

Constitutive Modelling of Wetting Deformation of Rockfill Materials

Erich Bauer

Institute of Applied Mechanics, Graz University of Technology, Graz, Austria

Email: erich.bauer@tugraz.at

Abstract

In this paper the constitutive framework of hypoplasticity is used to model long-term deformations and stress relaxations of weathered and moisture sensitive rockfill materials. The state of weathering of the material is represented by a so-called solid hardness in the sense of a continuum description. The time-dependent degradation of the solid hardness is a result of progressive weathering caused for instance by hydro-chemical reactions of fluid with the solid material. The degradation of the solid hardness can lead to collapse settlements and creep deformations, which are also called wetting deformations. In contrast to a previous version, a new evolution equation for a more refined modelling of the degradation of the solid hardness is proposed. With respect to a pressure-dependent relative density, the influence of the pre-compaction of the material and also the influence of the pressure level on the stiffness can be modelled in a unified manner using a single set of constants. The performance of the new model is validated by comparison of the numerical simulations with experiments data.

Keywords: Rockfill Material, Wetting Deformation, Solid Hardness, Creep, Hypoplasticity.