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Settlements of wide foundations in laterite formations

The construction of tall structures on laterite formations using a raft foundation is rare because of the inability to estimate accurately the settlements of such foundations. Very little published information of such settlements is available. Large scale testes are rarely attempted because of the costs involved unless they are made part of the construction process. However, when such testes are carried out, their results can be made use of to establish geotechnical parameters for future design.

This paper presents the results and analysis undertaken on the field settlements measured in Water Load Teats on two tanks of diameter 22 m in a hard laterite formation of average thickness 12 m. Settlement measurements were made on the foundation ring beam at 8 stations equally spaced on 45^{o} sectors on the periphery of the taken during the cyclic loading and unloading of the tank. Several sets of readings were taken during the cyclic loading and unloading of the Water Load up to maximum design load of 165 kN/m^2.

These settlements were first analysed to determine the rigid body settlements and out – of-plane settlements of the rigid ring beam. This showed that i) the settlements obtained during first loading consisted of an immediate settlement which increased non-linearly with load, together with a creep settlement at constant load; (ii) during the first loading of the virgin soil, whereas total rigid body settlements of 150 mm had been measured at maximum design load, the maximum out-of-plane settlement was only (3-4) mm ; (iii) very little settlements were associated with an increase in tilt of the tank; and a decrease in out-of-plane settlement. Analysis was then carried out with elastic theory, and the equivalent elastic modulus at maximum design load associated with the laterite formation of average SPT values in range of (15-20) was found to be 5300 kN/m^2 .