

INFLUENCE OF CRUSHED BRICK COLUMNS ON GEOTECHNICAL PROPERTIES OF EXPANSIVE SOIL

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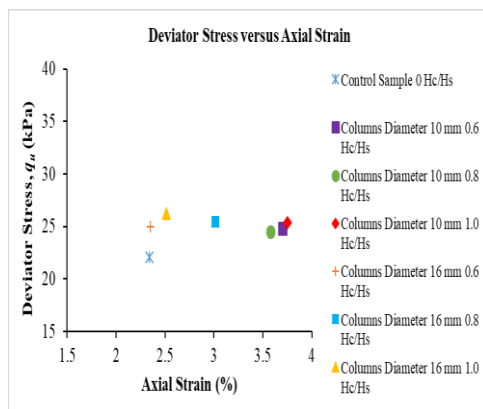
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Graphical abstract



Abstract

Utilization of crushed brick which is a common industrial material that is potentially wasted during the construction process in ground improvement can relieve its detrimental effects on the environment thereby reducing the waste disposal challenges. Hence, this study proposes its utilization as reinforcement to the soft clay soil. The tests mainly focused on the particle size distribution (PSD), specific gravity, Atterberg limit, proctor analysis as well as the shear strength parameters from Unconfined Compression Test (UCT). Coherently, the vibro-replacement method was deployed within a small-scale laboratory approach as a prediction model for the construction of a group of crushed brick columns. The column design was mainly classified into partially penetrated columns which have 60 mm and 80 mm height, and fully penetrated columns with 100 mm height. The mass of crushed brick used was approximately 1.07% - 4.56% of its total mass of specimen which produces the shear strength improvement rate from 11.00% - 18.55%. From the obtained results, the use of fully penetrated 100 mm diameter columns enhanced the undrained shear strength of kaolin clay to the maximum value, 26.20kPa or 18.55% as compared to the control sample with no reinforcement, which reduced the soil settlement and promoted the use of sustainable material in ground improvement.

Keywords: Expansive clay, brick, shear strength, ground improvement, foundation

Abstrak

Penggunaan bata hancur yang merupakan bahan industri biasa yang berpotensi terbuang semasa proses pembinaan dalam pembaikan tanah dapat mengurangkan impak buruk persekitaran dan dengan itu mengurangkan cabaran pelupusan sisa. Oleh itu, kajian ini mencadangkan penggunaannya sebagai penguatan kepada tanah liat lembut. Kajian ini fokus kepada agihan saiz zarah (PSD), graviti spesifik, had Atterberg dan analisa proktor. Untuk analisa parameter kekuatan ricih, ia ditentukan dan dianalisis melalui Ujikaji Mampatan Tak Berkurung (UCT). Secara koheren, kaedah penggantian vibro telah digunakan dalam ujian makmal yang berskala kecil sebagai model ramalan untuk pembinaan kumpulan tiang bata hancur. Reka bentuk tiang dibahagikan kepada tiang penembusan separuh yang terdiri daripada ketinggian 60 mm dan 80 mm, dan tiang penembusan sepenuh dengan ketinggian 100 mm. Berat bata