



DEPARTMENT OF THE ARMY
South Atlantic Division, Corps of Engineers
510 Title Building, 30 Pryor Street, S.W.
Atlanta, Georgia 30303

SADEN-F

5 September 1979

Mr. James P. Knight
Assistant Director for Engineering
Division of Systems Safety
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission,
Washington, D. C. 20555

Dear Mr. Knight:

Reference is made to the request in the Nuclear Regulatory Commission letter dated 27 December 1978 and subsequent telephone request by Mr. Owen O. Thompson of the Geosciences Branch, NRC, for assistance in evaluating the rock fill characteristics for the main dam of the Shearon Harris Nuclear Power Plant.

We have reviewed the "Report on Rock Fill Test Sections" for the main dam and our Mr. Gregory R. Baer has participated in an on-site visit to the test fills and quarry with representatives of NRC, EBASCO, and CP & L on 13 August 1979. The following comments are offered concerning the quality and characteristics of the rock fill with respect to gradation, strength and permeability. The comments were discussed by telephone with Mr. Thompson and other representatives of NRC, EBASCO, and CP & L on 17 August 1979.

The gradation curve with the minimum D_{50} of 3-inches presented on Figure 12 of the "Report on Rock Fill Test Section" represents the minimum acceptable gradation for the rock fill. Our review of the test fill report and site visit indicates that a well graded rock fill free of segregation, and meeting the minimum gradation, as well as density, can be achieved utilizing the proposed placement and compaction procedures. The requirement, however, of specifying the maximum stone size for the rock fill based on the average of the 3-dimensions for each stone is not entirely understood. It is anticipated that such a requirement will be difficult to control during construction. The accepted practice within this agency is to specify the intermediate dimension as the maximum particle size which is directly related to the gradation.

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Results of the field permeability tests indicate a permeability of 10^{-2} cm/sec in the test fills. A permeability of this order of magnitude is normally considered free draining. Assuming the fines are uniformly distributed throughout the fill, as was the case in the test fills, and the fines are non-plastic, as stated by representatives of EBASCO at the site visit, a permeability of 10^{-2} cm/sec appears to be representative of the rock fill. Caution should, however, be exercised during construction to insure uniform distribution of fines in the fill and to avoid the use of weathered rock containing plastic fines. Mr. Thompson has recommended that the first 3 lifts of rock fill in the downstream section of the dam (in the valley) be limited to a maximum of 5 percent fines. Mr. Thompson also has recommended that field permeability tests be conducted as part of the normal quality assurance testing program and that a minimum permeability of 10^{-3} cm/sec be required for all rock fill. Implementation of these recommendations should insure adequate drainage of the rock fill.

A 15-inch triaxial test, \bar{R} , was conducted on the rock fill with a gradation representative of the lower gradation which will be allowed. The results of the test show an effective strength ϕ' of 40.5° and no cohesion. In design, an effective strength ϕ' of 40° and no cohesion was assumed for the rock fill. It is noted in the "Report on Rock Fill Test Sections" that, as the excavation progresses, fresher granite of coarser gradation will be encountered. Based on this fact and the fact that the gradation of the material tested was the lower limit of gradation to be used, it is believed that the test results are representative of the strength of the rock fill. It is recommended, however, that a minimum of two additional triaxial tests be conducted on representative samples of the rock fill during the early stage of construction to substantiate the design values.

It has been a pleasure for the South Atlantic Division, Corps of Engineers, to be of assistance to the Nuclear Regulatory Commission. If we can be of any further assistance or offer any further clarification on the above comments, please contact Mr. Gregory R. Baer at FTS 242-4696.

Sincerely,


WILLIAM N. McCORMICK, JR.
Chief, Engineering Division