

Hydraulic Conductivity of Fly Ash-Amended Mine Waste

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Abstract: The objective of this study was to evaluate the effect of fly ash addition on hydraulic conductivity of tailings and mixtures of tailings and waste rock. Fly ash-amended mine waste mixtures have potential application as construction materials in active mines, transportation earthworks, and other geotechnical engineering projects. Natural tailings were collected from a garnet mine located in the U.S. Two synthetic tailings blends were developed in this study via blending commercially-available soils to represent typical particle-size distributions of actual mine tailings. The two types of fly ash used in this study both classified as off-specification, but had sufficient calcium oxide (CaO) content (17% and 18.9%) to promote pozzolanic activity. Hydraulic conductivity was measured on (i) pure tailings, (ii) fly ash-amended tailings. Hydraulic conductivity specimens composed of tailings alone or tailings and fly ash were tested in 101.6-mm-diameter flexible-wall permeameters. All experiments were conducted following a constant head technique (method A in ASTM D 5084). Fly ash was added to mine wastes at 10% based on dry weight, and specimens were cured for 7 and 28 d inside a room with 100% humidity and constant temperature of 21 °C prior to hydraulic conductivity testing. Effluent of hydraulic conductivity experiments was monitored to assess pH, electrical conductivity, and presence of heavy metals that could potentially leach from tailings. Results of the study were compared with published research on hydraulic conductivity and leaching of tailings-fly ash mixtures as well as natural soils amended with fly ash that have been used in geoenvironmental applications.