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

Subject: Comments on Applicant's Proposed Findings of
Fact and Conclusions of Law on Remedial Soils
Issues, dated August 5, 1983
Before the ASLB
Midland Underpinning

Dear Mr. Kane:

Following your request we have reviewed the above-referenced document and provide our comments below on those items relating to the Auxiliary Building and the Service Water Pump Structure. The page and paragraph number referred to precedes each comment.

AUXILIARY BUILDING

p. 163 ¶216 - The differential settlements that have occurred to date may have developed stresses in the range of 10,000 to 25,000 psi in the reinforcing bars at critical locations in the structure. These stresses are reasonably compatible with observed cracks, with computations by the applicant and with the measured differential settlements. The amount of differential settlement causing the above stresses probably is in the range of 0.1 to 0.15 in., or more, between the north and south side of the Control Structure. Thus small differential settlements of this stiff structure cause relatively high stresses. One cannot interpret the fact that these settlements are small and not unusual as an indication of satisfactory performance without separate justification of that conclusion based on the stresses for which the structure is to be designed.

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p. 164 ¶219 - The foundation soil of the Main Auxiliary Building and of the proposed underpinning is not a glacial till. The data available indicate that the foundation soils are clays that were deposited in a lake and subsequently loaded by the weight of a glacier. Apparently they were not sheared or otherwise disturbed by the glacial action. The vertical load of the glacier made these clays hard.

The term glacial till refers to "glacial drift deposited directly by ice, without transportation or sorting by water, consisting generally of an unstratified, unsorted...mixture of clay, sand, gravel and boulders" (Stokes and Varnes, 1955). This definition does not apply to the hard clay under the EPA's.

p. 165 ¶219 - Our understanding is that the 4-ft gap under the EPA will be filled with concrete, not compacted sand, although either would be satisfactory.

p. 165 ¶220 - The foundation soil of the underpinning wall for the Control Tower also is hard clay, rather than glacial till, as described above.

p. 169 ¶227 - The Main Auxiliary Building is founded on hard clay, not glacial till.

p. 170 ¶228 - During construction of an early pier, a load test is to be performed in situ on the bearing stratum.

The active jacking procedure will be maintained until the time settlement curve indicates that the stage of secondary consolidation has been reached. In addition, certain assumptions have been made about the anticipated long-term differential settlements. These assumptions should be fulfilled since they are the basis for design. By extrapolation of the measured secondary settlements and the measured differential settlements while the jacks are still active, one can estimate the future differential settlements for this purpose.

p. 170 ¶229 - The differential settlement of 0.25 in. was understood by the writer to mean differential settlement between the north and south sides of the Control Tower, a distance of 47 ft.

[During the recent audit of September 14 and 15, 1983, data were furnished by the applicant which indicated that their previous computations of stresses in the structure were based on the assumption that the 0.25 in. differential settlement would occur between Column Line C of the Auxiliary Building and the south side of the Control Tower, a distance of 150 ft. This assumption is much less critical than that of the writer. The writer's assumption was inferred from the testimony by Burke, Corley, Gould, Johnson, and Sozen.



The implication of the above difference is that the stresses in the structure provided by the applicant for those cases that include differential settlement effects, are smaller than would be obtained if a 0.25 in. differential settlement is imposed across the Control Tower.

During the recent audit, however, the stresses due to this latter assumption were provided by the applicant. The stresses were within code limits for the loading conditions considered. However, they provided no allowance for stresses that may exist after lockoff. In addition, in the loading conditions covered, the effects of the 0.25 in. long-term differential settlement were not taken into account for accident conditions, which may or may not be significant.]

p. 170 ¶230 - The applicant has taken into account only the differential settlement expected after lockoff, as described above. The stresses due to differential settlements to date have been considered to be zero after lockoff, which is not likely to be the case unless the building is lifted during underpinning.

p. 172 ¶233 - The fill under the FIVP's is not expected to be compacted to 95% relative density. The criterion is: compact to 95% of the maximum density determined in accordance with ASTM D-2049 (vibration) or D-1557 (impact), whichever is larger.

The underpinning is founded on hard clay, not on glacial till.

The main portion of the Main Auxiliary Building is founded on hard clay, not on glacial till.

p. 174 ¶237 - Not all of the instruments are installed away from the immediate area of construction activity since movements in the immediate area are required to be monitored. Care is needed during construction to avoid damage to some of the instruments.

p. 175 ¶237 - There is one gap in the settlement data for this structure. There are no data available, to the writer's knowledge, for settlements that occurred during the first year or so after construction of the Main Auxiliary Building.

p. 176 ¶238 - The writer does not consider the analysis made to be "very conservative." [The readings that have been made to date during underpinning indicate that the computed stresses due to a given movement agree very closely with the measurements.] Some of the loading combinations considered may be considered conservative by some.



p. 176 ¶240 - It was the intent, during the audits, that if the alert level is reached, every effort should be made by the applicant to prevent the action level from being reached. If the action levels were reached nevertheless, then emergency action would be taken to prevent further displacements.

p. 178 ¶243 - The comments given above detract somewhat from the generality of this statement. In particular, if the existing stresses in the structure due to previous settlements are not removed during underpinning, then the computed stresses in the structure due to the design load combinations will be higher than those computed by the applicant in some critical locations. The underpinning system itself is designed conservatively.

SERVICE WATER PUMP STRUCTURE

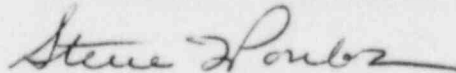
p. 181 ¶248 - There are zones in the SWPS where the cracking is consistent with the stresses that would be expected due to the partial weight of the overhang. The north-south differential settlement of 0.25 in. is small. However, this structure is very stiff. Therefore, the magnitude of 0.25 in. is not necessarily small for this structure.

p. 184 ¶254 - The dewatering will be sufficient to prevent blowup into the excavations for the underpinning piers. The 2-ft drawdown below the excavation is the minimum drawdown.

p. 185 ¶258 - A load test will be carried out in the bottom of one of the early piers to check that the compressibility and bearing capacity of the foundation soil is as expected during design.

Sincerely yours,

GEOTECHNICAL ENGINEERS INC.



Steve J. Poulos
Principal

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