SOIL STABILIZATION USING CERAMIC WASTE AND SODIUM HYDROXIDE AS A BINDER-A REVIEW

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ABSTRACT

This review paper is designed to treat unhealthy soils with tile waste and sodium hydroxide as a commitment to improve its engineering features. Weak soils become very porous when exposed to moisture and shrink because moisture evaporates, following a low carrying capacity. Therefore, unsuitable soil should be compacted, improving the subgrade load-bearing function to assist the road and foundation. Dangerous soils found in the area are associated with one of the potential particles of tiles and sodium hydroxide as a liability. Look for liquid limitations, plastic overlays, fall head extensions, check the popular proctor, and California bearing ratio to see if the use of different types of tiles has been achieved. waste and sodium hydroxide as a binder (CBR) direct shear has been done with a soil pattern and tested for the development of world engineering houses.

***KEYWORD**: Black cotton soil CBR, Calcium hydroxide, Vitrified tiles waste powder, Weak soil*

INTRODUCTION

The foundation of any fully formed earth-making system is essential and must be firmly established throughout it. The soil around the museum plays an important role in finding a solid foundation. So, on the way to the dusty drawings, we must first have a thorough knowledge of it. To increase the risk of soil erosion, features and variables that affect their homes have been needed. Soil consolidation is a way to improve the soil to improve its physical properties. Stabilization can improve the soil's ability to shave and reverse its degenerative properties. As a result, the workload of the lower distance to assist the pavement and foundation is improved. Clay is an actor on this project. Dust is collected. Clay soils are usually subtle soils with low strength and productive performance. Engineers faces many challenges. Clay soils are now not strong enough to withstand the pressures on them in a constructive way throughout nature or throughout life. By adjusting the moisture content, the clay soil often produces a decrease in dynamic behaviour. Therefore, this type of soil should be stable.

PROPERTIES OF VITRIFIED TILES POWDER AND NaOH

A. Vitrified Tiles Waste Powder

A ceramic tile is a non-metallic, inorganic solid substance. The first ceramics manufactured by humans were earthenware pieces made from clay, either alone or in combination with additional ingredients such as silica. Later, ceramics were glazed and burned to create smooth, coloured surfaces with less porosity. The basic materials used to make tile include clay minerals collected from the earth's crust and natural minerals such as feldspar. During the manufacturing, shipping, and placement of ceramic tiles, a large amount of tile waste is generated. Because the disposal of tile waste is a big issue, it is efficiently employed for soil stabilization. Hand ramming is used to turn tile waste into powder, and tile waste powder that passes through a 90-micron screen is refilled with soil. The tile waste consisting of 1.60% of Cao and 59.12% Silica. The physical properties are OMC-16.1%, MDD-21.34kN/m3.

B. Sodium Hydroxide

A solution of sodium hydroxide is a white, odourless, non-volatile solution. It does not burn but is quite reactive. It interacts violently with water, producing enough heat to ignite flammable items nearby. Its main benefit is that it quickly reacts with water, resulting in a potent compaction aid that provides a greater density for the same compaction effort.

Advantages of Chemical stabilization

1. Setting and curing times may be regulated in this stabilization process.

2. It improves the soil's strength.

3. The soil's compacted density is raised.

4.Chemical stabilization improves the soil's permeability.

LITERATURE AND REVIEW

The purpose of this research is to give a literature assessment on the stabilization of expansive soil utilizing solid wastes.

Industrial solid wastes are wastes produced as a result of numerous industrial activities. Some of the research projects on the stabilization of expansive soil utilizing various industrial solid wastes are discussed below.

Pandian et al. (2001) had added fly ash (class- F) up to 100% to black cotton soil at a 10% increment and discovered that California bearing ratio (CBR) values of black cotton soil rose up to 20% addition of fly ash beyond that, CBR dropped. It grew once more and reached an ideal value when the proportion of fly ash was 70%.

Sabat and Pradhan (2014) had investigated the effect of polypropylene fibre (content and length) on the compaction properties, unconfined compressive strength (UCS), soaked CBR, and PS of an expansive soil stabilized with the optimum percentage (20%) of fly ash and had discovered the optimum percentage and optimum length of fibre as 1%. and 12 mm, respectively, with improvement in strength and swelling behaviour.

Ashango and Patra (2014) had static and cyclic characteristics of clay subgrade stabilized with RHA and Portland slag cement were examined. For the stabilization of expansive soil, the optimal amount of RHA was determined to be 10% and Portland slag cement to be 7.5 percent. They came to the conclusion that the stabilized expansive soil was acceptable for the subgrade of flexible pavement because it had a considerable improvement in strength and was durable.

Sharma et al (2008) the behaviour of expansive clay stabilized with lime, calcium chloride, and RHA was studied. The optimal percentages of lime and calcium chloride for stabilizing expansive soil without the addition of RHA were determined to be 4% and 1%, respectively. When the soil was combined with lime or calcium chloride, the RHA level of 12 percent was shown to be optimal in terms of UCS and CBR. 4 percent lime and 1 percent calcium chloride were also shown to be optimal in expansive soil – RHA combinations.

Sabat and Bose (2014) ceramic dust's effects on compaction characteristics, UCS, CBR, Ps, and durability of fly ash-lime stabilised expansive soil were studied. The optimal percentages of fly ash, lime, and ceramic dust were discovered to be 10%, 5%, and 35%, respectively, with improved swelling, strength and durability.

Koyancu et al (2004) had stabilised Na –bentonite with ceramic tile dust and discovered that adding 40% ceramic tile dust waste lowered the PS and Sp by 86 and 57 percent, respectively.

Olaniyan et al (2014) has discovered that increasing the clay to sand ratio, or using a smaller quantity of filler, leads in an increase in kaolin activity. As a result, the mineral polymerization process was accelerated. The strength grows as harder geopolymer products are formed by increasing kaolin activity. At the highest clay to sand ratio, the compressive strength was greatest. When all specimens were compared, dry specimens had the highest compressive strength and moist specimens had the lowest. Sodium hydroxide may modify the clay mineral lattice by alkaline assault, resulting in a significant link between compressive strength and sodium hydroxide concentration. The breakdown produces sodium silicate and sodium aluminates, which continue to precipitate insoluble aluminium oxide hydrates in soil. Higher levels of strength are possible.

METHODOLOGY

Prepare a variety of samples using different proportions of soil, ceramic waste and Sodium Hydroxide. A series of tests were performed to try to find the optimal values for a mixed sample. Field trials are the ideal simulation method for any experimental study. This was generally avoided because it was expensive and time consuming. Thus, carefully performed model testing can serve as an alternative to obtaining useful qualitative and sometimes quantitative results. Thanks to modern measuring instruments and other tools, tests can now be carried out at close range. Moreover, laboratory tests have the advantage of better control over a variety of parameters that may affect the problem under consideration. For example, you can run a parametric study on a model while examining the effect of a particular parameter while keeping all other variables constant.

CONCLUSION

The present experimental studies were carried out to find out the stabilization of black cotton soil by using ceramic waste and Sodium Hydroxide. The following conclusions have been drawn based on the literature study.

1.The use of ceramic wastes and Sodium Hydroxide to stabilize weak soil enhances its geotechnical qualities.

2.The impacts of stabilization on index properties, compaction characteristics, UCS, CBR, and swelling properties of weak soil have been explored by the majority of the researchers.

3.Negligible studies have also been done on stabilization of ceramic waste and Sodium Hydroxide on expansive soils.

4.From study of literature reviews it can be concluded that it enhances the property of soil.

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