

Friction Coefficient (F)-Reynolds Number (Re) Relationship in non-cohesive suspended sediment laden flow through pervious rockfill dam.

ABSTRACT

Recently pervious rockfill detention dam is used as a flood mitigating structure. Analysis of hydraulics of turbulent flow through this kind of dam is mostly done using Darcy-Weisbach equation. So far, many attempts have been made to study the friction coefficient as a function of Reynolds Number in turbulent flow of clean water through pervious rockfill detention dams, while this subject has remained intact for sediment laden flow of water. In this paper relationship between friction coefficient and Reynolds Number for sediment laden flow through highly pervious rockfill dams was investigated. Required data for a regression analysis obtained by conducting a series of laboratory tests to calibrate and validate a proposed power law friction coefficient-Reynolds Number relationship. A changeable bed slop Plexiglas flume, an adjustable rate sediment feeder and a recirculating flow electro pump system were used in present study. The tests were carried out on four different rectangular laboratory rockfill dams and three different non-cohesive suspended sediments. A power law relationship was obtained with a correlation coefficient of 0.74 using two thirds of laboratory measured friction coefficient and Reynolds Number. The obtained relationship was validated employing the remaining unused data with a Mean Square Error of 0.29 which is an acceptable agreement. A new power law relationship was found between friction coefficient and Reynolds Number in sediment laden flow through pervious rockfill dams. This new relationship is the only one thus has been proposed for the sediment laden flow of water through pervious rockfill dams.

Keyword: Friction coefficient; Sediment laden flow; Reynolds number; pervious rockfill dam; Sediment free flow; Pipe theory; non-Darcy relationship.