N_q and N_γ = bearing capacity factors for an intermediate footing

p = surcharge

$q_{\gamma p}'$ = non-dimensional ultimate average bearing pressure

S_1 and S_2 = spacings of adjacent footings

W = width of intermediate footing

W_1' = non-dimensional distance of the location of the point of maximum pressure from the right edge of the footing

x and y = cartesian co-ordinates

γ = body force per unit volume of soil in the vertical direction

ξ_q and ξ_γ = efficiency factors

θ = angle between the direction of major principal stress and horizontal axis

μ = $(45° - \phi/2)$

σ = stress difference between the centre of Mohr's circle and the origin of Mohr-Coulomb failure envelope

σ_x and σ_y = normal stress along x and y axes respectively

τ_{xy} = shear stress in x-y plane

ϕ = angle of internal friction of soil

ψ = angle between the bedding plane and the direction of major principal stress

ψ' = angle between the bedding plane and the horizontal axis

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Strength Behaviour of Geotextile Reinforced Sand under Axisymmetric Loading

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Introduction

The technique of soil reinforcement is being extensively used since the last two decades in the construction of embankments, retaining walls, etc. As a result of this, large varieties of reinforcing materials have emerged, which include, metallic strips, bars, mats and geosynthetics. In India, reinforced soil construction has enormous potential. Various types of geosynthetics have begun to be manufactured in the country. Thus, it is imperative to understand the behaviour of reinforced soil structures thoroughly, so that their analysis, design and construction can be carried out with confidence. In view of this, the present studies were planned primarily to assess the influence of reinforcement on the overall behaviour of geotextile reinforced sand under triaxial conditions. The studies consist of conducting drained triaxial tests on large diameter sand specimens with and without reinforcement under different confining pressures in which the types and spacing of geotextile and types of sands have been varied. An attempt has also been made to compare the experimental values thus obtained with the corresponding theoretically computed values based on different models suggested by earlier researchers.

Literature Review

Several investigators (Yang, 1972; Schlosser and Long, 1974; Broms, 1977; McGown et al., 1978 and Mandal, 1987) have reported the results of

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triaxial and plane strain compression tests on ndrical specimens of sand containing thin horizontal layers of extensible reinforcing material. The behaviour of fabric reinforced sand has been explained by the concept of enhanced confining pressure. Yang (1972) suggested that the tensile stresses built up in horizontal reinforcing layers were transferred to the soil through sliding friction and caused an increase in confining pressure (σ_3). It was noticed by Schlosser and Long (1974) that the reinforcement induced an anisotropic or pseudo-cohesion (c') which was a function of spacing of reinforcement and its tensile strength. Experimental findings of Hausmann (1976), Broms (1977), Venkatappa Rao et al. (1987, 1989) are in general agreement with the hypothesis that slippage failure results in increased friction angle. Test results of Long et al. (1972) and Saran et al. (1978) indicated development of pseudo-cohesion where failure was due to the rupture of reinforcement. However, investigations by Subba Rao and Parsad (1987) and Venkatappa Rao et al. (1989) revealed an increase in angle of shearing resistance along with the cohesion intercept even in the slippage mode of failure.

$K_a = (1-\sin\phi')/(1+\sin\phi')$,

ϕ' = angle of internal friction of sand,

$K_b = 1/(1+2\tan^2\phi')$, and

α = multiplication factor, $0 < \alpha \leq 1$

Experimental Work

Material Properties

The present investigation was carried out on two sands viz., Yamuna sand and Ottawa sand. Yamuna sand is a fine grained sand whereas Ottawa sand is medium to coarse grained. The relative density, uniformity coefficient and coefficient of curvature for Yamuna sand are 0.60, 1.67 and 1.01 respectively whereas for Ottawa sand these are 0.72, 0.83 and 0.92 respectively.

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