بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

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بالرسالة صفحات

لم ترد بالاصل

AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
IRRIGATION AND HYDRAULIC DEPARTMENT

EFFICIENCY OF CUTOFFS UNDER APRONS OF HYDRAULIC STRUCTURES

BY

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(B. Sc. Civil Engineering, Ain Shams University 1990)

A Thesis

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ABSTRACT

Akram Karam Shehata. Efficiency of Cutoffs under aprons of hydraulic structures. Doctor of Philosophy in Civil Engineering, Ain Shams University, Faculty of Engineering, Department of Irrigation and Hydraulics.

Weirs, regulators, dams and locks are few examples of hydraulic structures that operate under differential heads between the upstream and downstream sides. The design of such hydraulic structures usually involves a study of the seepage aspects under their aprons. Reduction of the influence of these aspects for the hydraulic structure is generally accomplished by using cutoffs at the two edges of its apron. When the cutoffs are used, their effect on the stability of the structure should be carefully taken into consideration.

In this study, an analytical solution has been obtained for the problem of seepage flow underneath hydraulic structures provided with two unequal cutoffs at the edges of their aprons. The structures are founded on anisotropic layer of varying thickness or stratified soil of two or three layers. The derived equations have been used for computing the seepage characteristics. To facilitate the use of these equations, design charts have been obtained to calculate the relative uplift pressure distribution through the subsurface contour of the structures, the exit gradient at the downstream edge of the structure and the quantity of seepage discharge which seeps under the aprons can be calculated from the relevant charts. Also, a computer program was designed especially to compute the data required for a wide range of structure dimensions. The program is friendly used and includes artificial intelligence unit to check the input data.

The analytical results was calibrated using field data under Naga Hammadi Barrage. The results gave good correlation with the piezometric readings under the apron of the barrage. Also, an electrolytic tank model was designed and constructed especially for verification of the analytical results and for finding out the effective depth of the seepage zone. A good agreement between analytical and experimental results was obtained.

KEY WORDS: SEEPAGE, HYDRAULIC STRUCTURES, CUTOFFS, ANISOTROPIC MEDIA, VARYING THICKNESS, STRATIFIED SOIL.

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