) 11. Spot checked drawing stick at elevation 660 of reactor containment #2:

a. Drawing 7220-E554 SHT 1 Revision 12 indicated one FCR #3058. Computer listing in FDCC indicated two other outstanding documents - IDCN 4944 and FCN E8701.

b. Drawing 7220-E554 SHT 2 Revision 13 indicated FCR E8364. Computer listing in FDCC indicated one other outstanding document - IDCN 4945.

12. Ann Arbor document control center distributes and maintains files of current engineering design drawings and documents, hard copy or microfilm, plus all home office correspondence.

13. Manual control logs are maintained, tracking flow of documents through receipt, logging, reproduction and transmittal process by date and time. Transmittal has acknowledgement form. This process was found to be acceptable.

14. Documents designated "priority" are expedited.

15. Document turnaround from receipt through reproduction and to carrier is three to four days for standard documents and two to three days for priority documents.

16. Q and non-Q documents are handled in same manner.

17. The document turnover group handles retired records, record retention. All are on microfilm.

18. Document turnover provides total project record turnover to CP Co for Midland.

TRAINING

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Training Management Support Objective No. TN.1

Evaluator(s) J. Copley/W. Friedrich

I. Performance Objective

Management should ensure that an effective program exists for indoctrination, training and qualification of personnel involved in the project.

II. Scope of Evaluation

The evaluation of this area involved discussion with managers, supervisors and training coordinators. Approximately 10 man-hours were spent in reviewing records and interviewing various levels of supervision and management.

III. Conclusion

The utility meets the performance objective. Management provides adequate training facilities and the training coordinators assure the required training and certification requirements are satisfied. Middle management participates in training programs by establishing training requirements and requiring personnel to attend training sessions. This support was identified as a good practice.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Training Management Support Objective No. TN.1

Evaluator(s) J. Copley/W. Friedrich

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (TN.1-1) The following good practice was noted:

Management has supported the training programs through the acquisition of equipment and materials requested by the training coordinators.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Training Management Support (title) Objective No. TN.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. In a discussion with the construction project superintendent, it was stated that safety items and change to procedures were discussed at the gang box meetings. Formal training for crafts is not considered necessary because this is a union job and the union sends out members who are qualified in their trade.

2. Discussions with some of the training coordinators revealed that only non-manual personnel were enrolled in the training programs.

3. Procedure FPG-2.000, Rev. 1, "Training of Construction Personnel" places the responsibility on the construction superintendent to provide training and also determine the necessity of training manual craft personnel for specific operations.

   Subject matter is reviewed to determine what type of post session evaluation is appropriate to assess training effectiveness. Either the oral evaluation (questions and answers or discussion) or written evaluation is used.

4. Personnel training for required certifications, department QA training and programmatic QA training is provided for all MPQAD personnel by their immediate supervisor. This program is supported by QA management in MPQAD Procedure B-2M.

5. NDE personnel are trained and certified in accordance with MPQA Department Procedure B-4M. Management supports this training and certification program. It is mandatory to meet the requirements of the ASME code and an industry accepted program under SNT-TC-1A, 1975.

(TN.1-1) 6. Corporate managers expressed an active interest in training and were willing to spend time and money to support training programs and needs. Minimal restraints are imposed on acquisition of equipment and materials to enhance training programs.

7. Training coordinators indicated that supervisors were responsible for establishing the dates for their employees to complete the designated courses.

8. There was no evidence of a preplanned schedule except for Ann Arbor, which scheduled on a quarterly basis.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Training Management Support (title) Objective No. TN.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(TN.1-1)

9. During the indoctrination training for new hires, management expounds on their interest in training and their support of the programs.

10. Managers attended the Quality College to indoctrinate them in the fundamentals of the Quality Improvement Program (QIP).

11. The training records show that personnel are required to attend pertinent training classes. Individuals are not excused from completing the training classes.

12. Each trainee is required to complete a critique questionnaire evaluating the class value and the instructor's effectiveness.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Training Organization & Admin. Objective No. TN.2

Evaluator(s) J. Copley/W. Friedrich

I. Performance Objective

The training organization and administration should ensure effective implementation and control of training activities.

II. Scope of Evaluation

The evaluation of this area involved discussion with the training coordinators in their respective areas of responsibility. The organizational charts, facilities and materials used for training were used as the bases for discussion. Approximately 10 man-hours were expended involving ten people.

III. Conclusion

The training organization and administration meets the performance objective. There was one weakness and one good practice noted. Training and certification for inspectors and construction personnel are defined and controlled by procedures. Review of records indicate the program is effectively administered.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Training Organization & Admin. Objective No. TN.2

Evaluator(s) J. Copley/W. Friedrich

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (TN.2-1) The responsibility for the various QA training programs is divided among many organizations. This segregation tends to reduce the overall effectiveness of the program.

Corrective Action: To improve the effectiveness of the training efforts, as well as strengthen other MPQAD administrative efforts, a new section and section head for Administration and Training was implemented as of January 1, 1983. In addition, a training supervisor, who reports to this section head, was appointed on a full-time basis in January 1983. This supervisor is responsible for coordinating all Midland Project Quality Assurance Department training, including QA/QC recertification and training of a general/personnel nature. He is responsible for having an adequate staff of training professionals to ensure that the required MPQAD QA/QC training and certifications are accomplished. He is also responsible for evaluating the adequacy of quality training being accomplished by other departments associated with this project.

Finding: (TN.2-2) The following good practice was noted:

The training program at Ann Arbor, developed jointly by Bechtel and CP Co which serve departmental training, skill/certification and self improvement courses, is exceptionally good.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Training Organization & Admin. (title) Objective No. TN.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

(TN.2-1) 1. Training and certification of inspectors at the Midland plant is undergoing a complete overhaul. Because of the problem with soils, it was decided to consider training a special entity and to remove it from general QA training. This was also done for HVAC, ASME and balance of plant and QA. These programs are segregated and handled by different organizations.

(TN.2-1) 2. Training for construction personnel is defined in FPG-2.000 but is limited to non-manual personnel. Records are maintained by a training coordinator for orientation to the Bechtel quality program and for reading recommended field procedures.

(TN.2-1) 3. Additional training is made available to supervisors. It is coordinated by the Personnel Department. Self study, sound and slide programs are also available and are used for on-the-job training and as a supplement to upgrade Level I inspectors to Level II.

4. There is a construction operation certificate program which is presented after working hours twice a year. The cost of the course is $75 and is refundable after satisfactory completion.

(TN.2-2) 5. The training program at Ann Arbor, developed jointly by Bechtel and CP Co, includes 26 distinct courses which serve departmental, skill/certification and self improvement. The courses authored and the instructors provided by Bechtel and CP Co, and contain handouts, manuals and other aids.

6. Personnel who are candidates for QA audit team leaders are trained and certified in accordance with QAD Procedure B-5.

7. Personnel who are candidates for QA audit team members are trained and certified in accordance with QAD Procedure B-6.

(TN.2-1) 8. Inspection personnel are trained, tested and certified in accordance with MPQA Department Procedure B-3M. Records are completed and maintained in an orderly fashion by the administrative section of MPQAD.

9. Bechtel QC organization performs their own training and certification program. Inspectors are certified to project QC instructions (PQCI).

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Training Organization & Admin. (title) Objective No. TN.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary** (Continued)

(TN.2-1) 10. A regular, documented system for advising supervisors of employee progress in training was not noted.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area General Training & Qualification Objective No. TN.3

Evaluator(s) J. Copley/W. Friedrich

I. Performance Objective

The training program should ensure that all employees receive indoctrination and training required to perform effectively and that employees are appropriately qualified for their assigned responsibilities.

II. Scope of Evaluation

Reviewed the indoctrination program by attending the indoctrination class for all new hires. A critique of the subject matter was made to determine if it included safety, security, evacuation, tagging and work rules and the QA requirements for construction of a nuclear power plant. Approximately 10 man-hours were involved reviewing records and making observations.

III. Conclusion

The training program met the performance objective. The indoctrination of new employees covering plant familiarization, work practices and quality requirements is exceptional. Training and certification programs meet industry standards. One good practice was noted.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area General Training & Qualification Objective No. TN.3

Evaluator(s) J. Copley/W. Friedrich

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (TN.3-1)

The following good practice was noted:

The training and orientation for all new hires at the Midland job site is exceptionally good.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** General Training & Qualification (title) Objective No. TN.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

(TN.3-1) 1. The indoctrination training program included plant familiarization, working practices, safety regulations and strongly emphasized the need for quality work. The absolute requirement to follow procedures was stressed.

(TN.3-1) 2. The quality improvement program is part of the orientation and presents a good image of the project.

(TN.3-1) 3. In addition, each department imposes an orientation program for new hires which includes special instructions, required reading lists and on-the-job training.

(TN.3-1) 4. The absolutes of quality management were stressed in the indoctrination. These included:

- Definition - Conformance to Requirements
- System - Prevention
- Standard - Zero Defects (do the job right the first time)
- Measurement - Quantitative Measures of Quality

5. Programmatic training is provided to all QC personnel on a continuous basis.

6. QC personnel are trained to Project Quality Control Instructions (PQCIs) in each of their disciplines (mechanical/welding, civil, electrical, instrumentation). There are approximately 97 PQCIs. Certification is rendered after successfully passing a written test and demonstrating satisfactory implementation.

7. Training for the crafts is provided in cadwelding, pipe welding, structural steel and sheet metal welding. Included in the training are qualification requirements.

8. Training is provided in painting/coatings. Applicators must be qualified.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Training Facilities, Equip. & Mat'l Objective No. TN.4

Evaluator(s) J. Copley/W. Friedrich

I. Performance Objective

The training facilities, equipment and material should support and enhance activities.

II. Scope of Evaluation

Both classrooms and conference rooms were evaluated to determine their adequacy. Lighting, accoustics and comfort were evaluated, as were visual aids, projectors and handouts. Attendance sheets and test and certification records were reviewed. Approximately 10 man-hours were expended, because training is accomplished in various areas.

III. Conclusion

The training facilities at the Midland job site meets the performance objective. Effective handout material is provided for the training sessions. Training facilities are adequate, clean, well lighted and relatively quiet. Training aids such as audio/visual equipment are excellent.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Training Facilities, Equipment & Mat'l Objective No. TN.4

Evaluator(s) J. Coplev/W. Friedrich

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (TN.4-1) The following good practice was noted:

The training facilities, equipment and material were rated above the average usually provided in the industry.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Training Facilities, Equip. & Mat'l (title) Objective No. TN.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary:**

(TN.4-1) 1. All the areas used for training are spacious, clean, well-lighted, comfortable and relatively quiet for study. Classes are scheduled by a training coordinator who arranges for a qualified instructor. Classes are limited to a reasonable size and materials are prepared for adequate handouts.

2. Overhead projectors are readily available as are audio and visual tape cassettes.

(TN.4-1) 3. A wide selection of courses is available for areas such as cadweld rebar splicing, structural steel, coatings and corrosion control, heavy equipment handling, welding, piping and numerous others.

4. Courses are available for supervision, and include hiring and firing practices, motivation, grievance procedures, contract administration and equal opportunity administration.

(TN.4-1) 5. Arrangements for seminars and outside training is made with the approval of the manager.

6. Review of individual training and certification records confirmed that they were readily accessible and current.

7. The training coordinator's records included schedules for training, certification and re-certification of individuals to preclude expiration.

(TN.4-1) 8. Certification status is available on computer printouts for use in assigning personnel with current certification.

QUALITY PROGRAMS

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Quality Programs Objective No. QP.1

Evaluator(s) J. Copley/W. Friedrich

I. Performance Objective

The quality assurance (QA) program scope, content and applicability should be appropriate, defined clearly and understood.

II. Scope of Evaluation

The QA program was evaluated to determine if it included all the elements of 10CFR50 Appendix B, including control of nonconforming material and stop work authority. Interviews were held with supervision of the QA Department to determine how well the program was being implemented. Approximately 25 man-hours were expended in this evaluation.

III. Conclusion

The QA program meets the performance objective. There are some weaknesses identified that indicate a need to strengthen certain aspects of the organization, such as better coordination with construction. The documented QA Program meets the FSAR commitments and NRC regulations.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Quality Programs Objective No. QP.1

Evaluator(s) J. Copley/W. Friedrich

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (QP.1-1) The planning of construction and inspection activities is not a combined effort. Therefore, the potential exists for bypassing planned inspection sequence or requirements.

Corrective Action: Construction Completion Teams are being developed, some specifically for the inspection updating of Q-systems and ultimately the completion of these systems. The QC activities (inspections, etc) for these systems will be planned, performed and monitored as part of each team's planning and scheduling process.

The QC in-process inspection program will be directly coordinated with future installation sequences to insure that inspection points, identified by MPQAD in applicable PQCIs will be used by system completion teams (Construction Completion Plan) to ensure that QC inspections are adequately planned and scheduled into the process. The System Completion Team quality representative will be responsible for providing the link between the System Completion Team and MPQAD to ensure that quality requirements are fully identified and satisfied.

PQCIs will be reviewed and modified as necessary to ensure that proper attributes are being inspected, that inspection plans are clear and concise, that inspection points are specifically scheduled with installation activities and that inspection results are properly documented. MPQAD QA will be responsible for the PQCI review activity and will obtain assistance, as required, from other project functions, such as project engineering and quality control.

The Construction Completion Plan identifies that a project procedure linking construction and inspection efforts will be issued by February 22, 1983.

Finding: (QP.1-2) The QA/QC organization chart in the MPQAD Manual is not up to date.

Corrective Action: Efforts are presently under way that will result in an updated QA/QC manual including a new organizational chart reflecting the recent organizational changes. These are:

a. Procedures were revised to implement the integration of QC into MPQAD on January 17, 1983.

b. Revisions to higher level documents, such as Bechtel and CP Co topical reports, are scheduled for submittal to the NRC by February 17, 1983.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Quality Programs Objective No. QP.1

Evaluator(s) J. Copley/W. Freidrich

IV. Areas of Weakness and Corrective Action; Good Practices (Continued)

c. Functional descriptions are being prepared for job assignments throughout MPQAD to support implementation of the integrated organization.

d. Some procedural changes will continue beyond the above dates in order to consolidate Bechtel QC and CP Co QA procedures as much as practical. Manuals will be updated to reflect these changes.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Quality Programs (title) Objective No. QP.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. The QA manuals were reviewed to include all necessary program elements. The following manuals were reviewed for this information.
   - Quality Control Notices Manual
   - Nuclear Quality Assurance Manual
   - Quality Assurance Program Manual
   - Midland Project Quality Assurance Department Procedures
2. Day-to-day inspections are performed in accordance with Project Quality Control Instructions (PQCI).
3. The current QA program has been functioning at the Midland plant since the project reorganization in March 1980.
4. The manuals (policies and procedures) and the inspection instructions appear to be compatible. The instructions are clear and training classes on PQCIs are used as a basis for certification of quality control engineers (Bechtel inspectors).
5. Audit and surveillance schedules are utilized to monitor areas that need management's attention.
6. CP Co has taken over the contractor's QA programs. Examples are as follows:
   - Remedial Soils (Mercertine, Spencer, White - Prentice)
   - Heating Air Conditioning, Ventilation (Zack)
   - Mechanical, Electrical (Bechtel)
7. Training and indoctrination are provided through the quality program sufficiently to provide proficiency. This is explained in greater detail in the Training Section TN.1, TN.2, TN.3 and TN.4.
8. Stop work action is clearly defined in MPQAD Procedure F-6M. During the evaluation period, stop work was exercised by CP Co.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Quality Programs (title) Objective No. QP.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(QP.1-2) 9. The program does not include an up-to-date organization chart. The MPQAD organization is in a transition mode and will not be finalized for several weeks. Organization charts are part of the SAR requirements. Changes to the SAR must be submitted to NRC 30 days prior to implementation.

10. The QA program is applied to the Q structures, systems and components. BPCo, with input from NSSS supplier, develops the Q List.

11. The QA Manager has 25 years of service with CP Co. He was in charge of laboratory services and was involved in licensing. He served on the CP Co Blue Ribbon Committee to rewrite Volumes I and II of the CP Co QA Program manual. He also was the prime interface with Region III personnel on resolving the 1982 SALP Report. He does have a good understanding of quality philosophy and its interface with impacting organizations.

(QP.1-1) 12. It was noted that multiple inspections have resulted in issuance of NCRs and deficiencies due to different interpretations of requirements.

(QP.1-1) 13. Welding of camera track for reactor vessel 2 was stopped by the supervisor because of improper weld procedures and no preheat specified. There was no evidence of QA/QC involvement in the work instruction package preparation.

(QP.1-1) 14. Inspection requests vary from area to area. In the electrical discipline for cable pulling, a 24-hour notice is given. In the welding/mechanical discipline, a request log is maintained in the area used to notify inspectors. In other areas, a telephone contact is used to notify inspectors.

(QP.1-2) 15. A number of procedures and distribution lists do not reflect the current Midland Project QA Department organization.

16. The utility conducts evaluation of vendor's QA program as a joint activity with the constructor's quality representatives.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Quality Programs (title) Objective No. QP.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

17. CP Co maintains regularly scheduled audits of the construction and BPCo QA program to assure program effectiveness.

(QP.1-1) 18. The work instructions given to construction personnel are prepared by construction without QC participation.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Program Implementation Objective No. QP.2

Evaluator(s) J. Copley/W. Friedrich

I. Performance Objective

Quality assurance (QA) and quality control (QC) functions should support and control the quality of the project activities.

II. Scope of Evaluation

The QA functions were reviewed to determine their effectiveness. The QC functions were also reviewed to determine if inspections were performed in a timely manner, if there was objective evidence of their activity and if there was control of nonconforming materials. Approximately 30 man-hours were expended discussing the program with supervisors and inspectors and observing its implementation.

III. Conclusion

The QA program meets the performance objective. The utility has elected to merge the contractor's QC personnel with the utilities personnel to improve its effectiveness and standardize the operation. The Project Quality Control Instructions (PQCI) provide adequate instructions for the inspectors but effectiveness could be improved by incorporated specific criteria in the PQCI rather than by reference to engineering design documents.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Program Implementation Objective No. QP.2

Evaluator(s) J. Copley/W. Friedrich

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (QP.2-1) QA/QC interpretation of requirements is not always standard and sometimes change with the individual performing the inspections.

Corrective Action: With the recent integration of the QA and QC organizations into one department, interpretation and implementation of quality requirements will be much more standardized. Organizational responsibilities and job functions are being revised to clarify relationships and orientation/training will be conducted to promote understanding of the requirements.

A major effort is under way to clarify QC inspection plans (PQCIs), which will be a major step toward eliminating different interpretations of requirements.

A review of PQCIs is being performed by MPQAD to ensure that:

a. Attributes important to the safety and reliability of specific components, systems and structures are identified for verification.

b. Accept/reject criteria are clearly identified.

c. Appropriate controls, methods, inspection and/or testing equipment are specified.

d. Requisite skill levels are required in accordance with ANSI N45.2.6 or SNT-TC-1A.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Program Implementation (title) Objective No. QP.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. The relationship of QA and QC with other organizations is clearly independent of the other.

2. The QC Organization (Bechtel) is being absorbed by the CP Co organization.

(QP.2-1) 3. A cooperative relationship between inspection (QC) and construction work forces is deteriorating as a result of repetitive inspections and changing criteria of acceptance.

4. The QA programs of site contractors are evaluated before a contract is issued and the QA program is monitored throughout the life of the contract.

5. Technical specialists, field engineers and vendor representatives are used in the implementation of the quality requirements.

6. Implementation of the QA program is controlled by the use of detailed procedures.

(QP.2-1) 7. Interviews with several construction personnel revealed that they considered that QC engineer's (inspectors) interpretation of the acceptance criteria vary with the individual. They were continually "nit picking" in their findings. Planning is not sufficient to provide standardized accept/reject criteria.

(QP.2-1) 8. It was reported that multiple inspections are resulting in NCRs and deficiencies being issued because of different interpretations of requirements.

(QP.2-1) 9. It was reported that multiple inspections are resulting in NCRs and deficiencies being issued because of different interpretations of requirements.

10. The QC inspection is performed as requested by construction personnel to provide support of the construction schedule.

11. The MPQAD provides management the results of audit and trending status on a regular basis to keep them apprised of the effectiveness of the QA Program.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Independent Assessment Objective No. QP.3

Evaluator(s) J. Copley/W. Friedrich

I. Performance Objective

Management should provide an effective independent assessment of project activities affecting the quality of the project.

II. Scope of Evaluation

Quality audits are performed as independent assessment of the overall QA program. The records for performing these audits were reviewed and evaluated to determine if they met the qualifications of ANSI N45.2.23. The method for reporting the results of their findings was also reviewed and its implementation evaluated. Discussions were held with appropriate supervisors and tracking personnel. The expended time for this evaluation was approximately 15 man-hours.

III. Conclusion

The QA program meets the performance objective. Quality audits are performed as independent assessment of the QA program. These audits are performed by personnel outside the immediate organization being audited. Regular biennial audits of the QA program are performed by outside agencies.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Independent Assessment Objective No. QP.3

Evaluator(s) J. Copley/W. Friedrich

IV. **Areas of Weakness and Corrective Action; Good Practices**

No Findings.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Independent Assessment (title) Objective No. QP.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Audits are planned and scheduled to determine the QA program's effectiveness. Additional audits are planned and scheduled by the QA (E&QA) Department from Jackson, Michigan.

2. Results or findings are identified on the Audit Finding Report (AFD) and processed for disposition.

3. None of the audit personnel have direct responsibilities in the area being audited.

4. To resolve the audit findings, an analysis of the condition is made and action taken to correct the identified problem.

5. Management is informed of the audit findings and a course of action is implemented to resolve the finding. Management uses the audit system to measure the effectiveness of the program.

6. Management uses audit reports or requests audits to be performed:

   - When inadequacies or noncompliances in the QA program are suspect;
   - When significant changes are made in functional areas of the QA program, such as significant reorganization or procedural revisions are made.

7. A QA status meeting is held on Monday of each week to resolve open quality items. This meeting is presided over by the QA Manager and includes approximately 30 site management personnel.

8. Biennial audits have been performed by independent outside agencies.

9. The corporate audit activity is performed in accordance with a master schedule to assure that each element of the 18 criteria are audited on an annual basis.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Independent Assessment (title) Objective No. QP.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

10. The results of the review of audit reports indicated that independent assessments do identify substantive issues and corrective action is taken.

11. The corporate auditors are independent of any direct functional responsibility for the activities being audited.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Corrective Action Objective No. QP.4

Evaluator(s) J. Copley/W. Friedrich

I. Performance Objective

Conditions requiring corrections or improvements should be resolved in an effective and timely manner.

II. Scope of Evaluation

The system for corrective action was evaluated by reviewing procedures for documenting nonconformances, tracking mechanisms and corrective action to determine cause and prevent recurrence. The systems were discussed with personnel in the contractor's organization and the utility. Approximately 25 hours were expended interviewing, reviewing documents and investigating how corrective action was being implemented at Midland.

III. Conclusion

The results of this evaluation are generally satisfactory. However, there are some weaknesses identified that indicate a need to strengthen certain aspects of the corrective action procedure. The trending analysis provides management with information on the effectiveness of the QA program. It is noted, however, that an improvement in the mathematical base should be considered.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Corrective Action Objective No. QP.4

Evaluator(s) J. Copley/W. Friedrich

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (QP.4-1) The Quality Action Item List (QAIL) is not always an effective tool to obtain corrective action in a timely manner.

Corrective Action: Evaluation of the QAIL and other tracking systems is under way with an objective toward consolidation to create a more effective tool that will better inform management of the status of open quality items and track assignments for closure responsibility. This will ensure appropriate and timely action to effect resolution of quality items. The evaluation will be completed during the first quarter of 1983.

Finding: (QP.4-2) The trend report does not always provide a basis for analysis to identify significant conditions adverse to quality.

Corrective Action: The trend reporting system has been reviewed and an expanded concept is being proposed which considers the following:

a. Trending by attributes: each attribute inspected constitutes an inspection transaction.

b. Determining trends in quality performance by changes in the percent nonconformance for a time period to the succeeding time period.

c. Utilizing inspection records to trend quality performance by area and inspector via the inspection process control program.

A new procedure on these trending concepts has been drafted. It is expected that a decision will be made on putting the procedure into effect in March 1983.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Corrective Action (title) Objective No. QP.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Conditions adverse to quality are reported on In-Process Inspection Notices (IPIN), Nonconformance Reports (NCR), Audit Finding Reports (AFR), Quality Action Requests (QAR), Management Corrective Action Requests (MCAR) or Safety Concern and Reportability Evaluations (SCRE).

(QP.4-1) 2. The QAIL is used to provide data for input to report to management. Its usefulness is for tracking and corrective action. Corrective action is ineffective because the commitment dates are flexible and subject to change upon request.

3. Senior management is apprised of adverse quality via QCAR and at the Monday quality meeting.

4. An attempt is made to prevent recurring discrepancies through the use of the trend analysis and MCARs.

5. The trend analysis is a management tool to detect changes in the rates of nonconformance for selected performance areas and for selected nonconformance categories.

6. Several meetings were attended to assess the effectiveness of the Corrective Action Program. The first meeting was presided over by the Vice President, Midland Project Office. The agenda for the meeting included NRC open items. Each item was discussed in detail. Assignments and follow up action were assigned to individuals. The five hour meeting was attended by 30 contractor and utility personnel.

(QP.4-1) 7. A meeting was attended at the outage building conference room No. 1 to discuss and resolve NRC-M01-9-1-075 which was written as the problem identified as early as 1978. It pertained to wiring discrepancies in four diesel generator panels supplied by DeLaval. Although an action plan was devised, it was nearly four years after the problem was identified.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Compny
Midland Plant

1. **Performance Area** Corrective Action (title) Objective No. QP.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(QP.4-2) 8. The trend report does not have a mathematical base that compares acceptable with unacceptable, only the number of report (quantity) from one period to the other. Then generic conditions are shown without any other relationship as to system/P.N. identification. This was confirmed both in review of the report and interviews.

TEST CONTROL

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Test Program Objective No. TC.1

Evaluator(s) A. Robeson/D. Hubbard

I. Performance Objective

The test program should verify the plant's full capacity to operate as intended by testing the plant's systems functionally.

II. Scope of Evaluation

This evaluation was performed utilizing test program documentaton reviews, test personnel interviews and test observations.

Test program evaluation included documentation of policy, design criteria, and the formulations of test objectives as described in FSAR and regulatory guide 1.68.

The Midland Nuclear Plant Test Program Manual was reviewed for statements of policy, types of tests to be performed and the test program review and approval processes. Test exceptions, nonconformances and their resolutions were also reviewed in the manual and discussed during interviews with appropriate test personnel.

Approximately 20 man-hours were employed interviewing personnel and reviewing documentation. The results of the program evaluation are given in the performance evaluation details.

III. Conclusion

The test program, as documented, is adequate to verify the operability of the plant as designed. The program as being implemented satisfies the requirements of this performance objective. The practice of involving plant operations personnel in the test program provides a good basis for the translation from construction to operations.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Test Program Objective No. TC.1

Evaluator(s) A. Robeson/D. Hubbard

IV. Areas of Weakness and Corrective Action; Good Practices

No findings.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Test Program (title) Objective No. TC.1

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Documentation review shows the FSAR and Bechtel and B&W plant design are used in formulating test objectives and acceptance criteria.

2. The Test Program Manual (TPM) states test program policy and establishes the relationship with the CP Co quality assurance (QA) program under which the test program operates. It was noted that the TPM is reviewed and approved by top management in both nuclear operations and Midland project management.

3. A review of the turnover process shows that following system turnover, exceptions are entered on the CP Co Master Punch List. Exceptions were verified to include nonconformance items (NCRs).

4. The CP Co test engineer issues contractor work requests to Bechtel GSO, as required, to complete the unfinished work. This action was confirmed.

5. Nonconforming items (NCRs) found during completion of turnover exceptions or testing were verified to be added to the Master Punch List.

6. Review of the TPM and various test procedures show that wherever applicable, plant operating and maintenance procedures are employed in support of the test program. Plant operating and I&C personnel were observed being used by the test engineer in performing system tests.

7. Completed test packages are evaluated by the Test Working Group (TWG). Membership in TWG includes representation from the Test Program Group (TPG), Nuclear Operations, Bechtel and B&W (NSSS). This evaluation process was noted.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Test Group Organization and Staffing Objective No. TC.2

Evaluator(s) A. Robeson/D. Hubbard

I. Performance Objective

The Test Group organization and staffing should ensure effective implementation of the test program.

II. Scope of Evaluation

This assessment was made through the use of interviews and documentation reviews.

The Midland Nuclear Plant Test Program Manual administrative procedures were reviewed and the test organizational structure from system turnover through final approval of test packages was examined. Test interfaces with Bechtel and subcontractors were noted. Interface descriptions in the BPCo Project Procedures Manual were also reviewed. Key positions, from technical superintendent through test engineer were examined, including statements of responsibilities.

Interviews were held with Test Group personnel to determine if their qualifications were as stated in the job description.

Review of personnel experience levels were made to determine adequacy of staffing for the present level of testing activity.

Approximately 15 man-hours were employed reviewing documentation and interviewing personnel. The results of these interviews and reviews are given in the Performance Evaluation Details.

III. Conclusion

The organizational structure and staff of the Midland Test Group meet the requirements for an effective test program. The staffing level is adequate only for the present level of activity. The incorporation of all test activities: planning, scheduling procedures, turnover, engineering and performance and evaluation under the Technical Group is an effective mechanism to control the program.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Test Group Organization and Staffing Objective No. TC.2

Evaluator(s) A. Robeson/D. Hubbard

IV. Areas of Weakness and Corrective Action; Good Practices

No findings.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Test Group Organization and Staffing (title) Objective No. TC.2

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Test program requirements for organization, staffing levels, personnel qualifications and contractor interfaces are given in the Midland Nuclear Plant Test Program Manual. Turnover processes are described therein and in the Bechtel Midland Plant Project Procedures Manual.

2. Personnel interviewed meet or exceed the stated position requirements, through combinations of education, background and related experience.

3. CP Co Midland Test Program policy directs that plant staff personnel participate wherever possible in the test programs. Evidence of this policy was noted in actual test observations. Key test engineers will assume permanent plant staff duties at the conclusion of the test program.

4. A training program for test engineer qualification operates within the Technical Support Section. Engineers, who join the test group without the necessary qualifications, enroll in an on-site training program presented by a contractor organization. Upon completion of the formal course, the trainee undergoes some self-paced training in his particular test area. After successful completion of the training, the trainee is certified by the Technical Support Supervisor.

5. The Technical Group verifies that an operations personnel training program exists and is being implemented for plant staff personnel being used to support the test program. Involvement of the Technical Group was confirmed.

6. Discussions with planning and scheduling organizations indicate that staffing levels have been adequate for the present levels of test activity. Preparation of working test procedures is behind schedule, but manpower was not cited as a cause.

7. Reorganizations of the Technical Group now places all test program functions under one organization. This includes test planning, scheduling, procedures, turnover, test engineering, performance and evaluation.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Test Plan Objective No. TC.3

Evaluator(s) A. Robeson/D. Hubbard

I. Performance Objective

The test organization should prepare a plan and a schedule that describe the sequence of system or component testing to support major schedule milestones.

II. Scope of Evaluation

This assessment was performed through personnel interviews, documentation reviews and attendance at meetings with some facility walk-throughs.

Interviews were conducted with CP Co personnel in the site Technical Group responsible for system turnover, start-up system scoping, testing, scheduling, system turnover exception schedule and completion monitoring, and test procedure planning, preparation and scheduling. The interviews included the test engineers responsible for providing and reviewing the test plan. Interviews were also conducted with BPCo personnel in site construction planning and scheduling, start-up coordination, construction completion coordination, and engineering planning and scheduling.

Documents reviewed included the Midland CP Co TPM, the CP Co Project Procedures Manual, the test plan and related schedules, and the master punch list for controlling system turnover exception.

Facility walk-throughs were conducted in the test planning and scheduling areas.

Meetings attended include the monthly project status meeting, various turnover system construction completion punch list meetings, and the daily test planning meeting.

Approximately 20 man-hours were expended interviewing personnel, reviewing documents and attending meetings in this evaluation.

III. Conclusion

The test planning, scheduling and control methods, processes, procedures, personnel and systems evaluated under this performance objective were considered to satisfactorily provide test planning and scheduling. One good practice was noted.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Test Plan Objective No. TC.3

Evaluator(s) A. Robeson/D. Hubbard

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (TC.3-1)

The following good practice was noted:

A comprehensive program with appropriately experienced personnel is in use to schedule and track testing and testing preparations and to integrate testing schedules into the overall project schedule.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Test Plan (title) Objective No. TC.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. The Test Support Turnover (T/O) Scoping Group defines the scope of each start-up and test subsystem. "Scoping", controlled by the T/O Scoping subsection, is the process of marking the test system boundaries on controlled design drawings (e.g., piping and instrument diagrams, instrument loop diagrams, schematics, etc.). These documents are formally transmitted to BPCo construction and form the basis for the systems turnover packages and system test boundaries.

(TC.3-1) 2. The technical and planning personnel interviewed displayed knowledge of their roles and responsibilities. These personnel are qualified by education, background and related experience.

(TC.3-1) 3. Individual test plans for each test system are prepared jointly by the test planners and applicable test engineers. The plans are developed into schedules which include all key test activities, required test procedures, restraints, such as other systems required to support that system, open turnover exceptions, system turnover milestones and plant start-up milestones. The logic among the various elements of each individual test schedule are also included. The test plan and schedule are further reviewed by the test engineer prior to beginning the test.

(TC.3-1) 4. The individual turnover systems test plan schedules are integrated into a single network schedule, using an automated CPM schedule processor. This produces a single network of about 7,000 activities and milestones. The network contains all key test activities, required test procedures, construction turnover milestones, project test and start-up milestones, other restraints and selected system turnover exceptions that affect system testing. In addition, the schedule sequence and logic among these items is included. Three schedule reports are routinely produced from this data base:

a. Project test and start-up milestone schedule.

b. Short-term planning schedule showing two months from most current data date.

c. The Daily Working Schedule.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Test Plan (title) Objective No. TC.3

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

(TC.3-1) 5. The Daily Working Schedule is a two week look-ahead schedule which is statused daily and formally updated and reissued weekly. The daily meetings held on this schedule provide the review and status of test procedure preparation, system turnover, testing and turnover exception work progress and completions. Also covered are the plan and schedule for system/equipment outages to support testing, temporary field modifications, rework and turnover exception work. Attendees include test planning, test scheduling, test turnover scoping, affected test engineers, BPCo construction support, B&W construction and operations and maintenance. The summary of significant testing activities is issued daily as an overview of the daily meeting.

6. The test and start-up program schedule, status and progress is routinely provided to project management for information and action.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area System Turnover for Test Objective No. TC.4

Evaluator(s) A. Robeson/D. Hubbard

I. Performance Objective

The construction testing and turnover process should be controlled effectively to ensure that program objectives are met.

II. Scope of Evaluation

The Midland turnover program assessment was accomplished through a combination of BPCo and CP Co procedures review and appropriate BPCo and CP Co personnel interviews.

Interviews included the Bechtel construction completion coordination group manager and supervisor, the Bechtel start-up coordinator (turnover organization), CP Co turnover/scoping supervisor and the test support section head.

Documentation review included packages associated with several systems under test or in preparation for testing; CP Co system turnover schedule; BPCo actual turnover status; construction punch list; Midland Test Program Manual (TPM); and Bechtel Project Procedures Manual.

Approximately 20 man-hours were expended in this evaluation. The results of this process are given in the Performance Evaluation Detail.

III. Conclusion

The Midland Nuclear Plant turnover program and implementing personnel satisfy the requirements of this performance objective.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area System Turnover for Test Objective No. TC-4

Evaluator(s) A. Robeson/D. Hubbard

IV. Areas of Weakness and Corrective Action; Good Practices

No findings.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** System Turnover for Test (title) Objective No. TC.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. All testing is carried out by CP Co after system turnover by Bechtel. NSSS systems, furnished by B&W and erected by B&W Construction Co., are under construction subcontract to Bechtel and are handled through the Bechtel turnover process.

2. Scoping of plant systems into turnover units and the turnover process are coordinated by the CP Co turnover/scoping supervisor, test support section. The Bechtel turnover coordinator provides the interface with BPCo Construction. The CP Co test engineer, seven months prior to turnover, examines the scoped boundaries and determines the testability of the system.

3. The process, responsibilities and documentation for turnover are described in Bechtel and CP Co test program administrative procedures. These procedures adequately describe system turnover from Bechtel to CP Co.

4. System walkdowns are conducted by the BPCo start-up coordination utilizing BPCo field engineering, craft supervision and CP Co test engineering. The results of the system walkdown, the exceptions and their status, are maintained in the BPCo construction completion punch list. Any remaining open exceptions at the time of system turnover were confirmed to be logged in the system turnover package exceptions list.

5. The coordination of orderly completion of system turnovers is the responsibility of the BPCo Construction Completion Group (CCG), which is operated by Bechtel, with technical interfaces with CP Co and the NSSS vendor (B&W). By its overview of systems approaching turnover, the CCG can expedite restraining items and provide feedback to the test engineer, and BPCo and CP Co management.

6. All turnover packages reviewed were found to contain all related documents, including a list of turnover exception items. Sign-off in the package identified completion of each exception. The CP Co Master Punch List (MPL) is used to schedule and track the exceptions by package.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** System Turnover for Test (title) Objective No. TC.4

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

7. Prior to system turnover all cyclic maintenance activities are put on the CP Co Periodic Activities Control System (PACS). After turnover the PACS periodically generates equipment maintenance requirements. These are used by the test engineer to create a maintenance work order. Plant personnel then perform the work.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Test Procedures & Test Documents Objective No. TC.5

Evaluator(s) A. Robeson/D. Hubbard

I. Performance Objective

Test procedures and test documents should provide appropriate direction and should be used effectively to verify operational and design features of respective systems.

II. Scope of Evaluation

Test procedures and test documents were evaluated by:

1. Review of appropriate administrative procedures in the Midland Nuclear Plant Testing Program Manual.
2. Interviews conducted with personnel responsible for preparation, review, revisions and approval of test procedures. Interviews were also conducted with performing level test engineers.
3. Comparison of selected test procedures to the recommendations in Regulatory Guides 1.33 and 1.68, and NUREG/CR-1368.
4. Attendance at the daily test planning meeting.
5. Examination of the current status of test procedure preparation, review and approval, evaluated against the current status of systems turnovers.

Observations were made on four in-process tests and the performance of the test was evaluated against the procedure.

Approximately 25 man-hours were expended interviewing personnel, reviewing documents and observing tests in this evaluation.

III. Conclusion

The preparation and review of test procedures, within the guidelines established in the Midland Nuclear Plant Testing Program Manual, and related documents, assures appropriate direction for the test program to verify systems operational and design features. One minor weakness was noted related to the lack of timeliness in issuance of test procedures.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Test Procedures & Test Documents Objective No. TC.5

Evaluator(s) A. Robeson/D. Hubbard

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (TC.5-1) Preparation of working-level test procedures is behind schedule.

Corrective Action: The following steps are being taken to ensure that preparation of test procedures (including preops, acceptance, flush, specific and generic) are developed and approved in a timely manner.

a. Site management goals and objectives for 1983 direct the Technical Department to prioritize their efforts in procedure development.

b. Pending evaluation and issuance of a new Project Schedule, an interim recovery plan for procedure development has been developed.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** Test Procedures & Test Documents (title) Objective No. TC.5

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Administrative procedures have been prepared and included in the Midland Nuclear Plant Testing Program Manual, which provides requirements and format for test procedures.

2. Test procedures are written to test system performance against plant design criteria, as described in FSAR, using procedure guidelines such as Regulatory Guides 1.33 and 1.68. In addition, the procedures review and approval processes further assure test program verification of operational and design features.

3. Qualifications and responsibilities for supervisory personnel are stated in the administrative procedures. All of the supervisory personnel interviewed, met or exceeded the qualifications stated for their positions.

4. The Test Working Group (TWG), is the advisory body for the testing program. The TWG, composed of representatives from CP Co, Bechtel and B&W, reviews pre-operational test procedures, generic check-out procedures and safety-related specific check-out procedures and test results.

5. Test procedures utilize CP Co plant operating and maintenance procedures where feasible to validate these procedures; operations and maintenance staff are used as test personnel to develop skill and confidence before routine plant operation commences.

6. Preparation of working test procedures were observed to be coordinated by the test planning supervisor, who conducts a daily meeting of the test planning section. Status of all procedures and the impact on pending test schedules were reviewed at this meeting. A daily test working schedule was issued.

(TC.5-1) 7. Administrative procedures require that test procedures be completed and available for review by the test engineer, six months prior to the test schedule date. This requirement is not being met. Observations were made on three test programs; of the three, one had been approved a few days prior to the start date.

(TC.5-1) 8. Preparation and review of test procedures is behind schedule. When the backlog reaches TWG, delays in the test program are anticipated by TWG and test planning due to the review process.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Compny
Midland Plant

1. **Performance Area** Test Procedures & Test Documents (title) Objective No. TC.5

2. **Provide Factual Information That Supports the Performance Evaluation Summary (Continued)**

9. Design changes, which affect the intent, method or acceptance criteria of a test procedure, or a specific or generic check-out procedure, were found to require the same review and approval granted the original procedure. Necessary retesting is then conducted in accordance with the modified test procedure.

10. Design changes are implemented through the Construction Work Request (CWR) process. The need for retest is noted on the CWR form by the test engineer and approved by the technical superintendent.

(TC.5-1) 11. Preparation of working-level test procedures is behind schedule and the test planning section is working to correct this problem. To date, procedure delays have not affected the test schedule because the planned turnover of testing units is behind schedule.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area System Status Control Objective No. TC.6

Evaluator(s) A. Robeson/D. Hubbard

I. Performance Objective

A method should exist to identify the status of each system or component and the organization holding control or jurisdiction over that system or component to prevent interference and ensure equipment and personnel safety.

II. Scope of Evaluation

Controls which identify the status of test systems were evaluated by:

1) A review of turnover and tagging procedures, the CP Co master punch list, daily test planning records, and daily working schedules;
2) An interview with the scheduling supervisor;
3) Discussions on system working files;
4) Attendance at a daily test planning meeting to review daily statusing of schedules;
5) Examination of test program administrative procedures for turnover, preoperational, and acceptance tests which specify responsibilities for review and approval of test activities;
6) Review of CP Co and Bechtel tagging procedures which identify control of systems, ensure personnel safety and identify temporary alterations;
7) Discussion of Turnover Exception items (TOE) and Construction Work Requests (CWR) with the turnover/scoping supervisor;
8) Examination, with a test engineer, of the current status of a test program, including test summary sheet, TOE's, and related material making up the system working file; and
9) Observing tests in process.

Approximately 20 man-hours were expended interviewing personnel, reviewing documents and attending meetings in this evaluation. The results of this evaluation are given in the Performance Evaluation Details.

III. Conclusion

The status of each system in the test program and the control exercised is established by procedures, scheduling, and tracking activities, so as to minimize interference and ensure equipment and personnel safety. These documents and activities meet the performance objective for system status control.

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area System Status Controls Objective No. TC.6

Evaluator(s) A. Robeson/D. Hubbard

IV. Areas of Weakness and Corrective Action; Good Practices

No findings.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Company
Midland Plant

1. **Performance Area** System Status Controls (title) Objective No. TC.6

2. **Provide Factual Information That Supports the Performance Evaluation Summary**

1. Test program administrative procedures for turnover, preoperational and acceptance tests, and checkouts were reviewed. They specify responsibilities for review and approval of activities affecting the status of systems. The procedures also cover system/equipment tagging.

2. Procedures specify appropriate test and review sign-offs. Sign-off sheets for turnover and test packages, and step sign-offs on test procedures were noted to provide appropriate documentation.

3. CP Co and Bechtel have detailed tagging procedures to identify control of equipment and ensure personnel safety. Temporary turnovers and Construction Work Requests (CWRs) require transfer of system control between CP Co and Bechtel. Tagging procedures establish the required processes when control is transferred. Tagging logs are maintained and periodically reviewed by the plant/shift supervisor. During observation throughout the plant, implementation of the tagging procedures were confirmed.

4. Plant status control during testing was found to be provided by the CP Co test support section under the technical superintendent. Responsibilities of the section include: plant status control through turnover and tagging procedures; maintenance of the CP Co master punch list; daily test planning; and long term scheduling.

5. Current knowledge of the status of systems is being provided by the daily working schedule, which is a two week look-ahead schedule that is statused each day at a daily meeting. It is updated and issued each week. In addition, a summary of the daily testing-related work activities is issued after the daily meeting.

6. Also controlled through the daily working schedule, is the status of system/equipment outages and BPCo construction work in support of testing and turnover exception work.

7. After functional turnover, turnover exception items are handled by Construction Work Requests which are used to authorize construction work on systems after turnover. The test engineer monitors the contractor on his work. The process was found to be clearly documented as part of the corrective action procedure and is being applied. The schedule and status of each TOE is maintained in the CP Co master punch list of turnover exceptions for each system.

PERFORMANCE EVALUATION DETAILS

CONSTRUCTION PROJECT

Consumers Power Compny
Midland Plant

1. Performance Area System Status Controls (title) Objective No. TC.6

2. Provide Factual Information That Supports the Performance Evaluation Summary (Continued)

8. Temporary field modifications are being implemented as described in the equipment status tagging procedure. Temporary alteration tags identify the status of the systems involved in the temporary alteration.

9. A temporary alteration required for a test program will normally be included in the test procedure; installation, control and removal steps will be reviewed and approved along with other parts of the test. A temporary alteration may also be initiated by procedure revision. The plant/shift supervisor maintains a temporary alterations log, and conducts a quarterly review. These activities were confirmed.

10. Overall system and test status is provided by the system working files. These files and the system record files of completed tests, provide documentation packages.

11. The test engineer maintains the current status of his test package in the system working file. He maintains and keeps current the test summary sheet which is attached to the working copy of the procedures. The documents reviewed were found to be complete and include descriptions of changes, revisions, problems and their resolution.

12. When the test program is completed, the completed working copy is reviewed by the test engineer and approved by the discipline supervisor. It then is forwarded to TWG for review/approval and then the technical superintendent for his signature. The Document Control Center (DCC) receives the approved test package for entry into the system record file. All pertinent information relating to the particular test package is included in the system record file.

APPENDIX A

RESUMES

JOSEPH W. BRISKIN

PROFESSIONAL QUALIFICATIONS

Mr. Briskin has 21 years experience in Project Management and Project Control, 17 of which were in management positions.

EXPERIENCE

Manager, Support Services - Responsible for procurement, project control, contract administration, records management, accounting and project services and administration for two 1250 MW nuclear power plants.

Supervisor, Project Planning and Scheduling - Responsible for total planning, scheduling and cost engineering effort for development and construction of major projects.

Senior Planner - Responsible for development and implementation of systems and procedures for an integrated planning and scheduling system.

Project Control Director - Responsible to general manager for preparation, coordination and monitoring of detailed schedules, budgets and estimates for planning; design and construction of a cultural, educational, trade and entertainment complex administered by the Inter-American Center Authority for the State of Florida.

Construction Scheduling Manager - Responsible for formulation, implementation and updating of schedules for construction of two 1000 MW nuclear power plants. Included preparation of detailed schedules for a work force of 1500 craftsmen.

Senior Planner - Management planning consultant to Westinghouse on two 524 MW(e) nuclear power plants.

Manager, Program Control - Responsible to project manager for supervising all planning and estimating department functions related to installation and checkout of fuel systems for NASA's Apollo Project on Launch Complex 39A and 39B, Merritt Island, Florida.

Program Controller - Maintained schedules of mechanical and electrical installations on 200 Minuteman silos in Wyoming, Nebraska and Colorado. Duties involved daily scheduling of field operations, project status and coordination of manpower, tools and materials.

EMPLOYERS

Mr. Briskin has been employed by Houston Lighting and Power Company, Florida Power and Light Company, HRI Technical Services, Finley Development Corporation, WEDCO Corporation and Catalytic, Inc.

EDUCATION

Numerous professional training classes.

PROFESSIONAL AFFILIATIONS

American Association of Cost Engineers (Section Vice President and Board Member)
President, Board Member - WEDCO Management Association (NMA)

JAMES R. COPLEY, JR.

PROFESSIONAL QUALIFICATIONS

Mr. Copley has 22 years experience in audits and evaluations, quality assurance and control, product and supply administration and material inspection.

EXPERIENCE

Lead Auditor - Responsible for planning audit/evaluation of quality assurance methods as applied in management, design and development, procurement, manufacturing, construction and installation, operation and maintenance and product audits. Provided written plans, schedules, checksheets indicating appropriate specification, code and regulation. Participated in safety audits and appraisals of ANS reactors.

Supervisor, Supplier Quality Control - Responsible for establishing supplier QC section: formulation, development and administration of procedures; engineering assignments in supplier evaluation, surveillance and product acceptance for all divisions; determining status of product/service by analyzing results of examinations and tests (dimensional, destructive/non-destructive, functional); preparing and evaluating inspection planning and procedure requirements. Supervised certification program for testing source quality engineering representatives.

Senior Technical Specialist - Devised and established procurement document review interfacing with requisitioner and procurement presently in use at large laboratory. Assisted in source system/product evaluation program. Devised questionnaire which provided sufficient input to determine supplier QA systems, methods and general operation. Questionnaire became a company standard form. Performed field vendor audits. Devised audit checklists after assessing facility, system and procedures at site.

Quality Engineer - Supplier/receiving material review board supervisor. Devised system of vendor evaluation and corrective action which resulted in reduced supplier rejections and additional costs and delays.

Supervisor, Supplier Quality Representative - Supervised and trained supplier quality representatives. Assisted suppliers in interpreting specifications, drawings and contractual requirements.

EMPLOYERS

Mr. Copley has been employed by Argonne National Laboratory, Westinghouse Hanford Engineering & Development Laboratory, Aerojet-General Corporation and Pratt & Whitney Aircraft.

EDUCATION

Mr. Copley has studied statistics and metallurgy at the college level and has completed 23 technical courses in his field.

PROFESSIONAL AFFILIATIONS

Senior Member, ASQC
Region 12 Director, Energy Division - ASQC
Past Membership Chairman, Richland ASQC

WILLIAM J. FRIEDRICH

PROFESSIONAL QUALIFICATIONS

Mr. Friedrich has 29 years experience in quality control and quality engineering management, nondestructive testing and failure analysis associated with nuclear power and aerospace projects.

EXPERIENCE

September 1982 to Present — MANAGEMENT ANALYSIS COMPANY

Consultant - For an INPO self-initiated evaluation of VEPCO, Richmond, Virginia. Follow-up audit after INPO survey at Shearon Harris Plant for Carolina Power & Light.

INPO - Self-initiated evaluation and biennial audit at Midland Plant, Midland, Michigan.

1981 - 1982 — DANIEL INTERNATIONAL CORPORATION

Project Quality Inspection Manager - Wolf Creek Nuclear Generating Station. Responsible for inspection activities during construction, testing and turnover of systems to owner. Required supervision and direction of 250 inspectors in all disciplines (civil, mechanical/welding, electrical and instrumentation). Included interfacing with owners representative and NRC.

1980 - 1981 — MANAGEMENT ANALYSIS COMPANY

Consultant and Project Site Quality Assurance Manager for Brown and Root, Inc. at the South Texas Nuclear Project - Bay City, Texas - Responsible for development and implementation of total quality assurance program. Responsible for 279 QA/QC people, including quality engineering and quality control of general contractor and supporting subcontractors.

1973 - 1980 — KAISER ENGINEERS, INC.

Quality Assurance Manager - Responsible for management of nuclear projects, source inspections, supplier QA/QC program evaluations, management audits and consulting. Prepared and supplied necessary quality assurance input pertaining to proposals for power plants, coal gasification, waste management and mining operations.

1977 - 1978 SAN DIEGO GAS & ELECTRIC COMPANY

Compliance Supervisor - Supervised field quality assurance activities during construction of Sun Desert nuclear power plant at Blythe, California. During period of obtaining licenses, served as quality assurance field supervisor during construction of Encina #5, a 259 megawatt oil-fired power plant.

1969 - 1973 SACRAMENTO MUNICIPAL UTILITY DISTRICT

Assistant to Quality Assurance Director - Responsible for all quality assurance activity imposed by NRC under Code of Federal Register 10CFR50 at Rancho Seco Nuclear Generating Unit #1. Responsible for reviewing and approving quality assurance programs for major suppliers and contractors.

1968 - 1969 LOCKHEED PROPULSION COMPANY

Quality Assurance Engineer - Provided technical guidance on metallurgical and nondestructive testing problems. Performed supplier quality aduits and periodically functioned as resident source representative at General Electric Company, Evandale, Ohio, and Hitco, Gardena, California.

1967 - 1968 ROHR CORPORATION

Quality Assurance Manager - Respunsible for all quality control functions required by the Titan III motor production project while with Rohr Corporation of Riverside, California.

1956 - 1967 AEROJET GENERAL CORPORATION

Manager, Nondestructive Testing Department (1964 - 1967)

Manager, Propellant-Process Inspection (1956 - 1964)

EDUCATION

B.S., Metallurgical Engineering - University of Pittsburgh
Personnel Management & Business Law - Sacramento State College

PROFESSIONAL AFFILIATIONS AND CERTIFICATIONS

Registered Professional Engineer (Quality) - California
NDE Level III, Certified by the ASNT
American Society for Quality Control
American Society for Nondestructive Testing

KENNETH M. HORST

PROFESSIONAL QUALIFICATIONS

Mr. Horst has 26 years experience in the engineering of nuclear plant systems and components. During his 18 years engineering and project management, he managed the development of engineering organizations and the implementation of engineering and project management systems. He has worked in fabrication and test operations and procurement functions including hardware and engineering services. His business management experience includes strategic planning, economic studies, marketing and finance.

EXPERIENCE

1982 - Present

MANAGEMENT ANALYSIS COMPANY (MAC)

Consultant

Performed management assessment of a major utility engineering organization, performing technical support for an opeating nuclear plant. Included the development of a configuration management system for a utility engineering organization.

1980 - 1981

ENGINEERING DECISION ANALYSIS COMPANY (EDAC)

President

EDAC provided engineering services in the field of civil, structural, mechanical, reliability and safety engineering. EDAC's clients included industrial companies, utilities, EPRI, and government agencies (DOE and DOD). Typical projects included seismic analysis, linear and non-linear structural analysis, finite element analysis, impact load analysis, equipment qualification (environmental, seismic), fault tree analysis, failure modes and effects analysis. These analyses were performed on nuclear structures and components, petroleum systems, aerospace structures and fossil plant components.

1972 - 1979

GENERAL ELECTRIC COMPANY
ADVANCED REACTOR SYSTEMS DEPARTMENT

Manager, Engineering

Held several senior management level positions at the section level as manager of design engineering of advanced nuclear plants and reactor and materials engineering. These positions covered management of multi-technical disciplines involving design and development of reactor hardware, fuel assemblies, heat transport and fuel handling systems; and supporting analytical services covering heat transfer, fluid mechanics, structural, nuclear, reliability and safety engineering analyses.

Manager, Support Operations

Support operations covered management of fabrication facilities qualified to meet requirements of the ASME "N" Stamp for nuclear plant components, component testing facilities, fuel rod and assembly fabrication facilities, procurement of hardware and engineering services, advanced reactor economic studies, and development of business plans and strategies.

Both of these management positions included managing organizations of approximately 200 professionals and support personnel. Significant experience was obtained with matrix management approach to directing efforts of multi-functional organizations engaged in a variety of different projects.

1970 - 1971 WESTINGHOUSE COMPANY, WADCO (HEDL)

Deputy Manager, Engineering

Responsibility for safety analysis, preparation of SAR and review of the SAR with NRC for Fast Flux Test Facility (FFTF) and planning and specification of development test program in support of FFTF design and fabrication. The position also included responsibility for engineering of test facilities for FFTF development program.

1955 - 1969 GENERAL ELECTRIC COMPANY, ATOMIC POWER EQUIPMENT DEPARTMENT AND GAS TURBINE DEPARTMENT

Manager, Core Design and Specifications

Responsible for engineering core system and components for fast breeder reactors. Involved preparation of engineering drawings and specifications, thermal and fluid analysis of core system and components, structural analyses of components, and engineering for first-of-a-kind fuel hardware.

Project Engineer, Advanced Products Operations

Responsible for development program in support of the Southwest Experimental Fast Oxide Reactor (SEFOR), including formulation of development tasks, definition of project scope, scheduling and budgeting, program direction, and preparation of design and specification of fuel hardware and program management of procurement.

Engineer

Performed engineering of nuclear reactor components and systems including performance testing, thermal-hydraulic and structural analyses of fuel elements and other components for nuclear power plants. Performed testing of gas turbines.

EDUCATION

B.S., Mechanical Engineering, Pennsylvania State University
General Electric Executive Management Courses
Business Management, Matrix Management, Employee Motivation and Cash Management

PROFESSIONAL AFFILIATIONS

American Society of Mechanical Engineers
American Nuclear Society

DARREL G. HUBBARD

PROFESSIONAL QUALIFICATIONS

Mr. Hubbard has over 18 years experience in project management, administration and design engineering including instrument and control system design, value engineering, procedures and report preparation, data analysis, configuration control, document control, performance measurements, budgets, long-range forecasts, planning and scheduling, cost control and quality control.

EXPERIENCE

Consulting Associate - Principal participant in defining, developing and implementing integrated cost and schedule project management information system for major utility. Major participant in designing and developing total project management philosophy and associated information systems for multi-utility service company. Consultant to utilities for project management systems, administrative procedures, integrated cost and schedule control systems including software utilization and program implementation, work breakdown structures, application techniques, outage management, training, data initialization and user documentation preparation.

Program Manager - Responsible for determining and allocating NSS engineering work, preparing and assembling data required for engineering cost estimates and budgets, monitoring costs against budgets, and monitoring contract schedule requirements.

Project Administrator - Responsible for developing and administrating project policies and procedures, developing and implementing project office quality assurance procedures, providing interface between project office and customer and architect-engineer, reviewing and approving cost estimates, budgets, and actual costs.

Senior Planner and Scheduler - Responsible for providing overall planning and scheduling for nuclear steam supply project.

Program Engineer and Senior Design Engineer - Responsible for control and electrical technical design interface between Engineering and Projects; preliminary design and specifications for all specialized 1100 MW(e) HTGR control and instrumentation systems.

Flight Test Engineer and Standards Laboratory Engineer - Responsible for analyzing and evaluating system and control/measurement component design. Technically directed local and mobile calibration and maintenance teams.

EMPLOYERS

Mr. Hubbard has been employed by General Electric, General Atomic, Narmco Division of Whittaker Corporation and Astronautics Division of General Dynamics.

EDUCATION

B.A., Physics and Mathematics, Moorehead State University, Minnesota
Post Graduate, University of Idaho, San Diego State University and University of California at San Diego.

AFFILIATIONS

Registered Professional Control System Engineer, California
Senior Member Instrument Society of America
Member Project Management Institute

PM0382

RICHARD B. KELLEY

Professional Qualifications

Mr. Kelley has 20 years experience in the fields of engineering, construction management, start-up operations, maintenance and marketing. The majority of his management experience has been in thermal power plant construction start-up and maintenance, both nuclear and fossil. The remainder has been in oil refinery and chemical plant engineering and construction. Recent experience has included offshore oil market, subsea intervention systems inspection, repair and certification of marine structures and process facilities. He has developed new methods of materials testing, repair and inspection and maintenance programs for the commercial marine industry.

EXPERIENCE

1981 - 1982 SEADATA, INCORPORATED

General Manager

Overall responsibility for start-up and development of a new division specializing in marine and subsea maintenance and inspection. Developed international marketing activities and established joint ventures, agent representatives, and commercial intelligence. Organized a power generation consulting section and directly managed company affairs in selection of personnel and equipment, budget forecasts, and technology development.

1977 - 1981 CONSTRUCTION MANAGEMENT SERVICES, INC.

President

Owner and manager of consulting engineering and construction management company providing erection supervision, start-up and testing of the following Thermal Power stations:

- Yugoslavia - Krsko Unit No. 1, Westinghouse Nuclear International, 600 MWe PWR.
- Egypt - Cairo West Unit No. 4, Westinghouse International, 80 MWe oil fired unit.
- Iran - Tabriz Units 1 and 2, Comiran Consulting Engineers, two 368 MWe oil fired units.

1973 - 1977 FLORIDA POWER AND LIGHT COMPANY

Project Superintendent

Managed construction of 890 MWe Combustion Engineering PWR. Directed force account contractor, organized retrofit/maintenance department, negotiated maintenance labor agreements, performed outage management, responsible for budget and costs, schedule and quality.

1969 - 1973 BECHTEL POWER CORPORATION

Construction Superintendent
Supervised process piping and instrumentation installation for two 670 MWe Westinghouse PWR nuclear reactors. Supervised force account labor, start-up and maintenance.

1963 - 1969 UNITED ENGINEERS AND CONSULTANTS

Mechanical Engineering Consultant
Quad Cities Nuclear Units 1 and 2
Monsanto Chemical Company, St. Louis, MO
Centrel Engineering Division
Shell Oil Company, Wood River, IL
Wood River Refinery
General Electric Company, Bay St. Louis, MI
NASA's Mississippi Test Facility
International Minerals and Chemical Co., Ltd.
Canadian Potash Facility
Bettis Atomic Energy Laboratory, Pittsburgh, PA
Reactor Tool Design Section
GEO Space Corporation, Melbourne, FL
Apollo Project
Air Products and Chemical Co., Huntsville, AL
Apollo Project
General Electric Co., Huntsville, AL
Apollo Project
Brown Engineering Co., Huntsville, AL
Apollo Project
Combustion Engineering Co., Chattanooga, TN
Corporate Engineering Department

EDUCATION

Mechanical Engineering - Tennessee Polytechnic Institute and University of Tennessee
Management courses at FP&L and Bechtel

PROFESSIONAL AFFILIATIONS

World Trade Council of Florida
U.S./Yugoslav Economic Council
International Studies Association, Byrnes International Center
American Petroleum Institute
American Society of Mechanical Engineers
American Society for Non-Destructive Testing
Society for Underwater Technology (U.K.)
American Welding Society
Marine Technology Society
Association of Diving Contractors

GE0982

LEONARD J. KUBE

PROFESSIONAL QUALIFICATIONS

Mr. Kube has over 20 years experience in project management, engineering management, marketing, planning/scheduling and design engineering. Recent assignments include evaluation of factors affecting nuclear power plant design and construction, planning/scheduling of steam generator replacement, impact assessment of regulatory changes and coordination of configuration management investigations.

EXPERIENCE

Manager, Engineering Services - Responsible for establishing and managing an organization responsible for technical services work on the design, construction and modifications to nuclear and fossil power plants. Services included design engineering, risk analysis, planning, analytical support, fuel analysis and quality assurance.

Project Manager - Responsible for directing engineering and supporting services required to design and develop power plant steam supply system and associated fuel. Work included project interface with domestic and international companies sponsoring supporting programs.

Manager, Engineering - Responsible for managing engineering required to design and develop all equipment and structures needed to build steam supply system including engineering, design, planning/scheduling and administrative functions, and coordinating engineering support activities at foreign companies.

Project Engineer - Responsible for directing and coordinating project applied work conducted by engineering for twin 1100 MW(e) nuclear steam supply system. Responsibility also included preparation of technical proposals for equipment and interfacing with vendors.

Engineer - Responsible for planning and staffing engineering organization for design of steam generators. Group leader responsible for structural design and stress analysis of once-through subcritical steam generators. Conducted metallurgical and material property analysis on steel alloys and reinforced plastics. Conducted theoretical stress analysis on vessels and structures used in power plants.

EMPLOYERS

Mr. Kube has been employed by General Atomic Company and A. O. Smith Corporation.

EDUCATION

B.S.M.E., Marquette University, Milwaukee.
M.S., Mechanics, University of Wisconsin, Madison.
Management Training, San Diego State University, San Diego, California.

AFFILIATIONS

Member, American Society of Mechanical Engineers
Member, American Nuclear Society

GE0183

ROBERT R. LEE

PROFESSIONAL QUALIFICATIONS

Dr. Lee has over 19 years of experience in nuclear power plant analysis and the development of nuclear plant support methodology. He has been responsible for project management for a major utility funded program to develop and implement reload licensing methodology for light water reactors; he has been director of all NSSS and reload fuel physics design activities for a large NSSS vendor. He has extensive experience in managing computer code mathematical and physical model development, programming and code verification. He has been an adjunct associate professor of nuclear science teaching courses in nuclear engineering and reactor theory. For several years he was a member of a nuclear speakers service with strong participation in the public debate on energy issues. He is the author of several technical publications.

EXPERIENCE

Director, Nuclear Engineering - Managed department activities of 100 scientists and engineers responsible for physics design activities of nuclear steam supply systems. Work included fuel management (setting fuel enrichments and fuel loading patterns), calculation of safety parameters and radiation physics activities, development and verification of major computer codes used. Responsible for coordinating reload fuel engineering and licensing activities.

Manager, Physics Design Procedures - Managed group responsible for definition and development of physics design methods, computer codes, analysis of operating reactor data, quality assurance procedures and application of in-core instrumentation to power distribution measurements. Accomplishments included development and NRC approval for major computer codes with 3-D space-time kinetics model for accident analysis and 3-D power distribution construction from in-core instrument signals.

Manager, Computer Analysis - Overall responsibility for computer applications in nuclear power systems. Activities of group included model development, applications and systems programming and terminal operation.

Section Manager, Physics Code Development - Responsible for development of large scale computer programs and mathematical models for physics design of nuclear reactors, and evaluation and justification of new computer equipment. Accomplishments included development of mathematical model and computer code for prediction of reactor stability, development of fast three-dimensional method for analysis of power distribution control schemes.

Senior Staff Physicist - Developed models and specifications for computer codes for spatial depletion, fuel shuffling and load following calculations. Performed extensive FORTRAN programming on CDC-3600, IBM-360 and CDC-6600.

EMPLOYERS

Dr. Lee has been employed by Combustion Engineering, Inc. and by the Hartford Graduate Center. He was a Commissioned Officer in the U.S. Navy.

EDUCATION

B.S. Aeronautical Engineering, Rensselaer Polytechnic Institute
M.S. in Nuclear Science, Vanderbilt University
Ph.D. in Nuclear Engineering, Rensselaer Polytechnic Institute (USAEC Special Fellow in Nuclear Science and Engineering)

PROFESSIONAL AFFILIATIONS

American Nuclear Society
Chairman, Connecticut Section, 1976 - 1977
Chairman, Mathematics and Computation Devision, 1978 - 1979
Chairman, Local Sections Committee, 1979 - Present
Sigma Xi
Tau Beta Pi

G0182

ANDREW ROBESON

PROFESSIONAL QUALIFICATIONS

Andrew Robeson has 26 years experience in the nuclear field including reactor start-up, operations and support functions and has been licensed as a Senior Reactor Operator. He has served on safety review committees and has prepared and taught STA training programs and a full range of nuclear engineering subjects. He is the author of numerous technical publications.

EXPERIENCE

Consultant, Management Analysis Company - Analysis of procedural needs and consulting service in the upgrading and standardization of administrative procedures and management and quality assurance controls for three operating nuclear plants.

Consultant - Babcock & Wilcox Co. Member and Alternate Chairman, Safety Review Committee (and Audit Subcommittee), Lynchburg Research Center; VEPCO System Nuclear Safety and Operating Committee; and Traineeship Review Board, USAEC.

Industrial - Applied Physics Laboratory, Johns Hopkins University, Silver Spring, Maryland, Naval R&D; Oak Ridge National Laboratory, student and laboratory instructor, ORSORT; Babcock & Wilcox Co., start-up engineering-initial start-up of Oconee III, refueling of Oconee I; TVA, Brown's Ferry, Alabama, Plant Performance Results Section, restart of Units I and II, initial start-up of Unit III; VEPCO, North Anna Power Station, Engineering Operations, Pre-op of North Anna I, prepared and taught in initial STA training program; Metropolitan Edison Co., Middleton, Pennsylvania, Waste Management Group-Evaluation of liquid waste disposal alternatives.

Reactor Supervisor - VPI Nuclear Reactor. Responsible for initial licensing, start-up and upgrading from initial power level.

Academic - Professor of Nuclear and Mechanical Engineering, Virginia Polytechnic Institute and State University.

EMPLOYERS

Mr. Robeson has been employed by Johns Hopkins University, Oak Ridge National Laboratory, Babcock & Wilcox Co., VEPCO and Metropolitan Edison Co.

EDUCATION

B.S., Virginia Polytechnic Institute
M.S., University of Virginia
Ph.D., University of Virginia
Oak Ridge School of Reactor Technology

PROFESSIONAL AFFILIATIONS

American Nuclear Society:
National Program Committee; Executive Committee, Education Committee; Vice Chairman, Virginia Section; Chairman, Virginia Section; Representative to ECPD Guidance Committee.

LICENSES

Licensed Senior Reactor Operator

GE0982

LEWIS E. ZWISSLER

PROFESSIONAL QUALIFICATIONS

Mr. Zwissler has over 40 years of industrial experience. For the past 12 years he has been associated with the nuclear power generation industry: major evaluations of nuclear power plant construction and operation, document control, records management, design and construction of major modifications, quality control and quality assurance policy and procedures. Projects include six nuclear utilities and projects. Industrial experience includes major project management, management of manufacturing operations and quality assurance organizations, staff activity for nation's largest corporations and direction of research and development operations.

EXPERIENCE (Nuclear)

As Vice President of Management Analysis Company, participated in management evaluations of major nuclear power plant construction projects. Served as consultant to A/E, constructor and utility in developing QA corrective action programs to lift NRC show cause order on nuclear plant construction project. Served as site construction QA manager and later as senior QA consultant to the utility on the project. Acted as consultant to utilities on various aspects of QA for operating reactors.

Served nine years as Director of QA for national laboratory engaged in research and development of nuclear power generation technology. Developed and implemented a QA program satisfying the requirements of NRC and DOE quality programs covering design, procurement, construction, major modifications, operating reactors, research and development, testing and manufacturing.

EXPERIENCE (Industrial)

Project Director of the Mark 46 Torpedo production program, including engineering, manufacturing, quality assurance, testing and contract administration. Project comprised 2,350 personnel and had sales of over $100 million per year.

Manager for quality assurance of a large aerospace corporation and for specific programs including Polaris, Tital II and III and Gemini. Has served as responsible manager for research and development of manufacturing processes, components and pilot line and prototype production for high speed rotating machinery, rocket motors and engines. Served in executive staff positions for major corporations.

EMPLOYERS

Management Analysis Company, Argonne National Laboratory, Aerojet General Corporation, Ford Motor Company, General Electric Company, M. W. Kellogg Company, Elliott Company and Armour Research Foundation.

EDUCATION

B.S., Civil Engineering - Armour Institute of Technology
M.S., Applied Mechanics - Rutgers
Completed academic requirements for PhD, did not complete thesis because of World War II - Illinois Institute of Technology.

REGISTRATIONS

Professional Engineer - State of Illinois

PROFESSIONAL AFFILIATIONS

Member - Tau Beta Phi, Chi Epsilon and Sigma Xi honorary fraternities
Fellow - American Society of Quality Control
Senior Member - American Nuclear Society

NU0882

APPENDIX B

REFERENCED DOCUMENTS USED IN THE EVALUATION

REFERENCED DOCUMENTS USED IN THE EVALUATION

1. Midland Project Engineering Work Process Flow Charts - BPCo.
2. Group Leader Assignments for Nuclear Group - BPCo - Handwritten.
3. Calculation of DHR System - File No. M-3721.
4. Midland FSAR, Section 4.3 - DHR System.
5. DCCL for Nuclear Group - BPCo.
6. DRVC file for RMS System.
7. Potential Problem Document Transmittal (PPDT) for Control Systems Issues.
8. Design Review Notes (DRN) for Radiation Monitoring System Material Requisition.
9. BPCo Engineering Department Procedures (EDP), implementing documents (MED) and Project Engineering Procedures (PEP).
10. MCAR Index; MCAR-60-Deficiencies-Victoree QA Program and Workmanship affecting the Radiation Monitoring System.
11. BPCo Meeting Minutes for Remedial Soils Meeting, dated September 17, 1982.
12. Midland Daily News, article by Paul Rau, dated November 9, 1982.
13. BPCo Meeting Minutes for Remedial Soils Meeting, dated October 12, 1982.
14. Scheduling Plan, Midland Remedial Soils, dated October 7, 1982.
15. Consultants and subcontractors for Remedial Soils Work, BPCo File No. 95456.
16. NRC Open Item List, dated November 22, 1982.
17. CP Co letter to BPCo, "Soils Organization Chart", dated September 28, 1982.
18. Midland Project Office charter Revision, J. Cook to Distribute, dated November 5, 1982.
19. BPCo letter to CP Co, "MCAR 59", dated August 13, 1982.
20. MCAR 56 (revised), dated May 26, 1982.
21. BPCo letter to CP Co, "MCAR 55 (issued January 15, 1982)", dated July 28, 1982.
22. BPCo letter to CP Co, "MCAR 75", dated July 9, 1982.
23. BPCo letter to CP Co, "MCAR 58", dated July 8, 1982.

24. NCR to CP Co, Region III Inspection Report, dated February 12, 1982.

25. BPCo letter to CP Co, "Response to Open items", on PRA Study, dated June 19, 1981.

26. BPCo Field Organization Charts, Revision 11.

27. BPCo Field Inspection Manual, Volume 1, 2 and 3.

28. BPCo Project Field Procedures and Instruction Manual.

29. Project procedures Manual (CP Co/BPCo).

30. FSAR

31. NML Property Loss Prevention Report.

32. Project Status Report, September/October.

33. BPCo Daily Construction Schedule.

34. BPCo Mechanical Equipment List Drawing No. 7220-M-285.

35. B&W Organization Chart.

36. NRC Open Items List, November 22, 1982.

37. P and ID's

38. Hydrostatic Test Data Sheet FPB-1,000, Rev. 2.

39. Weld Check List, PI-AT-LH, Rev. 4.

40. Preservice Inspection Weld prep., FPW-5,000.

41. Weld Check List, WCIR No. CW.1.00-699.

42. CP Co CWR 582.

43. CP Co CAR X02-E-024.

44. BPCo Site Safety Manual.

45. BPCo Fire Brigade Training Manual.

46. Milestone Summary Schedule, MSS-1.

47. Document Control Volume Log (monthly).

48. BPCo Project Status Report, September 1982.

49. Combo Shop Work Request Form.

50. F-1, F-2, F-10, F-20, Maintenance Requirement for Storage Inspection.

51. CP Co Technical Department Daily Working Schedule.

52. FCR M-6301.

53. QCIR Log No. 200919.

54. Cable Pull - Pullback and Termination - Determination Cards.

55. Cable Pulling Rework Request No. 3273.

56. Warehouse and Storage Weekly Maintenance Schedule.

57. Concrete Drill Permit No. C-20, April 15, 1982 (D-112-4).

58. Concrete Blockwall and/or Temporary Construction Opening or Closure "Access Removal" Form.

59. Project Quality Control Instruction, 7220/c-1.60.

60. CWR Form (Contractor's Work Request).

61. CP Co Midland Plant Operating procedure 1042.1, Rev. 3. Workmens Protective Tagging.

62. CP Co Testing Program Manual.

63. PQCI Control Log (period ending October 9, 1981).

64. Reply to Nonconformance Reports. NCRs M01-5-2-014 and M01-502-017.

65. Administrative Guideline M-6.00, Rev. 0, November 29, 1982. Mechanical Equipment and Vessel Installation and Inspection.

66. Drawing A-72, Rev. 15. Requirements for use of coatings/paint.

67. Drawing A-41, Rev. 8. Surface preparation for coatings/paint.

68. E-900 Termination Lists.

69. B-3700 Cable Pull Identification.

70. Field Engineering Mechanical Equipment Maintenance Control Schedule.

71. Midland Site Plans.

72. BPCo Administrative Guidelines, "M"- Series.

73. Pressure Test Schedule.

74. P & ID (for DHR) M-140 (Q), Rev. 15.

75. Material Requisition for Radiation Monitoring System, J244-1 through 5.

76. DRVC for J244-4 (Q) - Radiation Monitoring System.

77. Stick File for Control Systems area (5th floor - Ann Arbor BPCo office).

78. Systems Responsibility assignments.

79. Calculation File for Large Bore Pipe Stress Analysis.

80. Internal BPCo Memo (April 1980), defining agenda items for Control Systems Chief - Group Supervisor monthly meetings.

81. BPCo "Key Systems Turnover Schedule", FPS-k000, Rev. 1.

82. BPCo Remaining Work Schedule (RWS) Add Sheet and Legend.

83. BPCo Pressure Test Schedule.

84. BPCo System/Area Turnover Status Report.

85. BPCo Field Construction Restraint List.

86. BPCo Mini-Schedule Review - Meeting Notice.

87. BPCo System Completion - Meeting Agenda, November 11, 1982.

88. CP Co AMP User's Manual, Rev. 4, excer.

89. BPCo Area/Facility Completion Schedule, FPS-4000.

90. BPCo Subsystems Detail (mini) Schedule.

91. Zack Construction Scheduling System, six-week schedule.

92. BPCo Midland Project Management Team Meeting Notice - Ann Arbor Office.

93. Midland Project Management Team Meeting Notice - Midland Job Site.

94. BPCo Project Schedule Change Notice.

95. BPCo Installation Data Sheets.

96. BPCo Milestone Summary Schedule, MSS-1, Rev. 7.

97. BPCo Project Status, Report September 1982.

98. CP Co Plant for Two Unit Start-ups, Midland Units 1 and 2, CP-7PS, Rev. 2.

99. CP Co Functional Systems Turnovers Scheduled vs. Actual, CP-TPS-1, Rev. 6.

100. CP Co Summary of BPCo System Turnover Status Report 24.

101. CP Co Area/Facility Status, memorandum.

102. CP Co BPCo System Turnover Status, Report issue 23, 24, 25.

103. CP Co Procedure Performance, TPC-6, Rev. 1.

104. CP Co Procedure Development, TPS-5, Rev. 1.

105. BPCo System Walkdown Form.

106. Milestones - System Designators.

107. Listing of Valid Department Codes.

108. BPCo Area Walkdown Form.

109. CP Co Site Commitment List.

110. CP Co Turnovers, TPS-4, Rev. 1.

111. CP Co Monthly System Turnovers, TPS-3, Rev. 0.

112. CP Co Turnover Composite Curve, TPS-2, Rev. 2.

113. CP Co Secondary side Approach to H.F.T., CP-ALM-2, Rev 1.

114. CP Co Short-Term Planning Schedule.

115. CP Co Daily Working Schedule.

116. CP Co Technical Department System Engineer Assignments and Construction Department Area Engineer Assignments, September 21, 1982.

117. CP Co Testing Department Procedures Index.

118. CP Co Testing Activities Summary.

119. CP Co Midland Plant Unit 2, RCS Cold Hydro Plan, ALM-1, Rev. 0.

120. ANSI N45.2.11 - 1974.

121. Civil Design Criteria 7220-C-501, Rev. 2.

122. Design Criteria for Pipe Whip Restraints and Jet Impingement Barriers, 7220-C-1221 (Q), Rev. 4.

123. BPCo Topical Report, BN-TOP-2.

124. Calculation No. 900-5799(a).

125. Restraint Drawing, FSK-M-1EBB-1-1-PR-160(a), Rev. 0.

126. Hanger Calculation C2-632-8, Rev. 0.

127. ACI-349.

128. Hanger Drawing H-632 SH8 DP360.

129. Pipe Class sheets, 7220-M-480(Q) and 7220-M-481 (non-Q).

130. Pipe Support Design Manual, Volume 1, August 1980.

131. Generic Corrective Action Report.

132. BPCo Input Document (BID).

133. Analytical Input Requirement Specification (AIRS).

134. Design Control Checklist, Mechanical Group.

135. Midland Project Engineering Design Work Process Flow Chart Manual.

136. Design Review Notice.

137. Project Field Engineering Procedures.

138. Design Change Authorization Requests.

139. Design Change Packages.

140. CP Co Midland Energy Center Project - Monthly Resume and Schedule Summary Report, August and September 1982.

141. CCG Work Plan, System 2BBD, Unit 2 OTSGs, Drawing CCW-12A, Rev. 1.

142. CCG Work Plan, Systems 2BBC-2 and 2BBC-3, Reactor Coolant Pumps and Auxiliaries, Drawing CCW-3A, Rev. 3.

143. Midland Plant, Project Schedule Change Notice (PSCN) Number 16.

144. CP Co memo - Midland Project GWO 7020, Unit 2 - Reactor Coolant System Hydro Modified Schedule, August 3, 1982.

To FWBuckman, P-14-113A
JAMooney, P-14-115A
GSKeeley, P-14-113B
RCBauman, P-14-314B
KRKline, P-14-314A
BWMarguglio, JSC-220A
ARMollenkopf, P-14-209A
RAWells, Midland-MPQAD
DBMiller, Midland (3)

From JWCook, P-26-336B

Date February 7, 1983

CONSUMERS POWER COMPANY

Internal Correspondence

Subject MIDLAND ENERGY CENTER PROJECT -
TRANSMITTAL OF CORRECTED PAGE 2
CONSTRUCTION PROJECT EVALUATION REPORT
FILE B1.1.5 SERIAL 20494

Reference

CC

Attached please find a corrected Page 4-35 which should replace the Page 4-35 in the Construction Project Evaluation Report for the Midland Energy Center Project which was previously provided to you.

JWC/cl

Ltr 31.1.5

ic0283-3750a102

PERFORMANCE EVALUATION SUMMARY

CONSTRUCTION PROJECT
Consumers Power Company
Midland Plant

Performance Area Design Output Objective No. DC.4

Evaluator(s) K. Horst/R. Lee/E. Schlinger

IV. Areas of Weakness and Corrective Action; Good Practices

Finding: (DC.4-1) The congestion being experienced in many areas of the plant requires that more attention be given to constructibility and maintainability in the design output.

Corrective Action: The ability to design optimum constructibility and maintainability into the Midland Plant is a significant challenge, given the limited space available and the evolution of regulatory requirements.

With regard to maintainability, Project Engineering has reemphasized the importance of ensuring that consideration is given in future design for maintainability. See Finding DC.1-1 for additional corrective action being taken. Constructibility in the design is provided by the assigned personnel using their education, training and experience and using the normal design process, which includes internal design interface coordination. As the plant is constructed and options for space become limited, changes required by regulatory agencies, state-of-the-art changes, vendor information changes, construction problems and design evolutionary changes combine to impact constructibility. These factors require that constructibility be addressed on a case-by-case basis. This situation has required major project attention, discussed as follows.

During the period from late 1979 through early 1981, special efforts (then referred to "room task forces") were taken to deal with particularly congested rooms. This effort primarily stemmed from design changes resulting from the Three Mile Island experience and related issues. In the latter part of 1981, a Space Control Group (SCG) was established to further assist in the dealing with plant congestion. The success of the SCG, based on its initial effort, has led to an expansion of current activities and includes (1) a rereview of all issued but not installed design for space-takers. This review will be made to provide additional assurance that items are constructible, (2) the inclusion of a physical walk-down by field engineering prior to forwarding the design to the crafts for construction, (3) the issuance of sketches for all currently field-run commodities (eg, conduit and tubing), with these sketches being processed through the SCG prior to installation, and (4) consideration is also being given to broadening the scope of this group's reviews to areas other than the auxiliary building and the containment building as necessary.

Within construction, additional attention will be given to installation sequence planning in advance of construction forwarding the design to craft personnel. This planning, conducted by system completion teams, will consider constructibility.