Seepage optimization for trapezoidal channel

Kacimov A.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

A complex-variable method and series expansions are applied to optimal- shape design problems for a channel bed. A dimensionless depth of a trapezoidal and rectangular channel is determined by minimizing the cost function constrained by specified hydraulic characteristics. The cost function includes seepage losses and the cost of lining. The hydraulic constraints are cross-sectional area, the hydraulic radius, and the discharge. The problem of steady-state two-dimensional seepage involves determination of a phreatic surface with geometrical parameters as control functions. The extremes found are stable for minor perturbations of channel shape. The optimal criterion value for trapezoidal channels is close to Preissmann's for an arbitrary bed outline. The including of supplementary factors (the cost of evaporating water, of the channel land area, and so on) as criteria are discussed. © ASCE.