

To File
FROM TCCooke/RMW
DATE December 12, 1978
SUBJECT MIDLAND PROJECT GWO 7020 - TRIP REPORT,
CHAMPAIGN ILLINOIS - DIESEL GENERATOR SETTLEMENT
File: B3.0.3 Serial: CSC-3674
CC PAMartinez CAHunt
GSKeeley DEHorn
DBMiller

Attachment 6

Kane

Consumers
Power
Company

INTERNAL
CORRESPONDENCE

The following represents a corrected set of CPCo notes from the November 7, 1978 meeting in Urbana, Illinois. The notes as written reflect comments from Bechtel, and Serial 3593 is superceded by these notes. Please note same on Ser. 3593.

Neil Swanberg opened the meeting by stating that a call would have to be made to the NRC at 10:30. A discussion would proceed up to 10:30 and after the call to the NRC. Darl Hood would be contacted within the NRC. Darl would later contact Mr. Heller to try to get a meeting set up before Thanksgiving. Dr. Skip Hendron asked what the NRC has been told to date. A discussion of Mr. Gene Gallagher's visit was given.

Chuck McConnell stated as of last Friday there have been no surprises and the trend is the same on the settlements. The far east bay of the Diesel Generator Building where the test pit had been dug has indicated settlements of 1" for the northwest corner, 3/4" for the northeast corner, 4/10" for the southwest and southeast corner of the pedestal during the last month. This area had received additional loading. Neil Swanberg noted settlement appears to be decreasing, but a rate of settlement curve has not been drawn.

Austin Marshall presented boring data to Dr. Peck.

Chuck McConnell stated the correction action options considered.

1. Use-as-is, with some grouting.
2. Continuous mat foundation.
3. Preloading.
4. A combination of continuous mat and preloading.
5. Underpinning.
6. Remove and replace fill.

Sherif Afifi stated that data had been made available to the consultants as it became available, summarized the conversations with the consultants since their field visits and stated that the consultants feel preloading is the most attractive option.

Discussion of preferred options followed. Dr. Peck opened by saying it is evident that the fill is loose. Settlement is due to its own weight. In Dr. Peck's opinion, there are only two options - preloading or remove and replace fill. Dr. Peck felt we should get on with instrumentation and preloading. He stated we do not have adequate data with the boring program to determine the amount of preload and

the length of preload. We should get data from the preload, which will provide a reliable estimate of the time required for preloading.

Dr. Hendron stated that there was neither a homogeneous engineered fill nor a uniformly compacted fill. Chuck McConnell asked why preload was more attractive than the others. Dr. Peck stated that the continuous mat foundation option would not stop the differential settlement and we would still have settlement of duct banks. Dr. Hendron stated that five or ten years down the road construction would be off the site and the owner would have settlement problems. The consultants stated that preload should (because of the type of material involved) provide us with rapid and decisive answers as to the effectiveness of this action. Stress may possibly be induced in the pipes below the building as a result of additional building settlement.

Phil Martinez stated that we have five months in the schedule for preloading and asked if this would be adequate time. Dr. Peck said that he did not know at this time, however, once preload did start we would know how long preload would be required.

Also, he stated that settlement will occur fast after preloading has begun. The consultants were also asked about bringing the pond up to elevation 627'. They stated that the preload should be applied prior to filling the pond to 627'. Due to the river water level restrictions, it was determined that there will be limitations to pumping so that pond fill should begin as soon as possible. By not saturating the soil, the consolidation process would be accelerated due to the absence of additional water in the voids.

Neil Swanberg asked if construction could continue in the Diesel Generator Building. Dr. Hendron said he did not see any problem with continuing construction and Dr. Peck agreed.

Dr. Hendron stated that he was disappointed that Mr. Heller from the NRC and staff had not seen the test pits. Don Horn stated that G. Gallagher from Region III, of the NRC, had taken pictures of the test pit located in the Diesel Generator Building and separation of soil from the footing.

Dr. Peck stated that underpinning may be required after, and only after, preloading. Underpinning prior to preloading was discussed. Dr. Peck stated that preloading was necessary. Underpinning efforts should not commence until after preload because drag down loads would be applied to the piles during preload. Also, damage to the structure could occur during underpinning prior to preloading. Dr. Peck felt that preloading should do the job.

Dr. Hendron added that there was no bearing problem static or dynamic loaded. Bob Wheeler asked if bearing capacity justification would have to be given the NRC after preloading had occurred. The consultants felt justification would not be necessary, however, if tests were required, test pits could be dug to determine the in situ bearing capacity of the soil.

Dr. Peck stated that if piling was to be used, in lieu of preload, there would be less than 50% chance that this could be justified to the NRC and that he did not consider piling adequate in his own mind.

Dr. Hendron agreed that cutting the duct banks loose has to be done. Dr. Peck and Dr. Hendron stated that settlement at various depths must be monitored beneath and away from the structures. The high priority as they see it is instrumentation and preload. Placement of piezometers can go in later.

Next the height of the preload was discussed. Chuck McConnell stated that we have 23 feet to work with because of the second floor of the Diesel Generator Building construction. The question of the rate of loading was asked. Dr. Peck stated that any rate would be adequate but even distribution was necessary. Dr. Hendron stated that preloading should be stopped at ten feet for about a week to monitor the effect of this preload. Discussions ensued and it was decided that fill would initially be placed 10' layer and a maximum of 20' with observations made during the placement. The consultants emphasized that it is very important to load the area between the north side of the Diesel Generator Building and the Turbine Building in order to effectively preload the area. Bechtel noted that further analysis and possible bracing of the Turbine Building wall will be required to support the additional surcharge between the buildings.

Tom Cooke asked what additional settlement we could expect based on this preload. Dr. Peck stated 6-18" additional settlement with the 18" being very pessimistic. Dr. Peck also stated that the height of the preload should be equal to the depth of the material to be consolidated and this would be approximately 20 feet. If excessive settlement is observed, the bulk of the problem should be resolved.

The question of grouting the gaps between the footing and the soil was discussed. Dr. Peck and Dr. Hendron did not feel the grouting of the gap between the footing and soil was necessary prior to preload. However, discussion continued and it was concluded that Bechtel would grout any gaps between the footing and soil after the preload had been removed. It was suggested by the consultants that the mud mat be broken up prior to preload application and that early grouting may also be beneficial in relieving some building stress.

Tom Cooke asked the consultants for the cause of the excessive settlement. Dr. Peck stated that there were in addition to non-uniform fill, erratic properties which may have been caused by too much variation in lift thicknesses. Dr. Peck added that material placed dry of optimum would later, with the presence of moisture tend to soften the materials. He also added that refilling of excavations from existing fills tends to be less adequate than the original fill. Large areas to be compacted are better than small areas. An example of the dike versus the Diesel Generator foundation area was given. The exact answer may be extremely difficult to determine. He stated that the exact cause may never be fully determined.

Next a discussion of the cooling pond dikes took place. The question of drilling holes in the dike was discussed. Dr. Peck and Dr. Hendron stated that they did not feel that this was necessary. The dike has not indicated any problems. Jim Betts mentioned that a settlement of . and 1/4" had been taken on a portion of the dike, however, this has not changed since that time and there is a possibility of this being an error in survey. No other areas have indicated settlement in the cooling pond dikes. Also, Sherif Afifi has stated that visual inspections have been made of the dike system and no problems seem to exist. The meeting adjourned

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at 10:30 so that Tom Cooke, Dr. Peck, Dr. Hendron, and Walter Ferris could contact the NRC. Darl Hood and Mr. Heller were both contacted in the same call. A meeting at the site is tentatively scheduled for December 3 and 4 with the NRC and consultants. A visit to the site would be made by the NRC on December 3 and discussions would follow on December 4 with the consultants. The NRC did not seem to want to make two trips to the site; they felt one should be adequate.

The meeting continued with Chris Lin stating he had plots of blow counts on sand materials under the Diesel Generator Building north. The plots indicated that some of the material may be questionable due to potential liquefaction of the material. Dr. Peck looked at the plots and stated that this problem would have to be evaluated. He stated that if there was a problem that vibroflotation could possibly be used.

John Dunnicliff, the Instrumentation Consultant, described the instrumentation that was proposed for use in the settlement evaluation. Five rods would be placed on the Diesel Generator pedestals, one in each corner and one in the middle. Also, riser pipes would be placed on the outside of these rods to keep soil from affecting the rods. Fifty borros anchors would be placed at three different elevations to monitor soil movement. Settlement platforms would also be placed in the fill at three different elevations. Drag through settlement cages with accuracy approximately $\pm 1/4$ " would be used to monitor pipe settlement. An average of the readings would be made to establish a baseline. Inclometers were going to be installed. Four electrical devices would be placed on the cracks to monitor movement. Tape would be placed over the cracks in the walls to keep material from moving into these areas. Dr. Peck and Dr. Hendron suggested that a 20' berm and 30° slope of preload be placed around the structure except for the north end where this would have to be modified due to the Turbine Building walls. Pore pressure monitoring would be done with 20 standpipe piezometers at three different elevations corresponding with the borros point anchors. It was mentioned that sand would be used as frost protection and Dr. Hendron stated that this was a good idea. Jim Betts asked if a structural backfill was compacted inside the structure, could it remain after preload. The consultants suggested that material not be placed above the foundation and that grating be used in the place of soil and slab. Bechtel Engineering said that they would look into this. The question of how often readings be taken on the anchors was asked. Dr. Peck suggested that the readings be taken daily (initially).

Other areas of possible settlement would be discussed following the December 4 meeting with the NRC at the site. It was suggested that another meeting not be held until the December 4 meeting with the NRC and that a tentative date, January 16, 1978, meeting with the consultants would be adequate.