World Journal of Engineering Research and Technology
WJERT
www.wjert.org
SJIF Impact Factor: 5.924

SOIL STABILIZATION BY CEMENT IN AL-SALT CITY

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Article Received on 09/12/2021 **Article Revised on 30/12/2021** **Article Accepted on 19/01/2022**

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ABSTRACT

Soil stabilization is defined as the process of chemical or physical treatments that increase the durability, stability and strength of the soil by increasing and developing its textile properties. It is also known as the process of supporting and developing the shear strength of the soil and increasing the durability of the soil for its ability to bear the loads from the facilities. Soil stabilization using cement is known as cement soil, and the cementing process results from chemical reactions with soil lamination through water and hydration reactions.

KEYWARD: Soil Stailization By Cement.

INTRODUCTION

Soil stabilization is one of the methods that gives resistance to the soil against traffic loads, especially in the roads, and also to reduce and limit cracks and structural defects in the road. The basic cement layer has benefits to become the best material for soil stabilization, and since ancient times until now roads are used for trade, transit and transport of goods, and the road should be safe and usable without any defects, and that heavy loads, heavy machinery and equipment that use roads have an impact on the structural structure of the road for that When designing the road, consideration should be given to the strength of the soil foundation, the increase in its strength and hardness, and the increase in geological characteristics, piling and resistance.

In this work, it was found that the amount of cement added to the soil depends on the dry density of the soil and the moisture content of the soil, which works to increase the nodding cycle, reduce the moisture content in the soil and increase the resistance of the natural soil

against traffic loads to reduce road defects and damage. In general, the installation employs the use of additives and piles and soil classification.

Portland cement is usually used due to its easy availability and the quality of its structural, physical and chemical properties.

Most of the research papers found that stabilization with cement is more suitable for soil and clay soil less PI.

According to the value of UCS, the quality of the soil used as the sub base layer is classified as a value of UCS to soft,medium stiff and hard. the results of curing the soil with the addition of a high amount of cement to the soil., the higher strength obtain on 14 days than 7 days curing.

For soil types, it was found PI for sand soil less than 30 and fine grain not more than 20 and LL not more than 40 for to achieve best results for stabilization.
Physical properties of soil like particle size distribution, clay content, liquid limit and plasticity index play a major deciding factor in any project. Also, the chemical nature of soil has a great impact on deciding the durability of roads.
To achieve a strong and stable foundation for the soil, we need stabilization techniques. Among the factors affecting the stability and stability of cement in the soil are:
Cement ,Soil Mixing, compact and curing
In order to achieve better results, it must be LL less than 45% PI less than than 20% and quantity of cement UCS.

METHOD AND MATERIAL

We can use cement with any type of soil except soil that contains organic matter more than 2% or that the pH is less than 5.3(ACI 230.1R-90, 1990).

It was found that the use of cement in granular soils is economical and effective because it requires less amount of cement. Moreover, it is difficult to mix soils that contain value of PI more than 30 with cement. To avoid this problem, it is possible to add lime with cement.

Table 1 Physical Properties of soil studied

Sl. No.	Properties	Local Soil
1	Liquid Limit (%)	45
2	Plastic Limit (%)	27
3	Plasticity Index (%)	18
4	Shrinkage Limit (%)	20
5	Specific Gravity	2.68
6	Gravel (%)	3
7	Sand (%)	52
8	Silt (%)	24
9	Clay (%)	21

The amount of cement we need according to the type of soil as follows:

“gravel soil - from 5 to 10%”

“sandy soil - 7 to 12%”

“silt soil - 12 to 15%”

“Clay soil - 12 to 20%”

The expected amount of cement shall be balanced to withstand a pressure of 25-30 kg/cm2 in tropical climates when the soil is stabilized.

If there is a layer of soil which has a surface area M (m2), thickness H (cm) and dry density as (T/M3), it must be fixed with X ratio of cement by weight on the basis of dry soil, then the cement mixture will be ((100 x H) / (100 + H))

The amount of cement we need to stabilize the soil is= (M x H x K / 100) x (X / (X + 100))

PROCEDURE

1-Material distribution: The cement arrives at the site either by bags or by large trucks. The bags are placed in a predetermined pattern depending on the required cement content. The best way to distribute the bulk cement is to use a mechanical cement sprayer or distribute it manually.

2-mix

The mixing process takes place either on site or in the main mixing stations. Mixing is done according to the physical properties of the soil, and then the soil mixed with cement is transferred to the site.

3-compacted

The road is compacted until arrive to 95 percent using different types of rollers such as iron and rubber.

Figure 1: Showing cement stabilised subgrade at test site.

Advantages and disadvantages

Advantage

1-Environmentally friendly

2- Excellent for sustainable construction

3- The ability to use recycled cement

Disadvantage

1-crack formation

2-Always requires checking the amount of water.

3-Not suitable for some soil types.

4-Requires appropriate supervision.

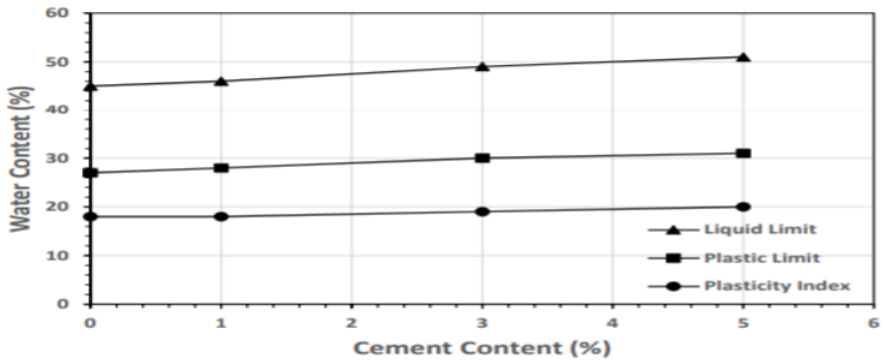

Figure 2 Effect of quantity of cement added to the soil on consistency limit of soil

Figure 2 shows the effect of the amount of cement added to the soil with the percentage of water content.

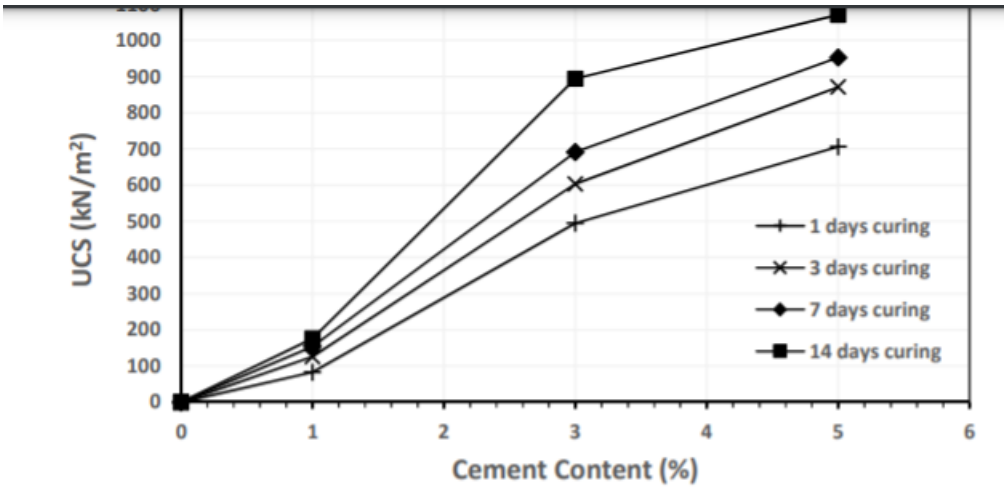

Figure 3 Effect of quantity of cement added to the soil on UCS of soil

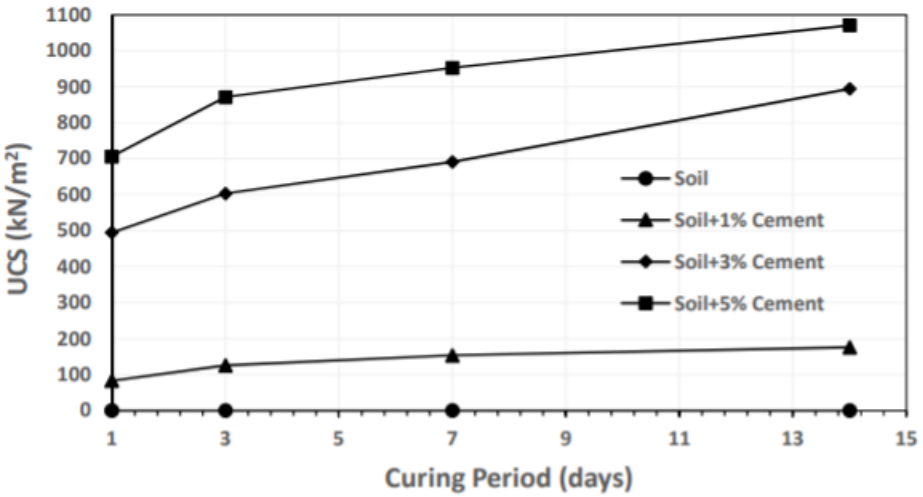

Figure 4 Effect of curing period on unconfined compressive strength (UCS) of soil

The third figure shows the effect of the amount of cement added to the soil and the compressive resistance of the soil according to the days. It was found that on day 14 to curing the soil, according to the proportions of the added cement and the optimal proportions of water, and conducting a pressure test in molds with dimensions (7 * 7 * 7)cm, it was found that the strength and resistance of the soil increases with the increase in the curing period, so this strength Soil depends not only on the amount of cement, but on the curing period.

CONCLUSIONS

1-Soil cement provided strength and durability for the base layers.

2-It is also the best low cost alternative material.

3- Soil cement benefits the pavement by distributing loads and resistance evenly, and greatly reducing basic erosion and cracks.

4-Reduces moisture problem.

5- The OMC of the mixture (soil - cement) increases with the increase of the cement content.

6- UCS of stabilized soils increases with increasing amount of cement in the mixture.

7- UCS of stabilized soil increases with increasing treatment period.

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