Improvement of Clayey Subgrade By Adding Kota Stone A Review

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Abstract- The quality and durability of highway pavement is greatly influenced by the type of sub-grade, sub base & base course materials. The most important among these are the quality & type of sub-grade soil because it is that part of which has ultimately load to bear and large deformation forces acting on it. But in India most of the flexible pavements are need to be constructed over weak and problematic clayey sub-grade. In constructing a highway over clayey subgrade the main problem to face is to increase the pavement thickness due to lower CBR value and high shrinkage and swelling ratio due to moisture fluctuation. There are various method to increase the strength and CBR value of such a subgrade but require huge investment and ineffective. Decrease in the availability of suitable sub base and base materials for pavement construction bound us to search for economic method of transforming locally available undesirable soil to suitable construction materials. In present study a new technique to study the stabilization by Kota stone slurry is done.

Keyword: Durability, Highway, subgrade, stabilization, CBR, stone

INTRODUCTION

It is desirable that sub-grade have high compressive and shear strength, permanency of strength under all weather and loading conditions, ease and permanency of compaction, easiness in drainage and less susceptible to volume changes and frost action. From the advent of highways it is noticed that performance of highway over cohesive subgrade is not satisfactory and possess various problem and make it susceptible to volume change and shear deformation. In India this is a major problem to construct a large road network because about 40% of total area in territory is occupied by clayey soil. Various investigation are made on such subgrade in past and different method to strengthen it are evaluated on basis of performance and economic aspect. As method used earlier are mechanical and chemical stabilization which are effective in one or other way but investment is large and require scientific method which may not be followed properly in field due inexperience of labour. Also as various natural resources are just to extinct if used by the rate we are using them. The choice of method for stabilization of weak soil depends upon Soil type, moisture content, site condition, cost, environmental pollution and hazards etc. Thus we should use a method which proves to be economic, eco-friendly, simple and effective. This work describes the benefits by stabilizing clayey subgrade by using Kota stone dust and comparing various results of MDD and OMC on altering the % addition of Kota stone dust. Due to lack of improper quarrying technique large Kota slurry is produced on finishing work completion. It will also lead to reduction in environmental hazards due to dumping of Kota stone slurry directly in agriculture fields and river and in open burials. It also causes soil pollution and air pollution both if not properly used. Thus it is beneficial to use that method of stabilization which is economic, eco-friendly and effective such a method is addition of Kota Stone Dust upto specific percentage.

Fig. components of Flexible Pavement

Fig. Huge waste of Kota Stone Slurry in Kota District. (Agrawal, S.C., 2003)
LITRATURE REVIEW

The concept of soil stabilization is not new. Early civilization often used some simple approaches to stabilize weak patches of soil over which buildings and highways are constructed. They used sun dried bricks in construction as a building material, somewhere in their experience they accept that by mixing soil with straw or other fiber available to them is helpful in improving properties (Dean, 1986). Efforts are being made by researchers (Katti, 1979; Natarajan and ShanmukhaRao, 1979, Steinberg, 1992, Ramana Murthy, PrasadaRaju) from time to time to improve the strength and stability of the clay subgrades in general and expansive soils in particular by stabilization, reinforcing, moisture control & soil replacement techniques. There are different techniques to increase the CBR value and to reduce the swelling pressure of soil. Stabilization using industrial wastes is one of them. Stabilization of expansive soil has been done by addition of different types of industrial wastes like, phosphogypsum (Mishra and Mathur, 2004), copper slag (Havanagi et al., 2006), cement kiln dust (Peethamparan and Olek, 2008), rice husk ash and marble dust (Sabat and Nanda, 2011), bagasse ash and lime sludge (Sabat, 2012), ceramic dust (Sabat, 2012), brick dust and lime (Abd EL-Aziz and Abo –Hoshma, 2013), steel mill dust (Meshida et al., 2013), ground polyvinyl waste (Oyekan et al. 2013) and silica fume (Negi et al. 2013) etc. Swami 2002 studied that by using marble dust up to a certain limit, 15% in sandy soil and 25% in black cotton soil improves greatly the dry density and CBR of soils.

METHODOLOGY

Soil stabilization can be broadly classified into two types:

- **Mechanical method of Stabilization**
  In this procedure, soils of different gradations are mixed together to obtain the desired property in the soil. This may be done at the site or at some other place from where it can be transported easily. The final mixture is then compacted by the usual methods to get the required density.

- **Additive method of stabilization**
  It refers to the addition of manufactured products into the soil, which, in proper quantities enhances the quality of the soil. Materials such as cement, lime, bitumen, fly ash, quarry dust etc. are used as chemical additives. Sometimes different fibers are also used as reinforcements in the soil. In stabilization of soil by various chemical or waste product admixture it is well known that soil properties can be improved a lot. Firstly sample is collected and identification is done on basis of test results like Liquid limit, plastic limit, and Specific gravity and classified on basis of IS classification system. Also note down the index properties of Kota stone dust used. Then it is only possible and meaningful to adopt the stabilization method. Sample here selected is identified as Silty clay, firstly make test on intact soil sample and note down the SPT test results, UCS test results. Thus Kota stone dust from quarries is added in it in varying proportion and similar test are performed. Compare the MDD and OMC of mixes made and determine the proportion by addition of which soil performs better.

CONCLUSION

From above discussion it is concluded that Kota stone dust have some or more cementitious property thus it will have lime content.

- **a)** Subgrade soil can be effectively densify by adding Kota Stone Dust up to a certain limit.
- **b)** By utilizing Kota stone slurry in stabilization of soil and other Engineering purposes harms due to its direct burial is prevented.
- **c)** Subgrade soil can be made more strong and resistant to overburden forces by addition of Kota Stone dust.
- **d)** It is also concluded that due to lime concentration

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