

# Utilization of Soil Cement in Construction of Road Pavement: An Overview

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## Abstract

The soil cement is an innovative construction material which can be produced by mixture of pulverised soil material and ordinary Portland cement and water. The soil cement can be compacted to high density. We used the soil cement mix in construction of road pavement because it's durability is good and having low cost as compared to bituminous road. It has advantages of rapid strength gain, elimination of water curing, good properties of mechanical and durability and also main thing is that it is absorb water deposited on it. These are eco-friendly sustainable material. The soil cement is one of the much more world's versatile, durable as well as reliable construction material.

The soil cement could be combination of sand, silt, clay and gravel or crushed stone. This paper just briefly reviews in order to introduce the new road pavement design construction using soil cement, various test on soil cement. This project deals with the practical study on using Soil cement product as the pavement material. As a part of this project various laboratory test like California bearing ratio (CBR) test, standard proctor's test (SPT) were conducted.

**Keywords** - Cement, Pavement, Sub-base, Flexible Pavement.

## I. INTRODUCTION

Soil-cement is an engineered material it can be used for designed and constructed for various pavement applications or material characteristics. The soil-cement product is the most suited to the specific application. Soil-cement is often used as a construction material for pipe bedding, slope protection, and road construction as a sub base layer reinforcing and protecting the subgrade. It has a good compressive strength, that's why in most of cases it is prone to cracks [1].

Because of the rapidly rising volume of traffic on the national highways and secondary roads, it is very important to understand the response of the pavement system due to changes in soil moisture and reaction to loading conditions on different highways and also changes in season.

## II. OBJECTIVES

The main objective of the project is to introduce the new road pavement design construction using soil

cement is one of the best options for the improvement of road densities in developing countries like India. Soil cement is frequently used in road construction as a sub base layer reinforcing and protecting the sub grade layer of it. It has good compressive well as shear strength. It is less expensive pavement material with long life and high strength comparatively.

The following objectives have been identified for the study:

- Geotechnical survey, traffic survey etc.
- Preparation of alignment design and drawings.
- Design of road pavement.
- Preparation of detailed cost estimate of construction.

## III. MATERIALS USED

Following materials are used in soil cement design road in construction.

### A. Soil Cement

A cement-modified soil contains relatively less proportions of Portland cement. The result is a lightly hardened material, similar to a soil, but with improved mechanical properties – lower plasticity, increased bearing ratio and shearing strength, and decreased volume change.

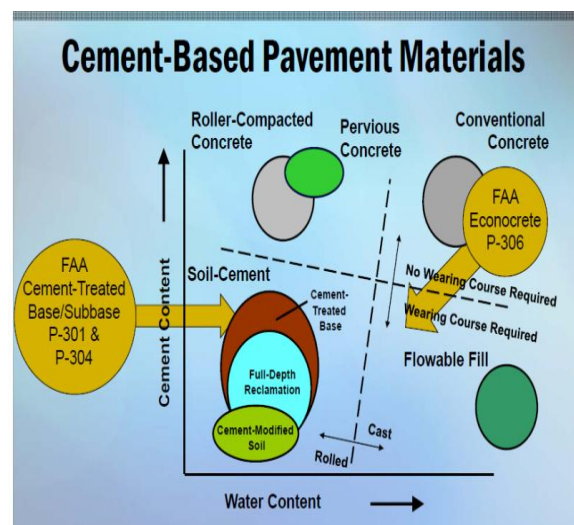


Fig. 1: Cement Based Pavement Materials

### B. Soil-Cement Base (SCB)

A soil-cement base contains the highly proportion of cement than cement-modify soil. It is generally used for cheap pavement base for roads, streets, parking lots, airports, as well as material handling areas.

Some specific equipment, such as stabilizer and a mechanical cement spreader is usually required. A sealcoat is just required to prevent the moisture out.

### C. Cement-Treated Base

A cement-treated base is a well mix of granular soil aggregates or aggregate materials with Portland cement in addition to water. It is similar in use and as the performance to soil-cement base.

## IV. VARIOUS TEST ON SOIL CEMENT

- Strength test
- Durability test
- The liquid limit
- Plastic limit

The all values obtained are in the limits of IRC specifications. IRC SP 89 code indicates that the changes should not exceed 20% at any case after 12 cycles. After the completion of durability test and got the sufficient result we laid a sample road near the Civil Engineering Laboratories building of SBIT engineering college [3].

### Advantage

- Stiffness
- Great strength
- Superior performance
- Economical
- Low initial cost
- Fast construction
- Recycling of existing materials

### Disadvantage

- Need to follow the standard strictly. If not, the result may not work properly.
- Water still be able to penetrate if capillary void too big.
- It will develop crack due to the high percentage of cement.

## V. METHODOLOGY

The soil-cement roads are as follows as Soil, Ordinary Portland Cement, needs a single coat of bituminous material to prevent moisture loss. This project deals mainly with field soil stabilization using cement and then using this stabilized soil as sub-base course and base course of pavement [4]. The following steps are followed for the stabilization process.

- Evaluating the properties of field soil where we want to do stabilization

- The suitability of soil for the cement stabilization
- Design of stabilized soil-cement mix by conducting mechanical properties test
- The construction procedure has finalised by adequately compacting the stabilized layers of the road. Evaluating the Properties of Soil Properties of the soil such as plasticity characteristics would affect the performance of the mix [5].

A mix soil has high plasticity index, results in poor stability under soaking conditions. So evaluation of properties of field soil is an important task in the process [6]. As per IRC SP 89-2010 for stabilizing soil cement, the soil has various plasticity indexes between 10 to 20 range and other specifications like uniformity coefficient, coefficient of curvature [8]. Then only we can proceed for further operations.

As per IRC, we should require a minimum of 2% cement for the stabilization process. On these mixes the strength tests are performed for obtaining the best mix.

As per British method the soil cement mix which gives a 7 days strength as  $17 \text{ kg/cm}^2$  is selected as the best mix [7].

## VI. CONCLUSION

From above done we concluded that the soil which we taken is slightly plastic and it has the uniformity coefficient greater than 10. Hence the soil is suitable for stabilization process with cement contents. In this review these have increase strength of pavement. Also soil is beneficial because it is easily available in place of sand. India has very low road densities due to uses of soil cement mix.

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