



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

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DEP. EX. NO. 7
FOR ID. AS OF 1/6/81

October 18, 1979

MEMORANDUM FOR: R. C. Knop
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FROM: G. Fiorelli, Chief, Reactor Construction and Engineering Support Branch

SUBJECT: MIDLAND CONSTRUCTION STATUS REPORT AS OF OCTOBER 1, 1979

The attached report was finalized based on your feedback requested in my memo of October 5, 1979. If you still feel adjustments are necessary please contact me. If you consider the report characterizes your current assessment of the Midland project, please concur and pass it along promptly.

G. Fiorelli
G. Fiorelli, Chief
Reactor Construction and
Engineering Support Branch

Enclosure: As stated

cc: J. G. Keppler

MIDLAND SUMMARY REPORT UPDATE

Facility Data

Docket Number	- 50-329 and 50-330
Construction Permits	- CPPR-81 and CPPR-82
- Permits Issued	- December 14, 1972
Type Reactor	- PWR; Unit 1, 492 MWe*; Unit 2, 818 MWe
NSSS	- Babcock and Wilcox
Design/Constructor	- Bechtel Power Corporation
Fuel Load Dates	- Unit 1, 4/82; Unit 2, 11/81
Status of Construction	- Unit 1, 54%; Unit 2, 61%; Engineering 82%

*Approximately one-half the steam production for Unit 1 is dedicated, by contract, to be supplied to Dow Chemical Corporation, through appropriate isolation heat exchangers.

Chronological Listing of Major Events

July 1970	Start of construction under exemption
9/29-30 & 10/1/70	Site inspection, four items of noncompliance identified, extensive review during CP hearings
1971 - 1972	Plant in mothballs pending CP
12/14/72	CP issued
9/73	Inspection at Bechtel Ann Arbor offices, five items of noncompliance identified
11/73	Inspection at site, four items of noncompliance identified (cadweld problem) precipitated the Show Cause Order
12/29/73	Licensee answers Show Cause Order commits to improvements on QA program and QA/QC staff
12/3/73	Show Cause Order issued suspending cadwelding operation
12/6-7/73	Special inspection conducted by RIII and HQ personnel
12/17/73	Show Cause Order modified to allow cadwelding based on inspection findings of 12/6-7/73

8/21/75 CP reported that 42 sets of #6 tie bars were missing in Auxiliary Building

3/22/76 CP reported that 32 #8 rebar were omitted in Auxiliary Building. A stop-work order was issued by CP

3/26/76 RIII inspector requested CP to inform RIII when stop-work order to be lifted and to investigate the cause and the extent of the problem. Additional rebar problems identified during site inspection by NRC

3/31/76 CP lifted the stop-work order

4/19 thru 5/14/76 RIII performed in-depth QA inspection at Midland

5/14/76 RIII management discussed inspection findings with site personnel

5/20/76 RIII management meeting with CP President, Vice President, and others.

6/7 & 8/76 RIII follow up meeting with CP management and discussed the CP 21 correction commitments

6/1-7/1/76 Overall rebar omission reviewed by R. E. Shewmaker

7/28/76 CP stops concrete placement work when further rebar placement errors found by their overview program. PN-III-76-52 issued by RIII

8/2/76 RIII recommends HQ notice of violation be issued

8/9 - 9/9/76 Five week full-time RIII inspection conducted

8/13/76 Notice issued

10/29/76 CP responded to HQ Notice of Violations

12/10/76 CP revised Midland QA program accepted by NRR

2/28/77 Unit 2 bulge of containment liner discovered by licensee

4/19/77 Tendon sheath omissions of Unit 1 reported

4/29/77 IAL issued relative to tendon sheath placement errors

5/5/77 Management meeting at CP Corporate Office relative to IAL regarding tendon sheath problem

12/5/75 CP reported that rebar spacing out of specification 50
locations in Unit 2 containment

3/5 & 10/75 CP reported that 63 #6 rebar were either missing or
misplaced in Auxiliary Building

3/12/75 RIII held management meeting with CP

5/24/77 Special inspection by RIII, RI and HQ personnel to determine adequacy of QA program implementation at Midland site.

6/75 - 7/77 Series of meetings and letters between CP and NRR on applicability of Regulatory Guides to Midland. Commitments by CP to the guides was responsive.

7/24/78 Construction resident inspection assigned.

8/21/78 Measurements by Bechtel indicate excessive settlement of Diesel Generator Building. Officially reported to RIII on September 7, 1978.

17/78 - 1/79 Special investigation/inspection conducted at Midland sites, Bechtel Ann Arbor Engineering offices and at CP corporate offices relative to Midland plant fill and Diesel Generator building settlement problem.

2/7/79 Corporate meeting between RIII and CPC to discuss project status and future inspection activities. CPC informed construction performance on track with exception of diesel/fill problem.

2/23/79 Meeting held in RIII with Consumers Power to discuss diesel generator building and plant area fill problems.

3/5/79 Meeting held with CPC to discuss diesel generator building and plant area fill problems.

3/21/79 10 CFR 50.54 request for information regarding plant fill sent to CPC by NRR.

5/5/79 Congressman Albosta and aides visited Midland site to discuss TMI effect on Midland.

5/8-11/79 Mid-QA inspection conducted.

Significant Major Events

Past Problems

1. Cadweld Splicing Problem and Show Cause Order

A routine inspection, conducted on November 6-8, 1973, as a result of intervenor information, identified eleven examples of four noncompliance items relative to rebar Cadwelding operations. These items were summarized as: (1) untrained Cadweld inspectors; (2) rejectable Cadwelds accepted by QC inspectors; (3) records inadequate to establish cadwelds met requirements; and (4) inadequate procedures.

As a result, the licensee stopped work on cadweld operations on November 9, 1973 which in turn stopped rebar installation and concrete placement work. The licensee agreed not to resume work until the NRC reviewed and accepted their corrective action. However, Show Cause Order was issued on December 3, 1973, suspending Cadwelding operations. On December 6-7, 1973, RIII and HQ personnel conducted a special inspection and determined that construction activity could be resumed in a manner consistent with quality criteria. The Show Cause Order was modified on December 17, 1973, allowing resumption of Cadwelding operations based on the inspection results.

The licensee answered the Show Cause Order on December 29, 1973, committing to revise and improve the QA manuals and procedures and make QA/QC personnel changes.

Prehearing conferences were held on March 28 and May 30, 1974, and the hearing began on July 16, 1974. On September 25, 1974, the Hearing Board found that the licensee was implementing its QA program in compliance with regulations and that construction should not be stopped.

2. Rebar Omission/Placements Errors Leading to IAL

Initial identification and report of rebar nonconformances occurred during an NRC inspection conducted on December 11-13, 1974. The licensee informed the inspector that an audit, had identified rebar spacing problems at elevations 642' - 7" to 652' - 9" of Unit 2 containment. This item was subsequently reported per 10 CFR 50.55(e) and was identified as a item of noncompliance in reports Nos. 50-329/74-11 and 50-330/74-11.

Additional rebar deviations and omissions were identified in March and August 1975 and in April, May and June 1976. Inspection report Nos. 50-329/76-04 and 50-330/76-04 identified five noncompliance items regarding reinforcement steel deficiencies.

Licensee response dated June 18, 1976, listed 21 separate items (commitments) for corrective action. A June 24, 1976 letter provided a plan of action schedule for implementing the 21 items. The licensee suspended concrete placement work until the items addressed in licensee's June 24 letter were resolved or implemented. This commitment was documented in a RIII letter to the licensee dated June 25, 1976. Although not stamped as an IAL, in-house memos referred to it as such.

Rebar installation and concrete placement activities were satisfactorily resumed in early July 1976, following completion of the items and verification by RIII.

Additional action taken is as follows:

a. By the NRC

- (1) Assignment of an inspector full-time onsite for five weeks to observe civil work in progress.
- (2) IE management meetings with the licensee at their corporate offices
- (3) Inspection and evaluation by Headquarters personnel

b. By the Licensee

- (1) June 18, 1976 letter committing to 21 items of corrective action.
- (2) Establishment of an overview inspection program to provide 100% reinspection of embedments by the licensee following acceptance by the contractor QC personnel.

c. By the Contractor

- (1) Personnel changes and retraining of personnel.
- (2) Prepared technical evaluation for acceptability of each identified construction deficiency.
- (3) Improvement in their QA/QC program coverage of civil work (this was imposed by the licensee).

3. Tendon Sheath Placement Errors and Resulting Immediate Action Letter (IAL)

On April 19, 1977, the licensee reported, as a Part 50, Section 50.55(e) item, the inadvertent omission of two hoop tendon sheaths

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3. Tendon Sheath Placement Errors and Resulting Immediate Action Letter (IAL)

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from a Unit 1 containment concrete placement at elevation 703' - 7" due to having already poured concrete in an area where the tendons were to be directed under a steam line. The tendons were subsequently rerouted in the next higher concrete lift.

An IAL was issued to the licensee on April 29, 1977, which spelled out six licensee commitments for correction which included: (1) repairs and cause corrective action; (2) expansion of the licensee's QC overview program; (3) revisions to procedures and training of construction and inspection personnel.

A special QA program inspection was conducted in early May 1977. The inspection team was made up of personnel from RI, RIII and HQ. Although five items of noncompliance were identified, it was the consensus of the inspectors that the licensee's program was an acceptable program.

The licensee issued it's final report on August 12, 1977. Final review onsite was conducted and documented in report No. 50-329/77-08.

Current Problems

1. The licensee informed the RIII office on September 8, 1978, per requirements of 10 CFR 50.55(e) that settlement of the diesel generator foundations and structures were greater than expected.

Fill material in this area was placed between 1975 and 1977, with construction starting on the diesel generator building in mid-1977. Review of the results of the RIII investigation/inspection into the plant fill/Diesel Generator Building settlement problem indicate many events occurred between late 1973 and early 1978 which should have alerted Bechtel and the licensee to the pending problem. These events included nonconformance reports, audit findings, field memos to engineering and problems with the administration building fill which caused modification and replacement of the already poured footing and replacement of the fill material with lean concrete.

Causes of the excessive settlement include: (1) inadequate placement method - unqualified compaction equipment and excessive lift thickness; (2) inadequate testing of the soil material; (3) inadequate QC inspection procedures; (4) unqualified quality control inspectors and field engineers; (5) over reliance on inadequate test results.

The proposed remedial work and corrective action are as follows:

- (1) Diesel Generator Building - apply surcharge load in and around building to preconsolidate the foundation material. Continue to monitor soil response to predict long-term settlement.
- (2) Service Water Pump Structure - Install piles to hard glacial till to support that portion of the structure founded on plant fill material.
- (3) Tank farm - Fill has been determined to be suitable for the support of Borated Water Storage Tanks. Tanks are to be constructed and hydro tested while monitoring soil response to confirm support of structures.
- (4) Diesel Oil Tanks - No remedial measure; backfill is considered adequate.
- (5) Underground Facilities - No remedial work is anticipated with regards to buried piping.
- (6) Auxiliary Building and F. W. Isolation Valve Pits - Installed a number of caissons to glacial till material and replace soil material with concrete material under valve pits.
- (7) Dewatering System - Installed site dewatering system to provide assurance against soil liquidification during a seismic event.

The above remedial measures were proposed to the NRC staff on July 18, 1979. No endorsement of the proposed actions have been issued to the licensee to date. The licensee is proceeding with the above plans.

The NRC activities, to date, include:

- a. Lead technical responsibility and program review was transferred to NRR from IE by memo dated November 17, 1978.
- b. Site meeting on December 3-4, 1978, between NRR, IE, Consumers Power and Bechtel to discuss the plant fill problem and proposed corrective action related to the Diesel Generator Building settlement.
- c. RIII conducted an investigation/inspection relative to the plant fill and Diesel Generator Building settlement. Findings are contained in Report 50-329/78-20; 330/78-20 dated March 1979.
- d. NRC/Consumers Power Company/Bechtel meetings held in RIII office to discuss finding of investigation/inspection of site settlement (February 23, 1979 and March 5, 1979).

- e. NRC issue of 10 CFR 50.54(f) regarding plant fill dated March 21, 1979.
- f. Several inspections of Midland site settlement have been performed.

The Constructor/Designer activities include:

- a. Issued NCR-1482 (August 21, 1978)
 - b. Issued Management Corrective Action Report (MCAR) No. 24 (September 7, 1978)
 - c. Prepared a proposed corrective action option regarding placement of sand overburden surcharge to accelerate and achieve proper compaction of diesel generator building sub-soils.
 - d. Issued 10 CFR 50.55(e) interim report number 1 dated September 29, 1978.
 - e. Issued interim report No. 2 dated November 7, 1978.
 - f. Issued interim report No. 3 dated June 5, 1979.
 - g. Issued interim report No. 4 dated February 23, 1979
 - h. Issued interim report No. 5 dated April 30, 1979
 - i. Responded to NRC 10 CFR 50.54(f) request for information onsite settlement dated April 24, 1979. Subsequent revision 1 dated May 31, 1979, revision 2 dated July 9, 1979 and revision 3 dated September 13, 1979.
 - j. Meeting with NRC to discuss site settlement causes and proposed resolution and corrective action taken dated July 18, 1979. Information discussed at this meeting is documented in letter from CPCo to NRC dated August 10, 1979.
 - k. Issued interim report No. 6 dated August 10, 1979
 - l. Issued interim report No. 7 dated September 5, 1979
2. Review of Quality Documentation to Establish Acceptability of Equipment

The adequacy of engineering evaluation of quality documentation (test reports, etc.) to determine if the documentation establishes that the equipment meets specification and environmental requirements is of concern. The licensee, on November 13, 1978, issued a construction deficiency report (10 CFR 50.55(e)) relative to this matter. An interim report dated November 18, 1978 was received

and stated Consumers Power was pursuing this matter not only for Bechtel procured equipment but also for NSS supplied equipment.

3. Source Inspection to Confirm Conformance to Specifications

The adequacy of equipment acceptance inspection by Bechtel shop inspectors has been the subject of several noncompliance/nonconformance reports. Consumers Power has put heavy reliance on the creditability of the Bechtel vendor inspection program to insure that only quality equipment has been sent to the site. However, the referenced nonconformance reports raise questions that the Bechtel vendor inspection program may not be effectively working in all disciplines for supplied equipment. Some significant examples are as follows:

- (1) Decay heat removal pump being received with inadequate radiography. The pumps were returned to the vendor for re-radiography and repair. The pumps were returned to the site with one pump assembled backwards. This pump was again shipped to the vendor for reassembly. CPCo witnessed a portion of this reassembly and noted in their audit that some questionable techniques for establishing reference geometry were employed by the vendor. The pumps had been shop inspected by Bechtel.
- (2) Containment personnel air lock hatches were received and installed with vendor supplied structural weld geometry which does not agree with manufacturing drawings. The personnel air lock doors had been vendor inspected.
- (3) Containment electrical penetrations were received and installed with approximately 25% of the vendor installed terminations showing blatant signs of inadequate crimping. These penetrations were shop inspected by 3 or 4 Bechtel supplier quality representatives (vendor inspectors).
- (4) 350 MCM, 3 phase power cable was received and installed in some safety related circuits with water being emitted from one phase.
- (5) A primary coolant pump casing was received and installed without all the studs in one casing stud hole being intact. The casings were vendor inspected by both Bechtel and B&W.

Additional IE inspections will be conducted to determine if CP has thoroughly completed an overview of the Bechtel shop inspector's function and that equipment already purchased has been reviewed to confirm it meets requirements.

4. "Q" List Equipment

- (1) There have been instances wherein safety related construction components and their installation activities have not ~~been~~ identified on the "Q" list.

This shortcoming could have affected the quality of work performed during fabrication due to the absence of quality controls identified with "Q" list items. Examples of non-"Q" list activities identified which should be "Q" listed include:

Cable Trays

Components of Heating and Ventilation System

- The licensee will be advised to review past as well as future construction activities to confirm that they were properly defined as "Q" list work or components.

5. Management Controls

- a. Throughout the construction period CPCo has identified some of the problems that have occurred and reported them under the requirements of 10 CFR 50.55(e). Management has demonstrated an openness by promptly identifying these problems. However, CPCo has on repeated occasions not reviewed problems to the depth required for full and timely resolution. Examples are:

Rebar omissions (1974)

Tendon sheath location error (1977)

Diesel generator building settlement (1978)

Containment personnel access hatches (1978)

In each of the cases listed above the NRC in it's investigation has determined that the problem was of greater significance than first reported or the problem was more generic than identified by CPCo.

This incomplete wringing out of problems identified has been discussed with CPCo on numerous occasions in connection with CPCo's management of the Midland project.

- b. There have been many cases wherein nonconformances have been identified, reviewed and accepted "as is." The extent of review given by the licensee prior to resolving problems is currently in progress. In one case dealing with the repair of airlock hatches, a determination was made that an incomplete engineering review was given the matter.

Inspection History

The construction inspection program for Midland Units 1 and 2 is approximately 60% complete. This is consistent with status of construction of the two units. (Unit 1 - 54%; Unit 2 - 61%). The licensee's QA program has repeatedly been subject to in-depth review by IE inspectors. The following highlight these inspections.

1. July 23-26, and August 8-10, 1973, inspection report Nos. 50-329/73-06 and 50-330/73-06: A detailed review was conducted relative to the implementation of the Consumers Power Company's QA manual and Bechtel Corporation's QA program for design activities at the Bechtel Ann Arbor office. The identified concerns were reported as discrepancies relative to the Part 50, Appendix B, criteria requirements.

2. September 10-11, 1973 report Nos. 50-329/73-08 and 50-330/73-08: A detailed review of the Bechtel Power Corporation QA program for Midland was performed. Noncompliances involving three separate Appendix B criteria with five different examples, were identified.
3. February 6-7, 1974, report Nos. 50-329/74-03 and 50-330/74-03: A followup inspection at the licensee's corporate office, relative to the items identified during the September 1973 inspection (above) along with other followup.
4. June 16-17, 1975, report Nos. 50-329/75-05 and 50-330/75-05: Special inspection conducted at the licensee's corporate office to review the new corporate QA program manual.
5. August 9 through September 9, 1976, report Nos. 50-329/76-08 and 50-330/76-08: Special five-week inspection regarding QA program implementation onsite primarily for rebar installation and other civil engineering work.
6. May 24-27, 1977, report Nos. 50-329/77-05 and 50-330/77-08: Special inspection conducted at the site by RIII, IE AND RI personnel to examine the QA program implementation onsite by Consumers Power Company and by Bechtel Corporation. Although five examples of noncompliance to Appendix B, Criterion V, were identified, the consensus of the inspectors involved was that the program and its implementation for Midland was considered to be adequate.
7. May 8-11, 1979, a mid-construction QA inspection covering purchase control and inspection of received materials design control and site auditing and surveillance activities was conducted by a team of inspectors. While some items will require resolution, it was concluded the program was adequate.

The licensee's Quality Assurance program has undergone a number of revisions to strengthen it's provisions. The company has expanded it's QA/QC auditing and surveillance coverage to provide extensive overview inspection coverage. This was done in 1975 with a commitment early in their experience with rebar installation problems and was further committed by the licensee in his letter of June 18, 1976, responding to report Nos. 50-329/76-04 and 50-330/76-04. This overview inspection activity by the licensee has been a positive supplement to the constructor's own program, however, currently our inspectors perceive the overview activities cover a small percentage of the work in some disciplines. This has been brought to the licensee's attention who has responded with a revised overview plan. RIII inspectors are reviewing the plan as well as determining it's effectiveness through observation of construction work. A specific area brought to the attention of the licensee was the lack of overview in the instrumentation installation area. The licensee has responded to this matter with increased staff and this item is under review by RIII inspectors.

The RIII office of inspection and enforcement instituted an augmented onsite inspection coverage program during 1974, this program has continued in effect until the installation of the resident inspector in July 1978.

Enforcement History

a. Noncompliance Statistics

Year	Number of Noncompliances	Number of Inspections	Inspector Hours Onsite
1976	14	9	646
1977	5	12	648
1978	18	23	1180
*1979 to date	7	18	429

A resident inspector was assigned to the Midland site in July 1978. The onsite inspection hours shown above does not include his inspection time.

*Through August 1979

- b. An investigation of the current soils placement/diesel generator building settlement problem has revealed the existence of a material false statement. Issuance of a Civil Penalty is currently being contemplated.

Summary and Conclusions

Since the start of construction Midland has experienced some significant problems resulting in enforcement action. These actions are related (1) to improper placement, sampling and testing of concrete and failure of QA/QC to act on identified deficiencies in September 1970; (2) to drawing control and lack of or inadequate procedures for control of design and procurement activities at the Bechtel Engineering offices in September 1973; (3) to inadequate training, procedures and inspection of cadweld activities in November 1973; (4) to a series of RIII in-depth QA inspections and meetings which identified underlying causes of weakness in the Midland QA program implementation relative to embedments in April, May and June 1976. (The noncompliance items identified involved inadequate quality inspection, corrective action, procedures and documentation, all primarily concerned with installation of reinforcement steel); (5) to tendon sheath omissions in April 1977; and (6) to plant soil foundations and excessive settlement of the Diesel Generator Building relative to inadequate compacted soil and inspection activities in August 1978 through 1979.

Following each of these problem periods, the licensee has taken action to correct the problems and to upgrade his QA program and QA/QC staff. The most prominent action has been an overview program which has been steadily expanded to cover safety related activities.

The evaluation both by the licensee and IE of the structures and equipment affected by these problems (again except the last) has established that they fully meet design requirements.

Looking at the underlying causes of these problems two common threads emerge: (1) utilities historically have tended to over rely on A-E's (in this case, Bechtel) and (2) insensitivity on the part of both Bechtel and Consumers Power 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.

Admittedly construction deficiencies have occurred which should have been identified earlier but the licensee's QA program has ultimately identified and subsequently, corrected or in process of correcting these deficiencies

The RIII inspectors believe that continuation of (1) resident site coverage, (2) the licensee overview program, (3) the licensee's attention and resolution of identified problems in this report, (4) ceasing to permit work to continue when quality related problems are identified with construction activities and (5) a continuing inspection program by regional inspectors will provide adequate assurance that construction will be performed in accordance with requirements and that any significant errors and deficiencies will be identified and corrected.