

50-329



DEPARTMENT OF THE ARMY

DETROIT DISTRICT, CORPS OF ENGINEERS
BOX 1027
DETROIT, MICHIGAN 48231

REPLY TO
ATTENTION OF

15 JUL 1982

NCEED-T

SUBJECT: Four Memoranda Providing Reviews of Applicant's Submissions
Regarding the Midland Nuclear Power Plant.

Mr. George Lear
U.S. Nuclear Regulatory Commission
Ch, Hydrologic & Geotech. Engrg Br.
Division of Engineering
Mail Stop P-214
Washington, DC 20555

Dear Mr. Lear:

Attached are four memoranda providing Corps of Engineers comments regarding the Applicant's submissions concerning the Midland Nuclear Power Plant. These submissions are summarized below:

<u>Submission Date</u>	<u>Topic</u>
14 May 82	Underpinning of the Auxiliary Bldg.
1 Jun 82	Settlement analysis of the D.G. Eldg.
7 Jun 82	Dewatering System Recharge Time Verification Test
7 Jun 82	Underpinning of the Auxiliary Bldg.

Sincerely,

4 Incl
As stated

P. McCallister
P. McALLISTER, P.E.
Chief, Engineering Division

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P. McCallister, P.E.
Chief, Engineering Division

SUBJECT-Midland Nuclear Power Plant - Review of the Applicant's
Submission of 14 May, 1982, pertaining to the Underpinning
of the Auxiliary Building.

1. (Review concern 4). The sketches (sk- 785 and sk- 786) furnished by the Applicant are not legible. Therefore, it is not possible to review the effectiveness of the construction dewatering wells. However, from Table-1, it is clear that most of the wells end above the proposed foundation elevation of the underpinning walls of the Control Tower (E~~el~~-562) and the Electrical Penetration Area (E~~el~~=571). Thus these wells will not be able to pump if water is encounter^{ed} in the neighborhood of the foundation elevation.
2. (Review concern-11)^{rod}. The criteria to measure the depth of voids by $\frac{1}{4}$ "x1" wooden ^{rod} is not justified. A separation of 1/16" or even less is needed to relieve the foundation soil from the building load, therefore, use^{of a} steel plate will be more realistic.
3. (Review concern-13): This change in design for the access shaft components ^{are} were not known to the Corps of Engineers. It will be helpful, if the revised pressure distribution diagrams are furnished to complete the review. The excavation behind the access shaft as shown in Attachment-6 might be filled with water thus creating considerable more pressure than normal earth pressure.
4. (Review concern-4). The explanation given by the Applicant as to the design of the initial access shaft is not clear. Removing the soil support from under the structure to relieve the surcharge load might be detrimental to the structure.

^{H.N. Singh}
H.N. SINGH, P.E.
Lead Reviewer
Midland Plant

SUBJECT: Midland Nuclear Power Plant-Review of the Applicant's Submission of June 1, 1982 (Response to the NRC staff request for settlement related analysis for the Diesel Generator Building)

1. (page 6, last para)

According to Fig. 27-10, 10CFR 50.54 (f), the Diesel Generator Building walls were completed to elevation 654 by the end of March, 1978 therefore, 'case a' analysis must include the rigidity of the structure up to elevation 654.00. The analysis performed representing a grade beam up to height 635 is not representative of ^{the} actual condition.

2. (page 7, para 1, and Fig 1-3)

Estimate of settlement for case b is not clear. Provide backup materials to evaluate the settlement.

3. (page 7, para 1, Figure 1-3)

The settlement values for ^{the} surcharge period (1/79-8/79) provided in Figure 1-3 are not consistent with those provided in Figure 27-11, 10CFR, 50.54 (f) submission. Please clarify the discrepancies.

4. (page 7, para 1)

The Applicant's statement "The comparison shows good correlation between values resulting from the finite element model and the measured values, and also for predicted settlement values" is not correct. Viewing the considerable rigidity of the structure, the discrepancies between the measured settlements and the settlements obtained from the finite element solutions as shown in Figures 1-3A, 1-3B and 1-3C are alarming.

5. (page 7, para 1)

The measurement of settlements has already shown that the building has undergone rigid body settlement as well as settlements creating curvature. It is not understood, why the Applicant keeps restating that the building will undergo mainly rigid body motion. We understand that because of the high rigidity of the structure, the magnitude of the differential settlement will be small in comparison to those of the rigid body settlement, but these small differential settlements would create very high stresses probably in ^{the} range of unacceptable levels.

6. (page 7, para 2, last sentence; Attachment I-2)

A comparison of isometric representation of Dr. Affifi's 40 years settlement values given in Figure 2 of attachment I-2 with that shown in Figure 1-3B indicates that values of Fig. 2 (attachment I-2) compare more closely to the measured values than those given in Fig. 1-3B. However, significant discrepancies still exist, and it appears reasonable to increase the lengths over which the spring values in Dr. Affifi's analysis are varied to achieve a settlement pattern comparable to the measured values. This analysis is expected to indicate further increase in the steel stresses in certain areas particularly in the footings. The Applicant should also have combined these stresses with other load combinations to verify the adequacy of structural members. It appears that stresses in the footing shown in Table 1 (Attachment I-2) when combined with the stresses due to tornado will reach the yield value of the steel.

7. (page 1 thru 8)

The Applicant's settlement data analysis does not prove that the structure has not undergone differential settlement. In any engineering activity involving measurements, some human errors are involved. This does not invalidate the results provided the work has not been carried in an unprofessional manner. If the Applicant has concluded that all of its previous measurements are incorrect, then it does not have any actual information pertaining to the settlement of the D.G. B. I do not believe the Corps of Engineers will be able to concur with the data which have been modified to suit the situation favorable to the applicant.

H.N.S. 196.
H.N. SINGH, P.E.
Lead Reviewer Midland Plant

SUBJECT - Midland Nuclear Power Plant - Review of Applicant's submission of 7 June 1982, on Permanent Dewatering System Recharge Time Verification Test.

The Corps of Engineers has reviewed the Subject Submission, and the following comments are offered:

1. (Section 3 Enclosure-1, page 1)

Drawdown phase before start of the recharge test should be identical to that which would prevail during the normal permanent dewatering period. However, from Section 3, it appears that groundwater levels around the site were lowered as low as practical with the cooling pond at Elevation 627. However, for the recharge time to be realistic, the groundwater at the site should be as high as possible consistent with 595.00 at the location where liquifaction potential exists.

2. (Section 4, para 2, page 2)

The statement made by the Applicant in the last sentence of paragraph 2 is not justified. Recharge test results for wells T-21A, CH-9A, and AX-13A appear to have started after 19 March and discontinued on 5 April or earlier, therefore, the tests were not continued long enough to justify 60 days recharge period. Further, the water level in these wells was lowered considerably below the elevation 595.00; Thus it is natural that it will take a longer period of time to reach elevation 610.00 than it would take if the recharge were started from the elevation 595.00.

H.N. Singh
H.N. SINGH, P.E.
Lead Reviewer
Midland Plant

SUBJECT: Midland Nuclear Power Plant - Review of the Applicant's Submission of 7 June, 1982 (Response to staff concerns for Underpinning of the Auxiliary Building)

(1) (page 2-6, section 6.3)

In Figure 2-6, in the area of the Main Auxiliary Building two values for Modulus of Subgrade Reaction have been shown, it is not known which value of these values has been used in the analysis.

(2) (page 2-7, section 7.1.1)

The validity of the two models stated to be used to analyse the existing stresses has not been demonstrated.

(3) (page 2-7, section 7.1.2, para 2)

Has the analysis stated to be performed according to paragraph 1 of this section considered the effect of the jacking load at the end of the EPA as stated in this paragraph? If not, what is the purpose of making this statement at this stage?

(4) (page 2-7, 2-8, section 7.1)

How are the stage construction sequences and the phase construction sequences related? Without relating the two sequences it is not possible to review this aspect of the analysis.

(5) The bottom elevations of the underpinning walls for the Control Tower shown in Figures 2-1 and 2-2 are not consistent. In Figure 2-1, it is shown as 556.00, whereas in Figures 2-2, it appears to be 662.00.

(6) The values of stresses for two conditions (after soil removed and with jacking load) for the three stages of the construction provided in Table 2-4 need more explanation. We understand that soil will be removed after transferring the load on jacks except for the 30' length at the end of the EPA's during stage-I construction. It is not understandable how the structure will remain stable without jacking and the structure could be analysed with soil removed.

(7) (page 2-8, section 7.2)

Where are the results of the analysis made to satisfy the staff concern 2b?

(8) (response to Review concern 6)

Please explain, how the loading and reloading curves obtained from the test will be utilized to determine the Modulus of Elasticity of the soil. I understand that, since the soil is not disturbed, the first loading curve will be used to determine the soil modulus.

(9) (page 6-4, para 1)

As confirmed by the borings, there is no appreciable variation in soils conditions in natural soil in the neighborhood of the proposed foundation elevation of the underpinning walls; the results of the plate-load test can be extended, without appreciable error to verify the settlement conditions of the piers and the walls which have foundation dimensions considerably larger than the plates to be used in the plate load tests.

H.N. SINGH, P.E.
Lead Reviewer
Midland Plant