



## Behaviour of Soft Clayey Soil Improved by Fly Ash and Geogrid under Cyclic Loading

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### Abstract

The effect of Cyclic loading on the foundation behaviour of many engineering structures presents more important and related to many problems in geotechnical engineering, Especially when construction on soft ground area which represent one of the major concerns in geotechnical engineering. This paper is conducted to investigate the influence of using several improving techniques as (fly ash, Geo-grid, fly ash and Geo-grid) on the behavior of soft clayey soil subjected to cyclic loading. A total of twenty four models have been tested which consists of a wide domain of boundary conditions, such as untreated model, Geo-grid reinforced models, fly ash treated models and models treated with fly ash incorporated with Geo-grid were conducted by varying parameters such as, footing elevations, test velocity and number of geogrid layers. The analysis demonstrates that the settlement behaviour of footing resting on treated models with fly ash and two Geo-grid layers perform better than other improving techniques. Also observed there was an increase in settlement, which corresponds to the increase in test velocity from 6 to 9 mm/sec. Furthermore, it was conducted that the more depth of footing the soil settlement decreases. In general, when other factors remaining constant, the bearing capacity of soil goes on increasing when the depth increased.

*Keywords:* Soft Soil; Fly Ash; Geogrid; Soil Treatment; Stabilization; Cyclic Loading.

### 1. Introduction

Many regions in Iraq contain very soft clays especially in south, which have undesirable geotechnical properties such as, low bearing capacity, high compressibility, And because of the rapid economic development and construction of infrastructure particularly transportation infrastructure (e.g., high speed railways, airports, expressways, subways, and ports) in which the load characteristics in most cases as cyclic loading However, there is an increasing demand for studies of the cyclic behavior of clay and methods of improvement. In the absence of a suitable ground improvement, the soft clay deposits clays can sustain excessive settlement, high excess pore-water pressures during cyclic loading. This have negatively effects on the stability of buildings [1]. Reinforcing soft ground by installing geogrid and fly ash well established technique practiced worldwide as well as suitable methods to enhance the geotechnical properties of soil. Settlement of structures built on improved soils with fly ash decreases and the time required for reaching the final settlement is reduced. Fly ash can be used in soil to get improvement in shear strength, cohesion and improvement in the bearing capacity [2]. Also, the inclusion of geogrid leads to increase bearing capacity of shallow foundation by placing one or several layers. Furthermore, it becomes more stable and the factor of safety against bearing capacity

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