

**UNIVERSITI TEKNOLOGI MARA**

**BEARING CAPACITY OF INTERBEDDED WEAK  
SEDIMENTARY ROCK**

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Thesis submitted in fulfillment of the requirements

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## Candidate's Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any other degree or qualification

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## ABSTRACT

Strength and behavior of shallow foundation on rock have been based on uniaxial compressive strength of intact rock sample in which is formulated as the bearing capacity of rock mass. Literature studies showed that the empirical correlations of bearing capacity of the rock mass were developed from a single type and isotropic rock. This research work is to assess and determine the bearing capacity and behavior of shallow footing on anisotropic and heterogeneous rock mass such as interbedded Kenny Hill formation, its established state as sedimentary weak rock, its constitutions of weathered sandstone and shale. The laboratory study was complemented by finite difference numerical analysis in order to achieve the objectives. From the Kenny Hill site assessment carried out, the rock masses were classified into Grades II, III, and IV for sandstone and Grade III for shale. The interbedding nature of the rock mass is named as composite rock sample, modeled in such whereby shale is sandwiched with sandstones by the thickness of 10% to 50% of the total height and is prepared for laboratory compressive testing and numerical simulation. The finite difference analysis using FLAC v 5.0, was conducted to analyse the influence of bedding orientation, and material stiffness to the strength of the composite rock. A simulation of shallow footing on composite rock models at different environment was performed accordingly. Subsequently, the distribution and intensity of stresses within the composite model, mode of failure and bearing capacity between the observed experimental result and numerical analysis were analysed. It prevailed that the presence of shale decreased a global strength and elastic modulus of composite by 40% to 70% depending on the composition and weathering grade of the constituent. Based on the developed charts and corrected rules of mixture law, the strength and elastic modulus of the composite can be predicted accordingly. It also demonstrates that the inclined bedding composites present the lowest strength at the inclination angle of  $32^{\circ}$ . The ultimate bearing capacity was found to be approximately 0.4 of uniaxial compressive strength of rock material. Conclusively, the presence of shale in rock mass dominating by sandstone influenced the stress distributions, modes of failure, stress intensity, and deteriorates the bearing capacity of the rock mass.

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