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Evaluation of extension in service life and layer thickness reduction of stabilized flexible pavement

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Abstract. Decrease in availability of suitable subbase and base course materials for highway construction leads to a search for economic method of converting locally available troublesome soil to suitable one for highway construction. Present study insights on evaluation of benefits of stabilization of subgrade soils in term of extension in service life (TBR) and layer thickness reduction (LTR). Laboratory investigation consisting of Atterberg limit, Compaction, California Bearing Ratio, unconfined compressive strength and triaxial shear strength tests were carried out on two types of soil for varying percentages of stabilizers. Vertical compressive strains at the top of unstabilized and stabilized subgrade soils were found out by elasto-plastic finite element analysis using commercial software ANSYS. The values of vertical compressive strains at the top of unstabilized and stabilized subgrade, were further used to estimate layer thickness reduction or extension in service life of the pavement due to stabilization. Finite element modeling of the flexible pavement layered structure provides modern technology and sophisticated characterization of materials that can be accommodated in the analysis and enhances the reliability for the prediction of pavement response for improved design methodology. If the pavement section is kept same for unstabilized and stabilized subgrade soils, pavement resting on lime, fly ash and fiber stabilized subgrade soil B will have service life 2.84, 1.84 and 1.67 times than that of unstabilized pavement respectively. The flexible pavement resting on stabilized subgrade is beneficial in reducing the construction material. Actual savings would depend on the option exercised by the designer for reducing the thickness of an individual layer.

Keywords: stabilization; finite element analysis; layer thickness reduction; traffic benefit ratio; vertical compressive strain

1. Introduction

Unstable soils can create significant problems for pavements. Lack of adequate road network to cater to the increased demand and increased distress in road leading to frequent maintenance has always been big problem in India. Evolving new construction materials to suit various traffic and site conditions for economic and safe design is a challenging task in road construction. Aggregate is generally expensive therefore it is often important to minimize the aggregate layer thickness for

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