

improper placement, sampling and testing of concrete and failure of QA/QC to act on identified deficiencies; (2) in September 1973 relative to drawing control and lack of or inadequate procedures for control of design and procurement activities at the Bechtel Engineering offices; (3) in November 1973 relative to inadequate training, procedures and inspection of cadweld activities; (4) in April, May and June 1976 resulting from a series of Region III in-depth QA inspections and meetings to identify underlying causes of weakness in the Midland QA program implementation relative to embedments; (5) in April 1977 relative to tendon sheath omissions; and (6) in August 1978 concerning plant soil foundations and excessive settlement of the Diesel Generator Building.

Following each of these problem periods, the licensee was responsive and took extensive action to evaluate and correct the problem and to upgrade its QA program and QA/QC staff. The most effective of these licensee actions included a comprehensive independent verification program over and above that performed by its contractors.

The evaluation both by the licensee and IE of the structures and equipment affected by these problems, with the exception of the soils problem which is still under review, has established that they fully meet design requirements.

Looking at the underlying causes of the above problems, two common threads emerged: (1) Consumers Power Company (CPC) tended to over rely on Bechtel, and (2) there was an insensitivity on the part of both Bechtel and CPC to recognize the significance of isolated events or failure to adequately evaluate possible

generic application of these events either of which would have led to early identification and avoidance of the problem.

With respect to the significant problems identified prior to December 6, 1979, NRC either initiated or caused to be initiated stop work action in those areas where the licensee's quality assurance program was basically ineffective. The one exception to this was the soils work where the ineffectiveness of the quality assurance activities was not recognized on a timely basis. Had the quality assurance deficiencies associated with the soils work been identified while the work was in progress, NRC actions would have been taken to stop work in that area.

Notwithstanding the above, it is our conclusion that the problems experienced were not indicative of a broad breakdown in the implementation of the overall quality assurance program. Admittedly, deficiencies have occurred which should have been identified earlier by quality control personnel, but the licensee's program has been effective in the ultimate identification and subsequent correction of these deficiencies. While we cannot dismiss the possibility that problems may have gone undetected by the licensee's overall quality assurance program, our inspection program has not identified significant problems overlooked by the licensee --- and this inspection effort has utilized many different inspectors.

Q. 3. What has been your assessment of the licensee's overall quality assurance program at Midland since December 6, 1979.

A. Since December 6, 1979, two significant quality related problems were identified. One involved deficient anchor bolts for the reactor pressure vessel and the second involved procurement and installation deficiencies with the heating, ventilating and air conditioning (HVAC) ducts and supports within the plant. With respect to the anchor bolt problem, the quality assurance concerns had their origin during the mid-1970's, similar to the soils work, and was identified as the result of a bolt failure following installation. With respect to the HVAC quality assurance problems, NRC first became aware of the significance of the problem through allegations made by a plant worker. In reviewing the matter, NRC found that the licensee had been trying to correct the problem for several months; however, we found that timely resolution was not being achieved and that substandard work was still continuing. Following NRC's investigation, the licensee agreed to stop this work until effective corrective actions were taken and verified by the NRC. In addition, consistent with the intent of the NRC's revised enforcement policy, a civil penalty of \$38,000 was levied against the licensee for the breakdown in quality assurance which resulted in this problem. Neither of these problems were indicative of a broader breakdown in the overall quality assurance program.

In August 1980, CPC further modified their project and quality assurance organizations for the Midland project. This included integration of the CPC and Bechtel Midland quality assurance organizations into a single Department aimed at providing clearer accountability for quality assurance and achieving a more responsible role by CPC in assuring that quality assurance policies, procedures and instructions are followed.

The results of our special quality assurance inspection of May 18-22, 1981 are discussed below.

Q. 4. Has the NRC reviewed the implementation of the corrective actions outlined by CPC in response to 10 CFR 50.54(f) Questions No. 1 and No. 23.

A. Yes. Special inspections were conducted in December, 1980 by the NRC at the Bechtel Offices in Ann Arbor, Michigan and at the Midland Construction site in January, 1981.

The inspection revealed that the licensee's corrective actions relative to the implementation of the soils remedial measures have been completed. Certain problem areas were identified relative to documentation of FSAR re-reviews and to the technical qualifications of the Midland Onsite Geotechnical Engineer. These problem areas have since been resolved. Inspection findings are documented in Inspection Report No. 50-329/80-32; 50-330/80-33 and Inspection Report No. 50-329/81-01; 50-330/81-01. Copies of these reports are attached to NRC Staff Testimony in Response to Stamiris Contention 3.

Q. 5. With respect to the recently completed quality assurance inspection at Midland, what was the inspection plan and why was it conducted at this time.

A. Basically, the purpose of the inspection was to test the effectiveness of the Midland Project Quality Assurance Department which was implemented in August 1980. The primary considerations which influenced me to have this inspection conducted at this time were as follows:

1. The new Quality Assurance Department represented an integrated organization of CPC and Bechtel Corporation whereas the previous organization placed primary responsibility for quality assurance with Bechtel while CPC served an overview function. Conceptually, the new quality assurance program offered improvements in the timely identification and resolution of problems; however, some Region III inspectors were skeptical as to the effectiveness of the new organization because of Bechtel's past dominance over CPC in the handling of many regulatory related problems. Although no significant quality assurance issues have arisen since the formation of the new Quality Assurance Department, I considered it of paramount importance to reassess the effectiveness of the organization prior to submitting testimony for the hearing.

2. A comprehensive review of the Midland Quality Assurance activities could provide an added dimension for the Licensing Board in their assessment as to whether the licensee's QA program can be expected to function properly in future soils work.

3. The findings of the inspection would provide insight regarding the validity of past assessments by the Region and NRC regarding the effectiveness of the Midland QA Program.

A team of eight experienced NRC inspectors, headed by a Region III Section Chief conducted the inspection on May 18-22, 1981. The thrust of the inspection was as follows:

1. To determine whether or not the licensee's QA program and organization, reported to the NRC on March 13, 1981, were in place and how effectively they were functioning.
2. To determine whether recognized quality assurance problems over the past few years were confined to narrow areas of activity, as previously thought, or were more indicative of a broader problem.
3. To determine the adequacy and effectiveness of management involvement in the resources support, monitoring, and problem solving of the site quality assurance program.

Q. 6. Would you describe the significant findings from the recent quality assurance inspection at Midland.

A. Major summary findings, both positive and negative, are provided in Attachment 2 for the areas of management effectiveness, piping and supports, QA/QC program assessment, civil (soils) activities, and electrical work. On balance, while a number of specific problems and deficiencies were identified with respect to the implementation of the QA/QC program and the adequacy of construction, the inspection found clear evidence that Consumers Power Company and Bechtel Corporation had formed an effectively integrated and coordinated construction and quality management team at the site. While the number of problems found might seem large, they are not surprising when viewed in terms of the scope and depth of construction and this inspection effort. It is the

unanimous view of the inspection team that the problems were generally isolated or limited to a specific area and not indicative of any major programmatic weaknesses in the implementation of the program.

The failure to comprehensively identify root causes of problems has historically been an issue at this site. Even so, it is our judgement that if the remainder of the QA program implementation continues to function properly (identifying and resolving problems as they occur) the inadequacy that we perceive should not have a serious impact on the as-built quality of the plant. Moreover, with due attention from the licensee, further improvements should be realized with respect to the more timely identification and correction of root causes.

(1). 7. Do you believe that quality assurance and quality control programs will be effectively implemented with respect to future soils construction activities including remedial actions taken as a result of inadequate soil placement.

A. Yes. As a result of the 1974 cadweld show-cause hearing, CPC initiated a number of actions to strengthen the effectiveness of the quality assurance program at Midland. Since that time, with the exception of problems discussed in Answers 2 and 3 above, CPC quality assurance has been generally effective. The most glaring breakdown in implementation was in the soils area. In retrospect, that breakdown can be largely attributed to the failure to fully recognize the importance of the application of quality assurance to soils work. The importance of quality assurance to soils work and consequent remedial actions at the Midland site is now fully recognized by CPC.

While we considered the previous quality assurance program to be acceptable, the August, 1980 reorganization can be viewed as positive management commitment to further improve the effectiveness of the quality assurance program. Notwithstanding the above, it should be recognized that further quality assurance problems may occur. Should serious quality assurance problems arise, I would not hesitate to initiate appropriate regulatory action.

CONCLUSION

The quality assurance program satisfies all requisite NRC criteria. Further, as a result of revisions in the quality assurance program, the improved implementation of the program, and other factors discussed above, the NRC has reasonable assurance that quality assurance and quality control programs will be appropriately implemented with respect to future soils construction activities including remedial actions taken as a result of inadequate soil placement.

JAMES G. KEPPLER - BIOGRAPHICAL INFORMATION

James G. Keppler has been Regional Director of the Nuclear Regulatory Commission's Region III Office of Inspection and Enforcement since 1973. (The Nuclear Regulatory Commission was formed in January 1975 to take over the regulatory functions of the old Atomic Energy Commission (AEC). The research and development activities of the AEC were assumed by the Department of Energy.)

The Regional Office in Glen Ellyn is responsible for inspection and enforcement activities at NRC licensed facilities in eight midwestern states. This encompasses 20 nuclear power plants now in operation, 21 plants licensed for construction or under licensing review, 12 operating research reactors, four fuel facilities and approximately 3700 byproduct materials licenses -- generally for medical, industrial, research or educational applications.

Mr. Keppler joined the AEC in 1965 as a reactor inspector. Prior to his present post as Regional Director, he was Chief of the Reactor Testing and Operations Branch in the AEC Headquarters in Bethesda, Maryland.

He is a 1956 graduate of LeMoyne College in New York State. Mr. Keppler's experience in the nuclear field includes nine years with General Electric Company, first in its Aircraft Nuclear Propulsion Department and later in its Atomic Power Equipment Department.

Management Effectiveness

1. Scope of Areas Reviewed

CPC and Bechtel principal site management organization down to the first level of supervision and "line" personnel regarding capability, attitudes, and functional adequacy.

2. List of Problems Identified

a. Site construction and quality management personnel are not sufficiently sensitive to symptoms of inadequacy identified by their program and other sources as evidenced by:

(1) The licens. is not routinely making comprehensive evaluations of root causes.

(2) When problems were identified in an area, the licensee continued working in that area and did not always expedite corrective actions.

(3) There is a need to be more specific in the administrative and organizational relationship of the Bechtel site construction management and quality control organizations, in regard to the

coordination interface and working relationships between the two organizations. The purpose of this clarification is to insure that the organizational freedom required by ALAB 152 is fully addressed in their program.

- b. Personnel recruitment and assignment philosophy is such that the licensee focusses excessively on academic achievement (college level degrees) to the detriment of its need for a significant amount of experience in its "field grade" or first line personnel. In some cases, primary inspections and other quality related activities are being conducted by insufficiently experienced personnel. It is NRC's assessment that the bulk of the NRC inspectors' findings during this inspection was principally caused by this inadequacy and management's failure to properly use its problem trending mechanism.

3. Positive Comments

The personnel interviewed in both the CPC and Bechtel organizations, were qualified, capable, and assertive individuals with positive attitudes. Licensee management controls were judged to be effective. There is every indication that CPC personnel are in control of the site, providing generally adequate direction and administration of Bechtel and other construction organizations. Examination of routine operations clearly demonstrated that CPC and Bechtel organizations have formed an effectively integrated and coordinated construction and quality management team.

Whereas Midland has experienced a number of serious failures in the management of certain construction and quality programs, the organizational and management personnel changes which have occurred over the past two years have strengthened the construction and quality management at the Midland site. It is the inspection team's conclusion that the Midland plant can be completed in accordance with the design and nuclear regulatory requirements.

Piping and Supports

1. Scope of Areas Reviewed

- a. Installation of large bore pipe suspension system components.
- b. Site design program for small bore piping system configuration and suspension.

2. List of Problems Identified

Large bore pipe support installation:

- a. Seven out of ten components selected for review were not constructed in accordance with the design requirements including meeting the established procedural tolerances.
- b. Six of the seven nonconforming components, identified in 2.a. above, had been QC inspected and accepted.

The issues identified above (2.a. & b.) are judged to be easily correctable and involve such things as, "mislocation of anchor bolts," "clearance dimensions," and "support plate/anchorage bearing area." To this

extent the identified discrepancies, when reviewed in context with the total large bore pipe program, did not merit stopping work.

Small bore piping system design:

- a. The licensee issued design drawings for fabrication and installation prior to formal documentation of all required stress analyses and calculations.
 - b. Specifications were maintained by design personnel at the work location, and superseded design calculations were not marked as such, resulting in confusion as to the basis for the hanger design.
 - c. QA audits conducted by CPC and Bechtel failed to include system stress analyses, and failed to followup on previously identified problems in hanger calculations. In general, there appeared to be a lack of technical auditing in the small bore design audit program.
3. Weakness in Management Controls that Contributed to Identified Problems
- a. Management failed to ensure assignment of technically qualified audit team members to the small bore piping site - design - program audits.

- b. Primary QC Inspectors lacked adequate training and/or experience.
- c. There was inadequate communication between QC managers, field engineering management, and craft supervision.
- d. Programmatic action was not sufficient to identify and control alterations to pipe support systems subsequent to acceptance by QA/QC organizations.

4. Positive Comments

Approximately 100 installed components in the auxiliary building were observed by the inspectors. No significant deficiencies were noted other than the seven identified hangers reported in 2.a. and 2.b. above. In spite of the deficiencies noted, the review indicated that the methodology of the design, installation and QC inspection was acceptable. The licensee has agreed to take corrective actions for problems identified.

QA/QC Program Assessment

1. Scope of Areas Reviewed

- a. Nonconformance Reports for timeliness, adequacy, and engineering evaluation.
- b. The revised QA/QC program and its implementation.

2. List of Problems Identified

- a. A large number of NCR's, written against the reactor coolant pumps during the past two years, indicate a trend which has not been adequately addressed.
- b. The technical resolution of some of the NCR's written by Bechtel and B&W involving installation discrepancies on the core barrel assembly, testing loads, and damaged threads on a motor stand were not adequately documented.

3. Weakness in Management Controls that Contributed to Identified Problems

The licensee was closing out nonconformance reports in some instances without adequate engineering evaluations.

4. Positive Comments

- a. The organizational changes reported by the licensee to the NRC over the past two years were in place and were judged to be effective.
- b. There has been a significant reduction in the time required for the complete resolution of nonconformance reports over the past 10 months.
- c. Generally the nonconformance reports processed recently are more responsive to the controlling procedures.

Civil

1. Scope of Areas Reviewed

A cross-section of past, present and planned civil activities including:

- a. Quality assurance.
- b. Trend Analysis and Evaluations.
- c. Nonconformance Report Review.
- d. Design control of block walls.
- e. Overinspection plans and implementation.
- f. Permanent dewatering system.
- g. Procurement of materials.
- h. Previously identified NRC items.
- i. Quality assurance audits.
- j. Project Quality Control Instructions (PQCI's).

2. List of Problems Identified

- a. The civil QA group is not adequately staffed with sufficient experience, capability, and number for the planned complex remedial soils and foundations corrective actions.
- b. The evaluation of adverse trends was insufficient to the extent that the root cause and needed corrective actions were not identified.

- c. Eighteen (18) repetitive NCR's on passing QC inspection hold points for installation of concrete expansion anchors were included in the trend analysis. However, adequate corrective action was not taken. The site QA manager issued a Stop Work Order as a result of this NRC finding.

3. Weakness in Management Controls that Contributed to Identified Problems

Insufficient determination of the significance of adverse trends.

4. Positive Comments

- a. QA staff has sufficient involvement with day to day issues, and adequately participated in resolution of nonconformances.
- b. The inspection indicated that the following areas were being adequately controlled by the licensee in the civil area:
 - . Design Control of block walls
 - . Implementation of overinspection plan
 - . Quality Assurance Audits
 - . Procurement of Material
 - . Utilization of Project Quality Control Instructions
- c. The licensee has taken timely and comprehensive action to correct areas addressed on previous NRC inspections.

Electrical

1. Scope of Areas Reviewed

- a. Quality Assurance Records
- b. Quality Assurance Implementing Procedures
- c. Quality Control Personnel - Qualification
- d. Visual Inspection of Electrical Work Activities - Terminations
- e. Licensee Actions on Previously Identified Items

2. List of Problems Identified

- a. Quality Control inspection of May 12, 1981, failed to identify minimum bend violations of Class IE cable.
- b. The licensee failed to take corrective actions to audit findings of April 3, 1980 and January 27, 1981, which identified the practice of reworking raceway without approved procedures.
- c. The amount of training which certain Quality Control personnel are receiving before they are certified as inspectors is not sufficient.

- d. CPC Testing Personnel were de-terminating and re-terminating electrical cables without an approved inspection plan. Testing personnel were performing their own QC functions.

3. Weakness in Management Controls that Contributed to Identified Problems

Identification of the root causes for repeated nonconforming conditions had not been performed.

4. Positive Comments

- a. The licensee has taken timely and comprehensive actions to correct areas addressed on previous NRC inspections.
- b. The Quality Assurance (electrical) organization appears to be strong and capable. Personnel interviewed indicated that management is responsive to their recommendations and that improvement has been noted in responses to Quality Action Requests.
- c. The program and its implementation regarding calibration of termination tools is satisfactory.