

UNIVERSITI TEKNOLOGI MARA

**FATIGUE BEHAVIOUR OF
WEATHERED ROCK UNDER
CYCLIC LOADING**

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Thesis submitted in fulfillment
of the requirements for the degree of
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Faculty of Civil Engineering

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ABSTRACT

Cyclic loading contributes to the degradation of strength and eventually to the failure of rock. However, cyclic loading investigations have been limited to fresh and jointed rock especially in temperate countries. This research aims to investigate the fatigue behaviour of tropically weathered rock under cyclic loading. Weathered rock is grouped together according to its strength classification by ISRM (2007). High strength to low strength weathered granite and quartzite is selected as rock specimens because they are the most abundant rocks to be found in Malaysia while quartzite are one of the most problematic rocks to be tested in laboratory. Characterization of weathered rock was carried out prior determining the cyclic behaviour of rock material. Characterizations such as rebound number, moisture content, compressive strength as well as velocity are determined. Uniaxial compressive strength (UCS) of rock; which later introduced as static strength is also determined to use under cyclic loading as maximum and minimum applied strength. Under cyclic uniaxial compression load, frequency of 1 Hz and constant sinusoidal waveform was applied onto weathered rock specimen. Stress ratio; which is the ratio of minimum to maximum applied stress is kept similar at 0.17 to be under cyclic load test. The cyclic load test was set at three different stress level of 70% ($0.7\sigma_c$), 80% ($0.8\sigma_c$) and 90% ($0.9\sigma_c$) of static strength. Between these three stress levels; $0.9\sigma_c$ shows significant impact on high to granite-A and quartzite-A. However, for granite-C and quartzite-C rock shows the least impact during the stress level of $0.9\sigma_c$ due to small stress amplitude. The fatigue strength of weathered rock at $0.9\sigma_c$, shows both granite-A and quartzite-A has lower in fatigue strength as compared to granite-C and quartzite-C. Based on the result, fatigue life of granite-A, granite-B and granite-C is about 83%, 82%, 75% of static strength. While for quartzite-A and quartzite-B, the fatigue life is about 83% and 78% of static strength. With the exclusion of quartzite-C, it can be concluded that the fatigue life of weathered quartzite is less than the fatigue life of weathered granite.

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