

Stephen H. Howell Senior Vice President

General Offices: 1945 West Parnall Road, Jackson, Michigan 49201 + (517) 788-0453

March 3, 1980 Howe-51-80

Mr J G Keppler, Regional Director Office of Inspection and Enforcement US Nuclear Regulatory Commission Region III 799 Roosevelt Road Glen Ellyn, IL 60137

MIDLAND NUCLEAR PLANT UNIT NO 1, DOCKET NO 50-329 UNIT NO 2, DOCKET NO 50-330 UNIT NO 1, REACTOR VESSEL BROKEN ANCHOR BOLT

References: Letter, S H Howell to J G Keppler; Midland Nuclear Plant; Unit No 1, Docket No 50-329; Unit No 2, Docket No 50-330; Unit No 1 Reactor Vessel Broken Anchor Bolt;

- 1) Howe-311-79; dated December 14, 1979
- 2) Howe-267-79; dated October 12, 1979

This letter, as were the referenced letters, is an interim 50.55(e) report concerning broken anchor bolts in the Unit 1 reactor vessel support skirt flange. The enclosure to this letter provides a status of the actions being taken to resolve this condition.

Another report, either interim or final, will be sent on or before May 1, 1980.

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- Enclosure: Broken Reactor Vessel Anchor Bolt in Unit 1 Status Report, MCAR-37, Interim Report #1, dated February 20, 1980.
- CC: Director of Office of Inspection & Enforcement Att Mr Victor Stello, USNRC (15)

Director, Office of Management Information & Program Control, USNRC (1)

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Enclosure to Howe-51-80

Bechtel Associates Professional Corporation

SUBJECT:

MCAR 37 (issued 12/28/79)

Broken Reactor Vessel Anchor Stud in Unit 1

INTERIM REPORT 1

DATE: February 20, 1980

PROJECT: Consumers Power Company Midland Plant Units 1 & 2 Bechtel Job 7220

Discrepancy

The discrepancies discussed in this report are the failed reactor vessel anchor studs in Unit 1. Status Reports 1 and 2. on the first failed stud are contained as attachment to this report.

Background

The anchor study in question are 2-1/2 inches in nominal diameter and 7 feet 4 inches long, embedded vertically in the reinforced concrete reactor vessel pedestal (Figure 1). There is a total of 96 studs per reactor vessel as shown in Figure 2. The study extend approximately 15 inches out of the concrete to bolt the reactor vessel skirt flange to the foundation structure. All the studs were purchased to a modified version of ASTM A 354-66, Grade BD standards by Bechtel. The modification was a waiver of the maximum diameter allowed in the 1966 version for Grade ED bolts. Each stud was preloaded to an initial nominal stress of 75 ksi in the shank region (A = 4.9 square inches except where the shank diameter was reduced to the equivalent effective thread area) before relaxation losses are taken into account. Design calculations indicate that the prestress force should have been computed on the basis of effective tensile area (A = 4.0 square inches). The result was a higher than planned preload (92 ksi versus 75 ksi), but the resultant stresses remained well under the design allowable stress of the material, which is 105 ksi.

The anchor studs were purchased from Mississippi Valley Structural Steel (MVSS) of St. Louis, Missouri. All material for the Unit 1 failed studs was supplied from Bethlehem Steel, fabricated by Southern Bolt and Fastener (SB&F) of Shreveport, Louisiana, and heat treated by J.W. Rex of Lansdale, Pennsylvania.

These studs were received on site by Bechtel in early 1976, embedded in April 1977 by Bechtel, and tensioned in late July 1979 by Babcock & Wilcox Construction Company (B&W CC), subcontractor to Bechtel, as part of its responsibility for installation of the nuclear steam supply system. The failure of the first stud was discovered on September 14, 1979. Failure of the second and third studs was reported on December 20, 1979, and February 5, 1980, respectively. The locations of these studs are shown in Figure 2. Based on an ultrasonic test, it is presently believed

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the third stud failed in the lower portion of the shank or in the lower threaded area. This stud will not be removed until the Unit 1 studs are detensioned.

Investigative Action

Records pertinent to the purchase of the reactor vessel anchor studs have been reviewed by Bechtel and Consumers Power Company. Unresolved questions from this review were sent to the vendor for clarification and a meeting subsequently took place on February 14, 1980, in Shreveport, Louisiana with MVSS, SB&F, Bechtel, CPCo, and the NRC. Review of records for other structures on the Midland project utilizing high-strength, low-alloy steel bolting material is currently underway pending determination of the root cause of the failures.

Bechtel has contracted with Teledyne Engineering Services of Waltham, Massachusetts to conduct a failure mechanism investigation. This investigation has, to date, included laboratory testing of the broken portions of the first two failed studs and field hardness testing of all remaining reactor vessel anchor studs. The report from this investigation is attached.

The tensioning procedure prepared by B&W CC has been reviewed by Bechtel and no inconsistency, other than the previously mentioned prestress level, has been identified.

Preventive Action

Preliminary analysis of the test data indicates that the studs were rendered susceptible to failure by excessive hardness. All the anchor studs for the Unit 1 reactor vessel will be detensioned to prevent any further breakage of studs, taking due care for personnel safety. The pretension of the studs in Unit 2 will be lowered to the intended design value of 75 ksi on the effective tensile stress area of 4.0 square inches. The actual tension in the studs will be determined by lift-off force during detensioning.

Corrective Action

Possible corrective action is currently being evaluated.

Safety Implications

This deficiency, if uncorrected, could adversely affect the safety of operations of the Midland plant at any time throughout the expected life of the plant.

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Reportability

This condition was reported by CPCo to the NRC under 10 CFR 50.55(e) on September 14, 1979.

Submitted by: Conig boynki Approved by: Ellelafatillacons Concurrence by: Ellelafatillacons

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Attachments: Status Reports 1 and 2(*)

*CPCO NOTE:

The information in these reports was included in the interim 50.55(e) reports provided by letters Howe-267-79 and Howe-311-79. Therefore, they have not been included in this interim 50.55(e) report.



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