International Journal of Emerging Trends in Science and Technology
7 (1) June 2021, 01-03
http://www.publishingindia.com/ijetst

A Review Paper on Soil Stabilization by using Waste Products

Ramkumar S.
Assistant Professor, Department of Civil Engineering, M.Kumarasamy College of Engineering, Karur, Tamil Nadu, India. Email: ramkumars.civil@mkce.ac.in

Abstract: Soil stabilization is the process of improving the shear strength parameters of soil and thus increasing the bearing capacity of soil. The soil stabilization may be defined as the alteration or preservation of one or more soil properties. The soil properties can improve engineering characteristics and performance of a soil. The soil stabilization can be referring to the procedure in which a special soil, cementing material or Other Chemical admixtures were added to the natural soil to improve or increase the soil strength. The soil stabilization refers to the any land-based structures, the foundation is very important and must be strong to support the entire structures. The shear strength parameters have been stressed upon and the comparative studies have been carried out using direct Shear test for shear strength measurement.

Keywords: Soil, stabilization, waste, admixtures.

I. Introduction

Soil is a mixture of minerals, organic matters, gases, Liquids and Countless organisms that together support life on earth. The soil can undergo by the development way of numerous physical, chemical, and biological process. The soil has some of the properties like strength, compressibility, workability, swelling potential and volume change tendencies may be altered by various soil stabilization method and the soil is the sediment or other unconsolidated accumulation of solid particles. They may produce by the physical and chemical disintegration of the rock. The soil may or may not contain organic material. Most of the stabilization must be undertaken in some of the soft soil like silt soil, clayey peat or organic soil. The clay soil and organic soil are rich in the water content compare to the other soil. Because the water content. In the peat soil the consistency may vary from muddy to fibrous and in most cases, the deposit is shallow but in worst case it can extend to several meter below the surface.

II. Steel Fiber

Steel fiber concrete was introduced in the year 20th century. People will be heard about rebar and steel structure. When subjected to loading, compressive, and tensile stresses begin to build over time. There will be slight gaps in areas where tension hits a critical point. Steel fiber collaborates inside the concrete matrix. Absorbing tensile stresses anytime and toward any path, therefore. Steel fiber gets little cracks a lot quicker than traditional reinforcement. At the point when the break happens, the hooked ends of the fibers remain solidly anchored on each side of the split, going about as a stress move media. The pull-out takes full effect when the maximum bond strength is reached with the concrete. This permits the subsequent fiber takes over, delaying cracks from developing. Various burdens require distinctive steel fibers.

Soil Stabilization

Soil adjustment is a strategy for improve the dirt properties by the blending of different materials. The dirt adjustment is the technique to build the shear quality parameters of the characteristic soil. Were these adjustments techniques may utilize for the dirt accessible for development isn't reasonable to convey auxiliary burden. The dirt adjustment may use to lessen the porosity and the compressibility of the dirt mass in the earth structures and they may expand the shear quality. In the dirt Stabilization they may utilize the folio materials in the feeble soil to improve the geotechnical properties. Like compressibility, quality, penetrability, and strength. In the dirt adjustment, they are determined by the warm, mechanical, compound, or electrical methods. Right now, warm adjustment and the electrical adjustment were seldom utilized in light of the fact that they have the less information is accessible in these two strategies. A few times soil adjustment is likewise used to forestall soil disintegration or development of residue which is extremely valuable particularly in dry and parched climate.

They may help in decreasing the dirt volume changes because of changes in temperature. The solidness may give more in incline soil and other such spot.

III. Soil Stabilization Materials

In street development activities, soil or gravelly material is utilized as the street principle body in asphalt layers. So, the dirt has required quality against the malleable burdens and strains range, the dirt utilized for developing asphalt ought to have extraordinary particular. Through this dirt adjustment unbinding materials can be balanced out with cementation material like concrete, bitumen, fly debris. Right now, there are two sorts,

- In-Situ Adjustment
- Ex-Situ Adjustment

Right now, boss properties of the dirt which are important to build are volume security quality, compressibility, penetrability, and solidness. Right now, mechanical adjustment may take significant job right now. I this adjustment they may utilize various kinds of admixtures. They are Lime Adjustment, Concrete Adjustment, Substance Adjustment, Fly debris Adjustment, Rice Husk debris Adjustment, Bituminous Adjustment, Warm Adjustment, Electrical Adjustment by Geo-material and Textures.

Mechanical Adjustment is the way toward improving the properties of the dirt by changing its degree. This procedure incorporates soil compaction and densification by utilization of mechanical vitality utilizing different sorts of rollers, rammers, vibration systems and at some point, impacting. The dependability of the dirt right now on the in a properties of the soil material. At least two sorts of characteristic soils are blended to acquire a composite material which is better than any of its parts. Mechanical adjustment is practiced by blending or mixing soils of at least two degrees to get a material gathering the necessary.

IV. Soil Stabilization Test Using Plastic

To conduct this study, various materials such as lateritic soil, plastic bottles (both cut and uncut), sea sand and synthetic threads were used. The Standard Proctor Compaction the amount of compaction and the water content required in field. The water content at which the maximum dry density is attained is obtained from the relationships provided by the tests. The California Bearing Ratio test was conducted to determine the optimum number of plastic strips in soil. This is done by mixing soil with varying percentages (0.0%, 0.2%, 0.4% etc.) of plastic strips in soil and the 4-day soaked CBR Value is obtained. Plate load tests were conducted with plain lateritic soil, soil stabilized with full bottles, soil stabilized with bottles cut to two halves and soil stabilizes with optimum percentage of plastic strips. Load-settlement graphs for each plate load test were drawn. For each load-settlement graph, the load corresponding to 4mm settlement was noted. The ultimate load and corresponding settlement of the plate is also determined from the load- settlement graph plotted for various test arrangements.

V. Soil Stabilization Test Using Grout Cement

The Grout is a material is used a chemical admixture is used to fill in the cracks. The grout material can give high compressive strength. The grout cement particles are which grow into crystal in form they can interlock with one another. By using the chemical Grout cement to the soil practical's, they can provide a good contact between them. This may know as cement stabilized base (or) cement treated aggregate base. By using the soil-cement they can be hard, and durability may high then they can improve the soil strength. The grout cement they can fill the void between the soil particles they can also reduce the void ratio. They can use the sulfate resistant cement and high alumina cement for the stabilization were the water is added to the soil cement the cement can react with the water and the soil stability can be increased by hardening. Then they increase the unit weight of the soil. By using the cement, they can increase the plastic limit of the soil. They can decrease the liquid limit.

A. Test Results

Standard Proctor Compaction Test by Using Lime

% of lime	0	1	2	3	4	5	6	7	8	9	10
OMC	14.87	13.98	13.87	12.96	12.4	11.3	11.1	11.09	10.9	10.89	11.9

Unconfined Compressive Strength by Using Lime

% OF LIME	0	1	2	3	4	5	6	7	8	9	10
UCS (1 DAY) X 10^-2	5.55	5.67	5.98	6.12	6.23	7.45	8.12	10.12	15.45	16.12	19.32

B. Test Results and Discussion

The most extreme dry thickness and ideal dampness content were acquired as 18.95kN/m3 and 11.22 % separately. This is utilized for finding the mass thickness of the dirt filled in the tank for plate load test. The California Bearing Ratio test was likewise completed by blending the dirt in with ideal dampness

content by using the plastic. It is plainly delineated that the unconfined pressure quality and California Bearing Ratio increments from 0.056 Mpa to 0.193 Mpa in one day with increment in lime % from 0% to 20% and from 7 to 12 with increment in lime % from 0% to 10%.

VI. Conclusion

In the soil stabilization by using the mechanical stabilization method. In mechanical stabilization method is more in economic condition. In mechanical stabilization they may use many types of admixture like rice husk, plastic, lime; cement and other chemical admixture were added to stabilize the soil by using this admixture and the chemical agent. The chemical admixture can be included into sub-grades to increase the soil strength, compact-ability, durability. And by using the plastic bottles and polythene bag, etc. as used as a soil stabilizer. It is an economical and gainful utilization were the society of good qualities of soil for the embankment and fills. This may take challenges of society to reduce the quantities of plastic waste.

References

[1] Y. Gündüz, E. Taşkan & Y. Şahin, "Using Hooked-end fibers On High Performance Steel Fiber Reinforced Concrete" 2016-This paper is part of the Proceedings of the *2nd International Conference on High Performance and Optimum Design of Structures and Materials* (HPSM 2016).

[2] Faisal Fouad Wafa, "Properties and Applications of Fiber Reinforced Concrete"- Division, *Technical Report,* No. 2-48, Ohio River, Cincinnati, Ohio (January 1966).

[3] Fangyuan Li, Yunxuan Cui, Chengyuan Cao and Peifeng Wu, "Experimental study of the tensile and flexural mechanical properties of directionally distributed steel fiber-reinforced concrete", *International Journal of Scientific & Engineering Research*, Volume 7, Issue 10, October-2016, ISSN 2229-5518

[4] Y. Gündüz, E. Taşkan & Y. Şahin, "Using Hooked-end fibers On High Performance Steel Fiber Reinforced Concrete" 2016-This paper is part of the Proceedings of the *2nd International Conference on High Performance and Optimum Design of Structures and Materials* (HPSM 2016).

[5] Masoud Ahmadi, Ali Kheroddin, Ahmad Dalvand, "New Empirical Approach for Determining Nominal Shear Capacity of Steel Fiber Reinforced Concrete Beams", *Construction and Building Materials*, 234 2020 117293.

[6] Tian Sing Ng Bosfa, "Steel fiber Concrete Pavements: Thinner and More Durable", *Concrete* in Australia Vol 44 No 1, 2018.

[7]Vakacharla Veera Mnikanta Srikar & G. Kalyan, "Performance of Concrete with Adding of Steel Fibers", *International Journal of Engineering Sciences & Research Technology*, 2016.

[8] Vikrant S. Vairagade, Kavita S. Kene, "Introduction to Steel Fiber Reinforced Concrete on Engineering Performance of Concrete", *International Journal of Scientific & Technology Research*, Volume 1, Issue 4, May 2017.

[9] R. D. Neves and J. C. O. Fernandes de Almeida "Compressive behaviour of steel fibre reinforced concrete", *Structural Concrete*, Volume 6, Issue 1, pp. 1-8, March 2005.

[10] S. Ramkumar, R. Dineshkumar, Experimental study on impact on fineness of sand and M-sand in M20 grade of concrete, *Materials Today: Proceedings*, 2019, https://doi.org/ 10.1016/ j.matpr.2019.05.356

[11] R. Dineshkumar, S. Ramkumar, Review paper on fatigue behavior of reinforced concrete beams, *Materials Today: Proceedings*,2019, https://doi.org/10.1016/j.matpr.2019.05.353.

[12] A.M. Shende, Comparative Study on Steel Fiber Reinforced cum Control Concrete, University of France, France, 2011.

[13] Faisal FW, Samir AA. Mechanical properties of high-strength fiber reinforced concrete. ACI Mater J 1992;89 (5): 449–55.

[14] Kurihashi, Y.; Taguchi, F.; Kishi, N.; and Mikami, H., "Experimental Study on Static and Dynamic Response of PVA Short-Fiber Mixed RC Slab," *fib Proceedings of the 2nd International Congress*, ID 13-20, Naples, Italy, 2006, 10.

[15] Cucchiara, C. Mendola, L. L. and Papia, M., "Effectiveness of Stirrups and Steel Fibres as Shear Reinforcement," *Cement and Concrete Composites*, Vol. 26, pp. 777-786, 2004.

[16] M. Maalej, S.T. Quek, Zhang J Behavior of hybrid-fiber engineered cementitious composites subjected to dynamic tensile loading and projectile impact, *J. Mater. Civ. Eng*. 17 (2005) 143–152.

[17] Wals HN, "How to make good concrete", *ACI Publications*1969.