Rockfill Breakdown under High Stresses

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# ABSTRACT

The utilisation of rockfill material in the construction of embankments and storage dams is a common practice at mine sites globally. This material provides a cost-effective and geotechnically sound solution when appropriate construction methodologies are employed. However, due to its unbound nature, rockfill structures are particularly vulnerable to water infiltrations, whether from precipitation or from the seepage of liquids contained within the storage facility. Understanding the influence of factors such as moisture content and applied stress on the particle breakdown of rockfill is essential, as this can lead to exacerbated settlement, pore water pressure increase and even potential structural failure, posing significant risks in mining operations.

This study examines the particle breakdown of a Type 2.3 road base rockfill under conditions of high vertical stress and varying moisture content. A large-scale high-stress consolidation apparatus was employed to test this road base material under vertical stresses up to 10 MPa, equivalent to the stress acted by the rock fill to a depth of 600m. Several vertical stresses were applied on samples with three different moisture contents, representing a spectrum from dry to fully saturated conditions. Particle size distribution analyses were conducted before and after each test to quantify the extent of material breakdown.

The results reveal that, contrary to expectations, this specific rockfill material under high stress did not exhibit increased breakdown when subjected to full saturation . Instead, the particle breakdown under high stress conditions occurred at similar rates regardless of the presence of water . These findings provide valuable insights into the particle strength and durability of compacted rockfill material, which are critical for the design and maintenance of geotechnical structures in mining environments.