

Performance evaluation of stone column foundation; a case study of Guheswori Waste Water Treatment Plant

Abstract—This study focuses on the efficiency of the stone column used for the foundation improvement at Guheswori Waste Water Treatment Plant. First the analytical study on bearing capacity is done for triangular and square pattern at various diameter ratio. A finite element modeling is done using PLAXIS 3D and the response is studied on it. A parametric study is done by varying the geometric and shear parameters of a stone column and surrounding soil as well as loading parameters. The results show that with the increase in area replacement ratio and depth of stone column, the stability of the foundation can be increased to a more reliable extent. Proper drainage at foundation ground is necessary as the settlement at submerged condition even with the stone column is more than without stone column at dry site condition. Study shows that effect of change in friction angle of stone column material on settlement reduction is effective at higher area replacement ratio. The Modular ratio has been found to have a negligible effect on improvement factor. The performance of the foundation is found to be more at a higher depth factor ($\beta > 0.7$) and the settlement improvement factor has been found to be less for higher loading for the same depth factor. It is also found that with the area replacement ratio of about 4.2 %, at $\phi_c = 400$, the settlement of the foundation has been reduced by around 19 %.

Index Terms—PLAXIS 3D, Settlement, Bearing Capacity, Stone Columns, Finite Element Modelling, Ground Improvement