AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
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MATHEMATICAL ANALYSIS OF SEEPAGE FLOW IN HYDRAULIC STRUCTURES

BY
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THESIS : **MATHEMATICAL ANALYSIS OF SEEPAGE FLOW IN HYDRAULIC STRUCTURE**

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STATEMENT

This dissertation is submitted to Ain Shams University for the degree of Master of Science in Civil Engineering .

The work included in this thesis was carried out by the author in the Department of Irrigation & Hydraulic, Ain Shams University, from December, 1992 to December, 1998.

No part of this thesis has been submitted for a degree or a qualification at any other University or Institution.

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Abstract

Title : Mathematical analysis of seepage flow in hydraulic structure

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Stability of foundation of a hydraulic structures is affected by several parameters, That are related to the hydraulic operating conditions, soil properties underneath the structure foundation, condition and the type of the construction, and also the downstream bed profile. Part of these parameters are subjected to some changes due to management and operation of the structure.

The parameters affecting the foundation stability of the River Nile barrages are subjected to some changes. The hydraulic operating conditions have been changed since the construction of the High Dam. A silt blanket has been created in the upstream side of barrages, particularly the upper Egypt barrages. These barrages are suffering from a progressing local scour downstream their aprons. Moreover, these barrages are suffering from some deteriorations in the bottom part of the apron foundation itself. Also these barrages are built on deep sandy layers; therefore their foundations are sensitive to the changes in the seepage flow conditions.

This study analyzes the effect of the variations that occur to the different effective parameters on barrage foundations stability against uplift, piping, soil particle erosion, soil particle sliding, and also on the bearing capacity of the soil under the foundations. These parameters include the hydraulic operating conditions, the soil properties, the construction condition, and maximum local scour depth and its location.

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