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GEOTECHNICAL INVESTIGATION OF BORROW PIT AS A SUBGRADE MATERIAL FOR ROAD CONSTRUCTION AT VICTOR ATTAH INTERNATIONAL AIRPORT, UYO, NIGERIA

BADANIE GEOTECHNICZNE MATERIAŁU Z WYKOPU JAKO PODŁOŻA DO BUDOWY DRÓG NA MIĘDZYNARODOWYM LOTNISKU VICTOR ATTAH, UYO, NIGERIA

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Abstract

One of the mass prompt practices of soils is for engineering projects such as the construction of roads, buildings, dams, and so on. Therefore, suitability of index and mechanical properties needs to be investigated. This study aims to determine the essential quality material required for road construction, thereby poses détente prospect for the disposal of ineffectual atrophy generated on sites. Such materials are classified into index and mechanical properties. Six subgrade samples were taken at the depth to bottom ranging from (1.0-5.0) m and tested. The sample was subdued to the laboratory tests, such as Sieve Analysis, Atterberg limits, compaction, California Bearing Ratio (CBR), and Specific Gravity (SG) respectively. The mechanical analysis which involved particle size distribution revealed that the subgrade was finely grated with a limit of ≤35% for subgrade passing sieve No. 200 (0.075 mm) with 29.1%, with an average Natural Moist Content (NMC) of 13.9%. The Maximum Dry Density (MDD) and Optimum Moisture Content (OMC) were 1.83 mg/m³ and 11.5%. The index analysis involved the liquid and plastic limits determination of Liquid Limit (LL) of 35.8%, Plastic Limit (PL) of 24.0%, and a Plasticity Index (PI) of 12%. California Bearing Ratio (CBR) results were 20.3% (soaked). The SG test results ranged from (2.68-2.94) kg/m³, employing the American Association of State Highway and Transport Officials (AASHTO) system of soil classification. The AASHTO grouped the materials into A-1, subgroups A-1-b and A-2-4 constituting 50% and 29.1%, with significant materials composed of stone fragments and sand rating the subgrade samples as excellent to good materials suitable for road construction.

Keywords: Lateritic, Liquid Limit, Plasticity Index, Subgrade

Streszczenie

Jedną z masowych praktyk związanych z gruntami są projekty inżynieryjne, takie jak budowa dróg, budynków, zapór itp. Dlatego należy zbadać przydatność gruntu i jego właściwości mechaniczne. Niniejsze badanie ma

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na celu określenie niezbędnych właściwości materiału wysokiej jakości wymaganego do budowy dróg, co stwarza perspektywę usunięcia nieefektywnych wykopów generowanych na terenie. Materiały są klasyfikowane według wskaźników i właściwości mechanicznych. Sześć próbek gruntu pobrano z głębokości w zakresie 1,0-5,0 m i poddano badaniom. Próbki zostały poddane testom laboratoryjnym, takim jak analiza sitowa, granice Atterberga, zagęszczenie, kalifornijski wskaźnik nośności (CBR) i ciężar właściwy szkieletu gruntowego (G_S). Analiza rozkładu wielkości cząstek wykazała, że grunt był drobnoziarnisty o uziarnieniu ≤35% dla sita nr 200 (0,075 mm) oraz 29,1%, przy średniej naturalnej wilgotności gruntu (W) wynoszącej 13,9%. Maksymalna gęstość szkieletu gruntowego (ρds) i optymalna zawartość wilgoci (Wopt) wyniosły odpowiednio 1,83 mg/m³ i 11,5%. Wyznaczono granice płynności i plastyczności: granica płynności (wL) wynosiła 35,8%, a granica plastyczności (wp) 24,0% oraz wskaźnik plastyczności (Ip) na poziomie 12%.

Kalifornijski wskaźnik nośności (CBR) wyniósł 20,3% (po nasiąkliwości). Wyniki badań G_S wahały się od 2,68 do 2,94 kg/m³, przy zastosowaniu systemu klasyfikacji gruntów AASHTO. Według AASHTO pogrupowano grunty na A-1, podgrupy A-1-b i A-2-4 stanowiące 50% i 29,1%, przy czym materiały składające się z odłamków kamieni i piasku oceniono jako doskonałe lub dobre materiały nadające się na budowy dróg.

Słowa kluczowe: lateryt, granica płynności, wskaźnik plastyczności, grunty

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