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"Assessment of Use of Lime in Expansive Soil Subgrade for Sangli – Kolhapur Highway"

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ABSTRACT

Black cotton soil is one of the major soil deposits of India. They exhibit high swelling and shrinking when exposed to changes in moisture content and hence have been found to be most troublesome from engineering considerations. Stabilization occurs when lime is added to black cotton soil and a pozzolanic reaction takes place. The hydrated lime reacts with the clay particles and permanently transforms them into a strong cementious matrix. Black cotton soil showing low to medium swelling potential from collage campas Maharashtra was used for determining the basic properties of the soil. Changes in various soil properties such as Liquid limit, Plastic Limit, Maximum Dry Density, Optimum Moisture Content, Differential Free Swell, Swelling Pressure and California Bearing Ratio were studied

INTRODUCTION

The seasonal moisture variations in expansive soil deposits around and beneath the structures lead to their subsequent upward and downward movements resulting into damages of varying degrees. Civil engineering structures such as highways, canals, and embankments occupy vast areas of land as they often stretch over several kilometers.

Among various methods for the solutions to the problems posed by expansive soils, especially for large area coverage, the stabilization of such soils would be a natural choice. Stabilization of expansive soils using lime is widely adopted by practicing engineers the world over. The pozzolanic property of fly ash makes it a potentially useful material especially in the civil engineering industry. Thus, there is a growing awareness among civil engineers to explore the possibility of beneficial utilization of this industrial waste material, which is available almost free of cost in India.

Urbanization and growth in the economy of cities of India have led to the steep increase in the building construction activities and has necessitated the implementation of infrastructure projects such as highways, railways, air strips, water tanks, reclamation etc. As we know the development of the Nation is depends upon their infrastructure and road constructions. Proper highway networks contribute to give the boost to the Economic development of country. Wide range of soil types available as highway construction materials. Roads running in black cotton soils are known for bad condition and unpredictable behavior for which the nature of the soil contributes to some extent.

The properties of the black cotton soils may be altered in many ways viz. mechanical, thermal, chemical and other means.

CHARACTERISTICS OF BLACK COTTON SOIL

Black Cotton soils are inorganic clays of medium to high compressibility and form a major soil group in India. Black Cotton soil has a high percentage of clay, which is predominantly montmorillonite in structure and black or blackish grey in color. Because of its high swelling and shrinkage characteristics, the Black Cotton soil has been a challenge to geotechnical and highway engineers. The soil is very hard when dry, but loses its strength completely when in wet condition (Balasubramaniam, et. al, 1989). The wetting and drying process causes vertical movement in the soil mass which leads to failure of a pavement, in the form of settlement, heavy depression, cracking and unevenness. It also forms clods which cannot be easily pulverized as treatment for its use in road construction (Holtz & Gibbs, 1956). This poses serious problems as regards to subsequent performance of the road. Moreover, the softened sub grade has a tendency to heave into the upper layers of the pavement, especially when the sub-base consists of stone soling with lot of voids. Gradual intrusion of wet Black Cotton soil invariably leads to failure of the road. However, since this soil is available easily at low cost, it is frequently used for construction purposes (Bell, 1988). Some of the factors which influence the behaviour of these expansive soils are initial moisture content, initial dry density, amount and type of clay, Atterberg limits of the soil, and swell potential.