

Exploiting Fly Ash in the Lime-stabilisation of Soils

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ABSTRACT

Soil stabilisation is routinely used to improve plastic properties and strengthen cohesive soils of high clay content. The process involves reaction of the binding material (lime or cement) with components of soil in the presence of moisture. However, with sulfate in soil, volume stability problems may occur due to ettringite formation, resulting in swelling of the stabilised material. Damaging effects often become visible only after completion of the built-on structure and can incur significant costs to rectify.

Fly ash has been found to offer benefits in suppressing sulfate attack in various construction situations, including concrete and grouting, due to its physical and chemical influences (in these systems) on the process. Given this, it is reasonable that the material could be exploited in lime-stabilised (sulfate-bearing) soils. The arguments for this are strengthened by the increasing use of fly ash as a cement component in the application. An extensive study was therefore initiated to examine the role of fly ash in the lime-stabilisation process and its influences on sulfate heave. Issues including reaction mechanisms, optimum quantities and sequence of application, as well as material properties (fineness, glass content, loss-on-ignition, storage history, etc.) were examined.

The paper will report some of the early findings of the work and highlight the important factors for effective use of fly ash in soil stabilisation practice in the achievement of key engineering and durability properties. This has important economic and environmental implications given the large stock of available fly ash on a global scale.

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