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**Numerical Modeling of Location Optimization of Drainage Gallery in
Gravity Dams**

by

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The undersigned certify that they have read, and recommended to the Institute of Engineering for acceptance, a thesis entitled "**Numerical Modeling of Location Optimization of Drainage Gallery in Gravity Dams**" submitted by Mr. Robin Ranjan Singh in partial fulfillment of the requirements for the degree of Master of Science in Geotechnical Engineering.

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ABSTRACT

The topic of the thesis is “Numerical Modeling of Location Optimization of Drainage Gallery in Gravity Dams”. An effort has been made here to find out the optimum location of the drainage gallery inside concrete gravity dams using Finite Element Modeling (FEM) analysis of a model. Gravity dam depends upon its own weight for resisting the uplift pressure which is exerted by the seepage of the water through the foundation of the dam. The effect of hydraulic uplift pressure can be reduced by using a drainage gallery inside the gravity dams. The position of the drainage gallery affects the hydraulic uplift force acting on the foundation of the dam. Hence the optimum position of the drainage gallery under gravity dam is found out which results in the maximum reduction factor of hydraulic uplift force acting on the base of the dam. Also the increase in factor of safety of the gravity dam is worked out after providing drainage gallery in the gravity dam.

An isotropic and homogeneous two dimensional model is prepared and analyzed from Rocscience Phase2 v 8.0. Based on the pore pressure obtained from the software, hydraulic uplift force for different upstream water level conditions are calculated manually. The results of numerical model are compared for different water head available at the upstream of the dam and for different positions of the drainage gallery provided inside the dam.

The maximum reduction in the hydraulic uplift force by placing a drainage gallery in the dams depends upon the size of the dam and the water levels maintained at the upstream and downstream of the dam. Different graphs were developed for different upstream and downstream water elevations, which can be referred for finding the optimum location of the drainage gallery.

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