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Title of Thesis: **GEOTECHNICAL CHARACTERIZATION AND UTILIZATION OF POND ASH IN NATIONAL CAPITAL REGION – DELHI**

Findings:

In this thesis, an experimental study has carried out on three different pond ashes collected from Badarpur, Rajghat and Dadri thermal power plants mixed with five different admixtures, namely, bentonite, fiber, lime, marble dust and gelatin-starch. Proctor compaction tests, triaxial shear tests and CBR tests are carried out on all pond ashes alone and after stabilization of all pond ashes with different percentages of above admixtures. Important geotechnical properties such as modulus of elasticity, cohesion and angle of shearing resistance to be used in numerical analyses are also evaluated from the test results.

The study has focused on ‘road construction’ and ‘raised embankments’ as two major areas for bulk utilization of fly ash. Finite element analyses of pavements constructed using pond ashes stabilized with different admixtures are carried out using PLAXIS software to evaluate service life of the pavements based on maximum vertical compressive strain at the top of subgrade. Based on a detailed parametric study, design charts are presented for different conditions including that of ‘equal service life’ and construction cost is compared. Some important conclusions have been drawn on bulk utilization of pond ash based on ‘service life’ and cost comparisons.

Stability of raised embankments is analysed using GEO-SLOPE software and the effect of variation of different parameters of raised embankments on the stability of

embankments is evaluated. In the study factor of safety of raised embankments constructed using stabilized pond ash by appropriate limit equilibrium method by varying different parameters of raised embankments, such as drain conditions, construction stage, slope angle, etc. and determined percentage increase in storage area is evaluated. It is found that the major factors affecting stability of raised embankments made up of stabilized pond ash are slope angle, construction stages and drainage conditions. Other parameters, namely, top width, berm width, etc. have a small influence on the stability. The cost benefit ratio of using different admixtures in pond ash stabilization for construction of raised embankment is also determined for the same factor of safety. The percentage increase in storage space is 0, 106.5, 70.2, 47.5 and 106.5, respectively, when the embankment is constructed using pond ash stabilized with 2% bentonite, 3% fiber, 8% lime, 10% marble dust or 2.5% gelatin-starch. These are some important findings from this study. The thesis has introduced new low cost waste material, marble dust, and another new materials gelatin-starch for stabilization of pond ash.

Doubts and confusion regarding cost benefits and technical utilization of several recently introduced additives, such as bentonite, fiber, lime, etc. in the stabilization of pond ash have been effectively clarified.