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GEOTECHNICAL ENGINEERS INC.

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PRINCIPALS
DANIEL P. LA GATTA
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GONZALO CASTRO

May 12, 1982
Project 81907
File 2.0
Ref: 81907-7

Mr. Joseph Kane
Project Officer
U. S. Nuclear Regulatory Commission
Division of Engineering, M/S P-214
Washington, D.C. 20555

Subject: Review of Letter dated April 22, 1982 from J. W. Cook to H. R. Denton on Respnse to NRC request for additional information on Borated Water Storage Tank and Service Water Pump Structure

Dear Mr. Kane:

In accordance with your request we have prepared Enclosure (1). For each geotechnical issue relating to the Service Water Pump Structure in the subject letter, we have indicated whether or not the issue is resolved and, if not the additional information that is needed.

Sincerely yours,

GEOTECHNICAL ENGINEERS INC.

Steve J. Poulos
Principal

SJP:ms
Encl.
cc: Mr. Reuben Samuels
Mr. Hari Singh

Incl. 5

E/16

8 Max rebar stress at El 620

By others

9 Max rebar stress at critical elements

By others

10 Out of plane shear

By others

11 Critical elements

By others

12 Interaction with CWPS, EDB, and Retaining Wall

By others

13 Bearing stratum acceptance

Remove the word "solely" in 5th line (p. 10). Remove the word "generally" from the 2nd line of 2nd paragraph on p. 11. Add that the correlation between the pier or plate load test results and the penetration tests done on the soil at the base of the pier or plate load test will be used to correct the correlation chart and to judge suitability of bearing stratum. The zone of influence shall be defined by lines extending at a 1H to 1V slope in cohesive soil. If soil is cohesionless, a braced excavation shall be used if the excavation must proceed more than 6 in. below adjacent pier. Movements of adjacent pier shall be monitored as the excavation to 18 in. or less is made. Excavation shall be stopped and construction procedure altered (use braced excavation) if movements are larger than expected.

14 Pile load test procedures

Use a maximum stress of 1.3 times maximum design stress on pier base. Use plywood covered with asphalt or similar procedure to ensure that skin friction is negligible.

Plate load test on 18-in.-dia. or larger plate at bottom of pier would be acceptable in lieu of pier load test. This approach would allow higher test load on bearing stratum.

If dense sandy alluvium is used as bearing stratum, make pier or plate load test on it also.

Carry out 5 to 10 cone penetration tests on bearing stratum that is tested with pier or plate load test. Measurement of in situ density is also desirable.

Carlson cells as located do not appear to give enough information to calculate stress on the bearing stratum. Thus, skin friction should be made negligible, as noted above.

Design load should be held until settlement is 0.003 in./hr or less.

15 and 16 Strain monitoring criteria, matrix.

Satisfactory except as noted under Confirmatory Issue 3.

17 Critical stages of construction

Use benchmark readings (vertical differential settlement) as control rather than strain gages. Ensure feedback between measurements and construction so that work is stopped immediately when movements reach limit set.

18 Contingency Plans

Comments below are on each item as numbered:

1. How can one determine if one specific well is failing?

2. Item (b) is not clear. What level will be equalized? How much time will be required for response. Is action dependent on settlement measurements being made?

3. Have all equipment on hand for carrying out techniques (a) and (b) so that time delay is only hours.

4. State limits of depth of excavation below adjacent pier. Use braced excavation if necessary. Bearing area should be increased only after consultation and approval by I & E Branch.

5. If the pier settles excessively, a review by NRC (I & E) should be required. Based on boring data, excessive pier movement would be caused by excess pier load or misinterpreted bearing stratum. Thus, a re-evaluation would be needed before proceeding.

6. Use wedges as a routine method to stop movement if jack fails.

7. If one of the northerly benchmarks is knocked out, stop work until it is functioning again.

3. Stop work first, support excavation faces carefully, then carry out the items listed.

19 Checking and adjusting jacking loads

Monitor the jacks at least at the start of every shift while piers 1, 2, and 3 are being constructed. Re-jack piers more frequently until rate of decrease of load is low enough to allow checking every shift.

Use wedges to prevent movement if jacks fail, both during pier construction and during application of final jacking loads. Control jacks by deep-benchmark settlement readings (i.e., limit the settlement to tolerance set in advance).

20 Application of final jacking load

See item 19 above. In addition, control the jacking by the vertical differential settlements as measured at the deep benchmarks. Monitor more frequently if necessary. What is the "predetermined" rate that is referred to?

21 Tunnel location

Resolved.

22 Crack repair

By others

23 Limit analysis

By others

24 Monitoring of fines

If greater than 10 ppm is retained on the 0.005 mm filter, the character of the material will be analyzed to judge whether fines are being removed that might affect the structure or the bearing capacity of the bearing stratum.

The observation wells should be changed to sensitive piezometers.

If the natural soil used as a bearing stratum is stratified with pervious layers, the bottom of the pier will blow unless the phreatic surface is below the bottom of excavation. This soil is stratified, therefore care will be needed, particularly for the first piers excavated.

GEOTECHNICAL ENGINEERS INC.

1017 MAIN STREET · WINCHESTER · MASSACHUSETTS 01890 · 617 729-1625

PRINCIPALS
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May 17, 1982
Project 81907
File 2.0
Ref: 81907-8

Mr. Joseph Kane
Project Officer
U. S. Nuclear Regulatory Commission
Division of Engineering, M/S P-214
Washington, D.C. 20555

Subject: Revisions to Review of Letter dated April 22, 1982 from J. W. Cook to H. R. Denton on Response to NRC request for additional information on Borated Water Storage Tank and Service Water Pump Structure

Dear Mr. Kane:

Enclosure (1) was previously transmitted by letter on May 12, 1982. It has been changed where shown by bars in the margin.

Sincerely yours,

GEOTECHNICAL ENGINEERS INC.

Steve J. Poulos
Principal

SJP:ms
Encl.
cc: Mr. Reuben Samuels
Mr. Hari Singh

8205210374XA

Incl. 6

Response to Letter Dated April 22, 1982
J. W. Cook (Consumers) to H. R. Denton (NRC)

on

Geotechnical-Related Issues for Underpinning the Service Water Pump Structure - Needed Information

Geotechnical Engineers Inc. Project 81907
May 17, 1982

Items are listed by Confirmatory Issue No. in letter of April 22, 1982.

1 Basis for stresses

By others

2 Justify 4000 kcf

In our opinion, it is not appropriate to use a k-value of 4000 kcf to compute stresses due to jacking load. Jacking will cause change in curvature of the lower mat. The structural group should review this item.

3 Acceptance criteria

5/16-in. extension in a gage length of 20 ft implies a very high stress in the steel and cracking during underpinning. Control should be on vertical differential settlement. The criterion should be consistent with that used for the Control Tower. The criterion should be small enough so that corrective action can be taken in advance of severe stressing of the structure.

4 Tendon anchor

By others

5 Dowels/rock bolts

By others

6 Sliding calculations

Provide calculations and assumptions used for soil properties and interface friction.

7 Empty forebay

By others

8 Max rebar stress at El 620

By others

9 Max rebar stress at critical elements

By others

10 Out of plane shear

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Comments below are on each item as numbered:

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GEOTECHNICAL ENGINEERS INC.
[illegible] MAIN STREET MANCHESTER MASSACHUSETTS 01944 617 729-1625

February 3, 1982
Project 81907
File 2.0
Ref: 81907-3

Mr. Joseph Kane
Project Officer
U. S. Regulatory Commission
Division of Engineering, M/S P-214
Washington, D.C. 20555

Subject: Trip Report No. 1
Site Visit on January 28-29, 1982
S. J. Poulos and R. Samuels
Midland Plant Underpinning
Contract No. NRC-03-82-092

Dear Mr. Kane:

Enclosure (1) contains a description of observations made during the subject site visit by Mr. Reuben Samuels and the undersigned.

The purpose of the site visit was to observe the service water structure, the feedwater isolation valve pits, the electrical penetration wings, and the control tower, and to gather other information related to our review for NRC of the proposed underpinning for these structures. The Trip Report is divided into the following subheadings:

1. Summary
2. Hard Clay Bearing Stratum
3. Fill Material
4. Concerns on Underpinning in Fill
5. Feedwater Isolation Valve Pit (FIVP)
6. Electrical Penetration Areas (EPA)
7. Control Tower (CT)
8. Service Water Pump Structure (SWP)

Sincerely yours,

GEOTECHNICAL ENGINEERS INC.

Steve J. Poulos
Principal

SJP:mmo
Encl.

Trip Report No. 1

SITE VISIT JANUARY 28-29, 1982

MIDLAND PLANT

CONTRACT SMC-03-82-092

Geotechnical Engineers Inc. February 3, 1982

This report contains observations made by Dr. Steve J. Poulos and Mr. Reuben Ramzels during a visit to the Midland Nuclear Plant site on January 28 and 29, 1982. Our preliminary discussion of the observations also is provided.

We were guided at the site by Mr. James Meisenheimer of Consumers Power Company. Mr. Charles Seabour of Bechtel escorted us throughout the visit. Bechtel personnel familiar with each item visited also guided us, as necessary.

1. SUMMARY

The bearing stratum of the auxiliary building and containments is a hard silty clay of low plasticity. Its overconsolidation apparently was caused by the weight of a glacier, but the glacier did not distort the stratification in the samples observed.

The fill material is a silty clay or a fairly widely graded silty sand, both of which stand well in shallow excavations above the water table. Neither appears to ravel. There is no regularity in the alternation between silty clay and the silty sand fill.

A silty fine sand layer apparently exists above the hard silty clay stratum at the south side of the auxiliary building. This material could ravel during underpinning below water.

Dewatering in pits dug early during underpinning should be considered. Use of such pits would increase the safety during construction of nearby pits that are used for bearing.

The pipes passing through the feedwater isolation valve pits are supported at the containment and at the south wall of the FIVP. The clearance between the pipes and the turbine building penetration is 6 in. or more. Pipe stresses due to settlement of the FIVP should be added to normal operating stresses, unless the settlement-induced stresses are relieved.