

SPT-Based Bearing Capacity Analysis of Shallow Foundations Using Terzaghi and Meyerhof Methods

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In geotechnical engineering, accurate assessment of bearing capacity is crucial for ensuring the structural stability and safety of shallow foundations. The Standard Penetration Test (SPT) is widely used to determine soil parameters for this purpose. This study compares bearing capacity calculated using Terzaghi's and Meyerhof's methods, based on SPT-N values collected from 58 boreholes in the Top City area of Wah Cantt, Pakistan. The SPT data was collected at every 5ft intervals to a depth of 25ft from each borehole. The upper soil strata primarily consisted of very stiff to hard Silty Clay (CL-ML group) with traces of grass roots and concretions. The ultimate bearing capacity was determined using both Terzaghi's bearing capacity equation and Meyerhof's modification, considering various factors such as depth, width, cohesion, and unit weight of soil. The results indicate that Meyerhof's method yielded higher bearing capacity values than Terzaghi's method. Meyerhof's calculations ranged from 5.0 to 6.8 tsf, while Terzaghi's method produced values between 4.0 and 5.5 tsf. The 20-25% higher values obtained through Meyerhof's method can be attributed to its incorporation of embedment depth, shape factors, and adjustments for various footing types (isolated and strip footings). The findings demonstrate that both methods are viable for estimating ultimate bearing capacity from SPT-N values. However, since no groundwater table was encountered during drilling, Meyerhof's method provided more realistic bearing capacity values, particularly for dry soil conditions and heterogeneous subsurface profiles like silty clay. This study emphasizes the importance of selecting appropriate methodologies based on site-specific conditions to prevent over- or under-estimation of bearing capacity. Further validation through in-situ testing and numerical modeling is recommended to enhance the accuracy of these estimations and ensure foundation design safety.

Keywords: Geotechnical; Shallow Foundations; Bearing Capacity; SPT-N Values; Terzaghi Method; Meyerhof Method.