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Influence of Bottom Ash on the Geotechnical Parameters of Clayey Soil

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Abstract : Clayey soils exhibit undesirable problems in civil engineering project: poor bearing soil capacity, shrinkage, cracking, ...etc. On the other hand, the increasing production of bottom ash and its disposal in an eco-friendly manner is a matter of concern. Soil stabilization using bottom ash is a new technic in the geo-environmental engineering. It can be used wherever a soft clayey soil is encountered in foundations or road subgrade, instead of using old technics such as cement-soil mixing. This new technology can be used for road embankments and clayey foundations platform (shallow or deep foundations) instead of replacing bad soil or using old technics which aren't eco-friendly. Moreover, applying this new technic in our geotechnical engineering projects can reduce the disposal of the bottom ash problem which is getting bigger day after day. The research consists of mixing clayey soil with different percentages of bottom ash at different values of water content, and evaluates the mechanical properties of every mix: the percentages of bottom ash are 10% 20% 30% 40% and 50% with values of water content of 25% 35% and 45% of the mix's weight. Before testing the different mixes, clayey soil's properties were determined: Atterbeg limits, soil's cohesion and friction angle and particle size distribution. In order to evaluate the mechanical properties and behavior of every mix, different tests are conducted: -Direct shear test in order to determine the cohesion and internal friction angle of every mix. -Unconfined compressive strength (stress strain curve) to determine mix's elastic modulus and compressive strength. Soil samples are prepared in accordance with the ASTM standards, and tested at different times, in order to be able to emphasize the influence of the curing period on the variation of the mix's mechanical properties and characteristics. As of today, the results obtained are very promising: the mix's cohesion and friction angle vary in function of the bottom ash percentage, water content and curing period: the cohesion increases enormously before decreasing for a long curing period (values of mix's cohesion are larger than intact soil's cohesion) while internal friction angle keeps on increasing even when the curing period is 28 days (the tests largest curing period), which give us a better soil behavior: less cracks and better soil bearing capacity.

Keywords : bottom ash, Clayey soil, mechanical properties, tests
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