COMPARATIVE STUDY OF PHYSICAL AND CHEMICAL PROPERTIES OF GEO-TEXTILES AND SUB GRADE SOIL WITH CBR USED FOR FOUNDATION CONCRETE

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Abstract:-

The economical development of the country is closely related to its road transport infrastructure facility. The periodic maintenance of the road is limited due to cost consideration which will disrupt the service and affect the function of the road. In order to overcome these constraints, geotextiles is used in this to improve the performance of the concrete paved road by increasing their life time, it minimize the maintenance cost, controlling the large deformations of the pavement by improving the thickness of the pavement. Non woven geotextiles is used because of its better puncture resistance when subjected to impact loading. when Geotextiles is placed in between the soft sub grade and base course which increases the California bearing ratio in un soaked and soaked condition. In this work M30 grade concrete is used and opc 53 graded cement is used as a binder.

Key Words – Geotextiles , puncture resistance, sub grade, base course, California bearing ratio

Introduction

To improve the strength of the concrete paved sub grade soil many techniques have been evolved, in that most of them involves the soil stabilization using the chemical admixtures. From that one of the recent techniques is use of geo textiles. Geo textiles can be placed within sub grade and base course to strengthen it. The thickness of the sub base and base course can be reduced by the sub grade soil this can be achieved by the CBR when the bearing ratio of sub grade soil is high. Geo textiles have been used very successfully in road construction for over 30 years. Their primary function is to separate the sub base from the sub grade resulting in stronger road construction.The non woven fabric which looks like a felt fabric is an arrangement of fibres. Non woven geo textiles fabric is more likely to stretch. It has the ability to let water flow along the plane of the geo textiles. While applying geo textiles in soil it increases soil bearing capacity. By increasing the speed of loading the geo textile rigidity and the amount of power increases in a definite strain that is the amount of CBR increased. The soil bearing characteristics increased when one layer of geotextile was used in clayey and sandy samples reinforced by geotextile. It also showed that through the addition of number or weights of geotextile into samples, the natural composition of the soil changed and the results are unreliable [1]. Some of the hard solid, changeable, poor soils in many areas results the sub grades will shrink and swell with variations in moisture content in the soil causes irregular road surfaces this can be rehabilitated and to improve the mechanical properties and performance of soil by using geotextile material [2]. The use of geotextile in many engineering applications have become more apparent and has proven to be an effective means of soil improvement.CBR ratio test were performed to investigate the load penetration behaviour of reinforced granular soils with geotextile. The result of the test shows that, bearing ratio of reinforced granular soils with geotextile increases [3]. Geotextile is an excellent drainage medium and can transmit water efficiently through its own thickness both across and along its plane.On application of repeated dynamic loads on road top, entrapped pore water is squeezed out without allowing migration of top soil particles. The result shows that it is very economical and leads to beneficial effects in engineering constructions [4]. Geotextile can be used in many ways for erosion control. Geotextile recommended for erosion control should have permeability, resistance to abrasion, and high resistance to ultraviolet rays as primary considerations. The permeability is that it ensures the faster dissipation of pore pressure gives better drainage which results in long term performance [5]. Concrete is the most extensively used edifice material in civil engineering industry because of its higher structural strength and stability. The concrete produced with cement contains pores, in order to condense the pores, use of industrial by product like GGBS as a filler material. A cement concrete with M Sand and GGBS were prepared in different proportions 5%, 10%, 15%. The strength properties were achieved at 7 and 28 days. Result shows that GGBS is highly significant to improve the strength of concrete as a filler material [6]. The sustainable development in construction involves use of waste materials and by products. For this work M30 grade of concrete were prepared in various proportions. Copper slag was used as constant

replacement of sand. The copper slag is replaced by 20% of total weight of sand and MSP were used in different proportions as filler. The benefits of using MSP in cement concrete as mineral filler 25% gave the optimum results compared to the other proportions [7]. Experimental studies had conducted on mechanical properties test and durability tests. The mechanical properties are compressive strength, split tensile test and pull out test. Pull out test is made for simulate severe local corrosion to simulate relatively uniform corrosion along the reinforcing bar surface. The durability studies had to conduct on chloride penetration test and rapid chloride penetration test. Measured apparent chloride diffusion coefficients were correlated with the results of rapid index methods that provide an indication of the characteristics of concrete [8].

Properties of Materials Used and Tested

Two types of aggregate are obtained. For the fine aggregate specific gravity, fineness modulus, type of sand and zone conforming are tested. For the coarse aggregate specific gravity, Impact value, Bulk density, Percentage of voids and grade of aggregate are tested. For the cement specific gravity, fineness modulus, water consistency, Initial setting time and Final setting times are tested. For geo textiles acid test and water absorption are tested.

Table 1.physical properties of fine aggregate

S. NO	Properties	Result	Range	References
1	Fineness modulus	3.1	2.9 to 3.2	IS 383:1970
2	Zone conformation	Zone I	-----	IS 2386 (Part I):1963
3	Specific gravity	2.496	2.4 to 2.9	IS 2386 (PartIII):1963

Table 2.physical properties of coarse aggregate

S.NO	Properties	Result	Range	References
1	Specific gravity	2.86	2.5to 3.00	IS 2386 (PartIII):1963
2	Impact value	20.28	Not exceed 45%	IS2386 (PartIV):1963
3	Bulk density	Compacted aggregate = 1550 kg/m3	1520 to 1680Kg/m3	IS2386 (PartIV):1963
4	% of voids	50%	Not exceed 50%	IS 2386 (Part III): 1963

Table 3. Physical properties of geo textiles

S.No	Properties	Result	Range	References
1	Mass	4.0gm	200gm	ASTM D7880
2	Thickness	0.6873mm	3.415mm	ASTM D7880
3	Diameter	14.2mm	71mm	ASTM D7880
4	Color	Sky blue	Sky blue	ASTM D7880

The specific gravity value is 4.0; acid absorbing capacity is 1.07g, and the wet weight 79.5g

Table 4.Physical properties of cement

S.NO	Properties	Result	Range	References
1	Specific gravity	3.15	3.0 to 3.6	IS2386 (PartIII):1963
2	Fineness modulus	2.20	2.0 to 3	IS 4031 (PartI) :1996
3	Water consistency	29.5%	26 to 33%	IS 4031 (PartIV):1988
4	Initial setting time	28 min	30min	IS: 4031 (PartV) :1988
5	Final setting time	9.75hrs	10 hrs	IS: 4031 (PartV) :1988

Table 5. Chemical properties of cement

S.NO	Properties	Result	Range	References
1	Loss of ignition present, maximum	4	Not exceed 5	IS 12269-1987
2	Insoluble residue, present, maximum	2	Not exceed 4	IS 12269-1987
3	Magnesia Mgo, present	6	Not exceed 6	IS 12269-1987
4	SO3,persent, Maximum for i)C3A>5 percent ii) C3A<5 percent	2.5	Not exceed 3.5	IS 12269-1987
5	Lime saturation factor	0.9	0.8 to 1.02	IS 12269-1987

Conclusion

Thus from the results we concluded that the physical and chemical properties of fine aggregate, coarse aggregate, cement and geo-textiles has been studied and they were discussed with their strength, behaviour and characteristics of the material used in this project. The other experimental investigation will be carried out in the following due project.

References

[1] Mahdi TaghipourMasoumi, Ali Abdi Kordani "Experimental study of geo textile effect on improving soil bearing capacity in aggregate surfaced roads" International Journal of civil and environmental engineering Vol:11, No:1, 2017

[2] M.H.Elshakankery, Alsaid Ahmed Almetwally "Experimental study of bearing capacity for Egyptian soils reinforced by geotextiles" Journal of applied sciences and research, 9(3):2378-2385, 2013

[3] S.A.Naeini, M.Mirzakhanlari "The Effect of Geo textile and grading on the bearing ratio of granular soils" ejgevol 13 bund.j

[4] D.TharunAvinash, P.M.S.S.Kumar "Application of geotextiles to improve CBR value of sub grade" Aijreas Vol 2, Issue 2 (2017, Feb)

[5] Dr.S.K.Chaudhary "Geotextiles in road construction, maintenance and erosion control" The Master builder-October 2013-www.masterbuilder.co.in

[6] R.Subashini, T.Sonia, M.Shahulhameed " Study on the behaviour of M Sand concrete using GGBS as filter" International Journal Of Science Technology And Engineering Vol.3. Issue 05, Nov 2016, ISSN (online): 2349-784X. http//www.ijste.org

[7] M.Shahulhameed., Vijayalakshmi,M and Sekar A.S.S., "Influence of marble dust as partial replacement of cement in concrete in different Envrn. Exposure", Journal of Civil Engineering & Construction Review, www.cecr.in, ISSN 0975-9034 Vol-23, pp.78-84,2010