

Engineering Properties of Different Lithological Varieties of a Singapore Granite

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Abstract : The Bukit Timah Granite, which is a major rock formation in Singapore, encompasses different rock types such as granite, adamellite, and granodiorite with various hybrid rocks. The present study focuses on the Central Singapore Granite found in the Mandai area. Even within this small aerial extent, lithological variations with respect to the composition, texture as well as the grain size have been recognized in this igneous body. Over the years, the research effort on the Bukit Timah Granite has been focused on achieving a better understanding of its engineering properties in association with civil engineering projects. To our best understanding, a few types of research attempted to systematically investigate the influence of grain size, mineral composition, texture etc. on the strength of Bukit Timah Granite rocks in a comprehensive manner. In typical local industry practices, the different lithological varieties are not differentiated, but all are grouped under Bukit Timah Granite during core logging and the subsequent determination of engineering properties. To address such a major gap in the local engineering geological practice, a preliminary study is conducted on the variations of uniaxial compressive strength (UCS) in seven distinctly different lithological varieties found in the Bukit Timah Granite. Other physical properties including Young's modulus, P-wave velocity and dry density determined from laboratory testing will also be discussed. The study is supplemented by a petrographical thin section examination. In addition, the specimen failure mode is classified and further correlated with the lithological varieties by carefully observing the details of crack initiation, propagation and coalescence processes in the specimens undergoing loading tests using a high-speed camera. The outcome of this research, which is the first of its type in Singapore, will have a direct implication on the sampling and design practices in the field of civil engineering and particularly underground space development in Singapore.

Keywords : Bukit Timah Granite, lithological variety, thin section study, high speed video, failure mode

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