

REGULATORY

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Consumers
Power
Company

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February 10, 1976

Director of Nuclear Reaction Regulation
Attention: Mr. Roger Boyd, Acting Director
Division of Reactor Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555



MIDLAND PROJECT
DOCKET NUMBERS 50-329, 50-330
REGULATORY GUIDE MEETINGS
FILE: 0505 SERIAL: 2141

The enclosed information completes the response to Mr. A. Schwencer's
January 26, 1976 letter regarding implementation of Regulatory Guide
1.94 for the Midland Plant.

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Project Engineer

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THE APPLICANT'S RESPONSE
TO NRC COMMENTS ON
CONSUMERS' REGULATORY GUIDE 1.94 POSITION

1. Definition of Sample Point and In-Process Tests for Concrete

Staff Comment: "All sampling should be after final mixing but before discharge to the forms, conveyor or pump. Where pumping is used, a correlation program should be employed as well."

Response:

For the Midland Project, the concrete receives its final mix at the central batch plant, and is transported by agitator trucks to the final conveying system.

The sampling point for the compressive strength test cylinders is from the discharge of the central batch plant stationary mixer, based on the following:

ANSI N45.2.5 Section 4.8 states that "Samples for inprocess tests shall be taken at the Sampling Point in accordance with ASTM C-172."

ASTM C-172, Section 2, Note 3, reads: "Sampling should normally be performed as the concrete is delivered from the concrete mixer to the conveying vehicle used to transport the concrete to the forms." ASTM C-172, Paragraph 3.2.1 entitled Sampling from Stationary Mixers Except Paving Mixers, gives explicit instructions for stationary mixer sampling.

Compressive strength test cylinders are cast from representative samples taken from the discharge of the batch plant stationary mixer in accordance with Paragraph 3, ASTM C-172. Slump, air content, unit weight and temperature of the concrete will be recorded when cylinders are being cast. For purposes of correlation, cylinders will also be cast from a sample taken at the transport discharge of the same batch from which a sample was taken at the stationary mixer. After correlation has been established, correlation cylinders are continued on a periodic basis to verify the correlation.

The conveying vehicle is defined as an agitator truck. The drums are turned at agitating speeds and not at mixing speed, because the concrete is completely mixed before being loaded as evidenced by the mixer uniformity tests of ASTM C-94.

Concrete samples from the batch plant mixer allow for better control of preparing samples, as well as less disturbance of cylinders from preparation through initial curing.

The sampling point for final acceptance of air content, slump and temperature is at the truck discharge except for concrete conveyed by pump. Pumped concrete is sampled at the pump line discharge.

The production control for air content, slump and temperature can be at the batch plant discharge or truck discharge provided that a correlation program is developed as recommended by ACI/304 Paragraph 9.7. The correlation program compares the test results for the same batch between the batch discharge and truck or pump discharge.

2. Qualification Tests for Liquid Membrane Curing Compound

Staff Comment: "In the absence of justification to the contrary, such qualification testing should be performed in accordance with ASTM C-309."

Response:

Qualification tests shall be performed by the manufacturer in accordance with the Regulatory Guide.

3. Concrete Placement

Staff Comment: "No justification has been given for the proposed use of outdated specifications. Future construction practice should use ACI 309-72."

Response:

ACI 309-72 was incorporated into the Construction Specification in 1973, subject to the use of the existing equipment, and the standard practice of depositing concrete in 24 inch lifts.

Alternate to Equipment Requirements

The project concrete placement specification was written in 1970, and based on the then current ACI Committee 609 report. The equipment currently in use on the project was purchased in accordance with the ACI Committee 609 report, and has been maintained in conformance with it to date. Field inspection of concrete placements and concrete cores indicate satisfactory concrete consolidation has occurred. We therefore see no sound reason to justify the replacing of the project equipment to meet the recommendations of ACI 309-72, and discarding equipment that is currently performing in a satisfactory manner.

Alternate to Lift Thickness Requirements

ACI 309-72 Section 7.1 states: "The concrete should normally be deposited in layers 12 to 18 inches (30 to 45 cm) thick (depending on the length of the vibrator head and other factors)."

Other ACI specifications and recommendations for lift thickness are as follows:

1. ACI 301-72 Chapter 8 on "Placing," Section 8.3.1 states: "Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section."
2. ACI 301-72 Chapter 14 on "Massive Concrete," Section 14.4.3 states: "Concrete shall be placed in layers approximately 18 in. thick."
3. ACI 301-72 Section 8.3 references ACI 304 for detailed recommendations for depositing concrete. ACI 304-73 Chapter 6, Section 6.1 states: "It (concrete-ed.) should be placed in horizontal layers not exceeding 2 ft. (60 cm) in depth, avoiding inclined layers and cold joints."

The project construction specifications require that concrete be placed in horizontal layers "of not greater depth than 24 inches so that satisfactory consolidation can be achieved with vibrators." Field inspections of concrete placements and concrete core samples indicate satisfactory consolidation and placement of concrete has occurred. By combining the foregoing requirements and other related factors (concrete mix consistency, and results of field inspection), the use of lifts not exceeding 24 inches is in accordance with ACI specifications.

4. In-Process Tests

Staff Comment: "See (1) above."

No response required

5a) Mixer Uniformity

Staff Comment: "The NRMCA procedure does not require the use of ASTM C-94. The guide should be followed."

Response:

The central batch plant will be inspected every 6 months in accordance with ASTM C-94.

5b) Air Content

Staff Comment: "The guide requirements should govern. WASH-1309 should be amended to conform."

Response:

Air content will be tested for the first batch produced each day and every 50 cubic yards placed thereafter, thus complying with Regulatory Guide requirements.

5c) Compressive Strength of Grout

Staff Comment: "The guide provisions should be followed."

Response:

We propose the following alternate to the Regulatory Guide position:

Testing of Grout

1. Batch Plant Mixed Grout

The specifications require that each class of concrete has a companion grout mixture for use on construction joints, buttering pump lines and such other applications as shown on the drawings. The grout mix is specified to be the 3/4 inch max. size aggregate concrete with the 3/4 inch aggregate removed, leaving the cement, pozzolan, sand and admixtures in the same ratio as before and enough water to provide the desired consistency, but not exceeding the maximum water/(cement + pozzolan) ratio established for the concrete mix. Since this will produce a grout at least as strong as its companion concrete (due to the high cement content per cubic yard), testing of all the materials used in manufacturing grout is done as part of the concrete in process testing program, and this accomplishes satisfactory quality control of the grout.

2. Pre-mixed Grout

Factory packaged grout which requires addition of water and mixing in accordance with the manufacturer's instructions will be tested in accordance with ASTM C-109 for each lot purchased as a quality control check on the factory's production. Since the project specifications require proper storage to prevent deterioration, there is no reason to require daily testing.

5d) ii, iii and iv - Aggregate Testing for Friable Particles, Lightweight Pieces and Soft Fragments

Staff Comment: "The guide requirements are more detailed and insure better quality control. They should be followed."

Response:

The referenced tests will be performed monthly, thus conforming to Regulatory Guide requirements.

5d) i - Aggregate Finer Than 200

Staff Comment: "No reasons for deviating from the guide are presented. The guide requirements should be employed."

Response:

The test will be performed daily, thus conforming to Regulatory Guide requirements.

5d) v - Aggregate Los Angeles Abrasion Testing

Staff Comment: "Bechtel's proposal is acceptable provided the interval between tests does not exceed six (6) months."

Response:

This test will be performed every 6 months, thus conforming to Regulatory Guide requirements.

5e) Water

Staff Comment: "Sufficient justification for these exceptions has not been provided and the guide should therefore be employed. However, a test frequency of every 2500 yards is acceptable provided the interval between tests does not exceed six (6) months."

Response:

The following tests will be performed, which conform to the Regulatory Guide position.

Water and ice shall be tested every 6 months by comparing the sample water with distilled water specimens using the same cement made in accordance with the following tests:

- 1) Compressive strength, ASTM .109
- 2) Setting time, ASTM C191
- 3) Soundness, ASTM C151

The water shall be acceptable if it meets the following criteria:

- 1) C109 - The results obtained for the proposed mixing water shall not be lower by more than 10% of those obtained for distilled water.
- 2) C191 - The results obtained for the proposed mixing water shall be within + 10 minutes for initial setting time and + 1 hour for final setting time of those obtained for distilled water.
- 3) C151 - The results obtained for the proposed mixing water shall not be more than +0.10 percent above those obtained for distilled water.

5f) Admixtures

Staff Comment: "No composite testing is provided. The guide should be followed."

Response:

The manufacturer or shipper will submit an infrared spectrophotometry analysis on each shipment, thus complying with the Regulatory Guide requirements.

5g) Cement

Staff Comment: "Twelve hundred (1200) tons corresponds to approximately 1000 cubic yards. This is much more frequent than the 5000 cubic yards proposed by Bechtel. The guide should be used."

Response:

In-process testing will be performed every 1200 tons, thus complying with the Regulatory Guide requirements.

6. Qualification of Cadweld Operators

Staff Comment; "This interpretation has been agreed to in the past and continues to be acceptable."

No response required

7. Welded Reinforcing Bar Splices

Staff Comment: "AWS D12.1 provides details of the welding techniques for reinforcing steel welding but does not state the requirements for testing. The testing procedures and requirements are stated in the ACI/ASME 359. For this reason, it is suggested that the applicant comply with both documents AWS D12.1 and ACI/ASME 359."

Response:

Welding of rebars will conform to AWS D12.1-75 and ASTM Section III-2/ACI 359 Sections CC-4331 and CC-4334, thus conforming with Regulatory Guide requirements.

8. High Strength Bolting

Staff Comment: "We cannot make a final evaluation until Bechtel submits for review the quality control measures that will be followed with the use of these devices in the Midland project."

Response:

The installation and inspection of high strength bolted joints are accomplished by one of three methods. Two of these methods, i.e., automatic cut-off impact wrench, and the turn-of-the-nut method concur with ANSI N45.2.5 requirements. The third method, the use of direct tension indicators, is a new method permitted by the Errata of October 22, 1974 to the "AISC Specification for Structural Bolts Using ASTM A325 or A490 Bolts."

The quality control procedures required for the use of direct tension indicators are as follows:

- 1) To verify the load indicating qualities of the load indicators, at least three load indicators from each bag or box shall be verified in a calibration device similar to that required for wrench calibration. If nut face washers are used between the indicators and the nuts, the indicators shall be tested with washers at the rate of three washers from each bag or box. Each verification test shall show not less than the specified gap when bolt is tightened to the specified tension.
- 2) Load indicator washers shall be installed in accordance with the manufacturer's instructions. When a load indicator is required under the nut a special nut face washer shall be fitted between the indicator and the nut.
- 3) Bolted joints made with load indicators shall be inspected visually to ensure that all bolts have the load indicators properly installed and to the proper gap. At least 20 percent of the bolts in each connection but not less than two bolts shall be checked with a feeler gage to determine the bolts are properly tightened.
- 4) Direct tension indicators used with bolts that have been tightened to the full extent specified in Section 5 of the AISC Specification shall not be reused.

Concurrent with the implementation of Regulatory Guide 1.94 with the aforementioned alternatives, the applicant intends to delete direct references to ACI 301 in the Midland PSAR. Neither Regulatory Guide 1.94 or ANSI N45.2.5 reference ACI 301. ACI 301 gives general specification requirements, parts of which, upon detailed review, are not necessarily fully applicable to nuclear power plant construction. The applicant will review ACI 301 in detail and assure that each topic and item discussed in ACI 301 is appropriately addressed in the Construction Specifications, in order to assure the applicable portions of ACI 301 are implemented.

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(TEMPORARY FORM)**

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TO: Mr Boyd		ORIG one signed	CC	OTHER	SENT NRC PDR	XX	SENT LOCAL PDR
CLASS	UNCLASS XXX	PROP INFO	INPUT	NO CYS REC'D 1	DOCKET NO: <u>50-329330</u>		

DESCRIPTION:
Ltr re our 1-26-76 ltr....trans the following:

ENCLOSURES:
Response to our letter furnishing info concern
ing implementation of Reg Guide 1.94.....

(10 cys encl rec'd)

PLANT NAME: Midland 1 & 2

SAFETY	FOR ACTION/INFORMATION	ENVIRO	2-11-76	ehf
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