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Dr. Morris

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Ltr. furnishing comments on the stability of the proposed submerged weir in intake canal, relative to Duke Power Co.....

ENCLOSURES:

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COMMENT ☐

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NATHAN M. NEWMARK
CONSULTING ENGINEERING SERVICES

1114 CIVIL ENGINEERING BUILDING
URBANA, ILLINOIS 61801

5 July 1967

Dr. Peter A. Morris, Director
Division of Reactor Licensing
U. S. Atomic Energy Commission
Washington, D.C. 20545

Re: Submerged Weir in Intake Canal
Duke Power Co.
Docket Nos. 50-269, 50-270, 50-287

Dear Dr. Morris:

The following report is based on the studies made by Dr. A. J. Hendron, Jr. of our staff, and has been approved by Dr. W. J. Hall and myself. Our comments concerning the stability of the proposed submerged weir, as described in Supplement 5 of Amendment 5, by Item No. 11, dated 16 June 1967, follow.

(1) The factor of safety for static behavior under rapid drawdown, within the pressure levels of interest, as stated in the report is consistent with the shear strength of the material equal to or greater than that corresponding to a Mohr failure envelope with a cohesion intercept of 280 psf and an angle of internal friction of 30^{o}, for consolidated-undrained conditions.

These material properties appear to be reasonable. However, the test technique used may not give completely conservative values since there may be a possibility of incomplete saturation of the samples because they were not "back-pressured" to assure 100% saturation, immediately before shearing. Nevertheless, from the results of our calculations, there appears to be no cause for concern.

(2) For combined earthquake and rapid drawdown, the effective shearing resistance of the dam on sloping surfaces is about 0.09W, where W is the weight of the sliding wedge. Although this is slightly less than the maximum earthquake acceleration of 0.10g, for a consistent value of maximum ground velocity of 5 in/sec., the maximum sliding displacement of each of the sloping surfaces is estimated to be less than 0.4 in. Even for a larger earthquake, the amount of motion under earthquake conditions appears to be relatively small or negligible.

(3) It appears that the static stability and the resistance to piping are the major problems in relation to possibilities of instability. Another major concern is the possibility of erosion of the downstream sloping surface if local settlements of the crest could occur, causing high velocity local flows if the weir is overtopped. A special spillway section could avoid this difficulty.

(4) Avoidance of erosion due to overtopping is also possible through use of riprap of adequate thickness and size of stone. This should be placed on a filter layer of thickness adequate to insure that the continuity of the filter will not be interrupted. It may not be possible to have this assurance with only a 12 in. thickness of filter, unless there is careful inspection during construction.

(5) To avoid piping and to insure downstream stability under steady-state seepage, a base drainage filter and toe drain is usually required. Although this is not shown in Amendment No. 5, it is our understanding that such a drain and filter of length about one-third the base width of the weir will be used. This will probably be adequate.

(6) Although no specific foundation treatment is indicated beyond the removal of alluvial materials, it appears to us that the foundation will present no problems from the point of view of large amounts of seepage or of stability against earthquake motions of the intensity considered possible in the application.

Respectfully submitted,

N. M. Newmark

N. M. Newmark

bjw
cc: W. J. Hall
A. J. Hendron, Jr.