STABILITY ANALYSIS AND IMPROVEMENT EVALUATION ON RESIDUAL SOIL SLOPE WITH REINFORCEMENT LOAD: BUILDING CRACKED & SLOPE FAILURE

GOH JEE REN

Thesis submitted in fulfillment of the requirements
for the award of the degree of
Bachelor of Engineering Technology (Infrastructure Management)

Faculty of Engineering Technology
UNIVERSITI MALAYSIA PAHANG

JANUARY 2018

ABSTRAK

Kegagalan cerun adalah geologi yang serius dalam banyak negeri di Malaysia. Di negara ini, kebanyakan kes tragedi melibatkan kawasan lereng bukit seperti kampus UIAM, Kuantan yang mendapati bahawa bangunan dan jalan utiliti yang membebankan secara langsung di lereng telah rosak disebabkan kegagalan cerun dan tanah runtuh. Kajian projek tertumpu kepada sifat-sifat tanah dan parameter yang menjejaskan kestabilan tanah dengan kegagalannya dan menghasilkan kestabilan cerun dengan FOS yang lebih tinggi dengan menggunakan konsep reka bentuk tanah-struktur tetulang. Projek ini merangkumi beberapa pendekatan iaitu lokasi kejadian pemantauan & pengukuran, makmal eksperimen tanah dan kestabilan analisis pemodelan dengan SLOPE/W (2007). kerja-kerja pemantauan dijalankan untuk mengumpulkan sampel tanah dan juga fotogrametri (menangkap gambar). Sampel telah diuji di makmal tanah geoteknikal untuk ujian indeks tanah bagi menyediakan ciri-ciri tanah dan ujian kekuatan untuk mendapati parameter kekuatan tanah. Pemodelan kestabilan (SLOPE/W) telah direkakan berdasarkan keputusan parameter eksperimen makmal untuk mendapatkan faktor keselamatan (FOS) bagi cerun tersebut. Kajian projek menunjukkan kegagalan cerun dengan 0.828 (FOS) yang lebih rendah daripada minima 1.4 yang bersepatutan disebabkan oleh penambahan dalam kelembapan dan menyebabkan penurunan dalam kedua-dua perpaduan dan sudut geseran dalaman. Oleh itu, beban tetulang telah ditambah untuk meningkatkan kestabilan cerun yang gagal dengan bahan-bahan yang berbeza seperti sauh tanah, paku tanah, geo-kain dan cerucuk pacu. Semua beban tetulang menungjukkan peningkatan kestabilan cerun tanah dengan FOS yang tinggi 2,911, 2,911, 1,624 dan 2. 982 masing-masing. Cerucuk pacu menunjukkan kekuatan tegangan tertinggi apabila ikatan antara tanah dan struktur. Selain itu, gabungan tetulang adalah satu reka bentuk yang berdaya cipta dan inovatif untuk penambahbaikan kestabilan dalam kajian projek ini. Gabungan tetulang juga meningkat kestabilan cerun dengan FOS tertinggi 2,919 (anchor + cerucuk), 2,615 (sauh + kain + cerucuk), 2,201 (sauh + kain), dan 1,915 (kain + cerucuk). Kajian projek telah disampaikan tahap kemampuan yang kuat bahawa tunggal dan gabungan tetulang kedua-duanya boleh meningkatkan sifat-sifat tanah dan parameter dalam reka bentuk cerun.

ABSTRACT

Slope failure is a very serious geologic hazard in many states of Malaysia. In this country, most cases of the tragedies involved a hillside area such as IIUM, Kuantan campus which found that the building and road utilities which loading directly on the slope was damaged due to slope failure and landslide. This project study focused on the soil properties and parameters which affected the stability of residual soil slope against failure and producing the stability of slope with higher FOS by using design concept of soil-structure reinforcement. The project employed several approaches i.e. field monitoring and surveying, laboratory experimental and stability modelling analysis with SLOPE/W (2007). A field monitoring works carried out to collect soil samples and also photogrammetry (photo capture surveying). The samples collection were tested with at geotechnical soil laboratory for soil index test to provide soil properties and shear test to provide shear strength parameters. The stability modelling (SLOPE/W) was applied based on the laboratory experimental results to obtain the appropriate factor of safety for the typical slope. This project study demonstrated the slope to be failure with FOS of 0.828 which lower than the minimum standard of 1.4 due to the increasing of moisture content and caused a drop in both cohesion and angle of internal friction. Therefore, reinforcement load was added to improve the stability of typical failed slope with different materials of ground anchor, soil nailing, geo-fabric and driven pile. All the reinforcement loads increased the stability of residual soil slope with the highest FOS of 2.911, 2.911, 1.624 and 2.982 respectively. Driven pile showed the highest tensile shear strength when bonding between soil and structure load. Besides, combination reinforcement load was an inventive and innovative design for stability improvement in this project study. The combination reinforcement also increased the slope stability with the highest FOS of 2.919 (anchor + pile), 2.615 (anchor + fabric + pile), 2.201 (anchor + fabric), and 1.915 (fabric + pile). This project study was delivered a strong belief that single and combination reinforcement load both can improve soil properties and parameters in slopes designs.