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Evaluation of Shrinkage and Desiccation Crack Propagation Patterns in Clays for the assessment of their suitability in landform rehabilitation

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The variation of water content has a significant effect on the engineering behaviour of clayey soils. This is in particular of high importance to infrastructure projects such as open pit mine rehabilitation. During the construction of open pit mines, the natural ground water level needs to be lowered for the feasibility of mining activities. This dewatering causes significant shrinkage and development of cracks amongst the deposits of cohesive soils. In order to design a rehabilitation plan, it is critical to investigate the shrinkage and desiccation cracks occurred within and around open pit mines as the result of dewatering. This study aims at identifying the shrinkage and crack development patterns using an experimental approach and utilizing image analysis. Three different types of clays were studied to this end. Physical properties including liquid limit, plastic limit and linear shrinkage of clays were determined. Soil samples were put in circular moulds of 150 mm diameter and 5 to 25 mm thickness. The variation of water content, while desiccating, was monitored. In addition, a digital camera was used to capture the initiation and propagation of desiccation cracks. Crack and shrinkage intensity factors were determined and analysed against various soil properties. The results obtained in this study could potentially lead to developing models to predict crack propagation patterns in various soils. This will ultimately result in more realistic and reliable future designs of infrastructures, such as mine rehabilitation.