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BEHAVIORAL STUDY OF STABILIZED MUD BLOCK

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Abstract:
India is made with rural and urban area; rural area consists of ancient mud which we used in construction. This mud soil has been used in the construction of houses for ancient time. Interlocking paver blocks are used in immense extent and its demand is increasing day by day for creating the pavement or for exterior flooring. But largely paver blocks are cast using concrete, in which cement is the binder but is an energy absorbing product which consumes more energy during its all phases of production process and it gives out great volume of carbon di-oxide (CO2) to the outside environment causing serious treat on the atmosphere. Thus, there is needful to minimize the usage of cement or to find the other possible binding agent which is ecofriendly. In the other hand large quantity of agro-industrial wastes are getting accumulated which is simply burnt or dumped in a place because of which environmental problems are rising and the valuable lands are getting turned into dumping yards. Only little percentage of these wastes is being used for various purposes. Hence in this study an effort is made to use locally available Gadhichi soil to make paver blocks which is then stabilized using some percentage of cement , Fly Ash , and Admixture. The pavers were cast and tested for compressive strength.The mixture of soil with 10% of Fly ash and 5% addition of cement by the weight of soil and with addition of 10gm APG Mix with or Without Coating showed satisfactory results .
Key Words: Gadhi Soil , Fly Ash, Cement, Compressive Strength , APG Mix

A. Introduction:

Ancient historical mud fortresses exist in many villages of the Vidarbha region of Maharashtra, India. They are deposits of soil almost the size of a small hill and have been in existence for several centuries, the youngest of them is reportedly about 150 years old (Devendra, 1998). In ‘Marathi’, a local language of this region, this kind of dwelling / fortress is called ‘Gadhi’ (Marathi Vishwakosh, 1980). Locally, this soil is called ‘gadhichi or pandhari mati’ (Reddy et al., 2003). This soil is designated as ‘Gadhi soil’ (GS) in the present study. Figure 1 shows photograph of Gadhi in nearby village

Figure 1 Gadhi soil heap in village

It is learnt from villagers that this soil is not found naturally but that people from older generations have prepared it by using stabilization techniques through the addition of certain

ingredients mixed with the locally available black cotton soil (BCS). There is no documentation available on how this Gadhi soil had been prepared. Gadhi soil has been utilized for several generations in the construction of houses providing excellent seasonal comfort to the residents. This region has a tropical monsoon climate with summer, winter, monsoon and spring season

B. Literature Review

Related to the project, the review presented here is mainly about paver blocks using soil ,fly ash cement etc. An attempt has been made out to briefly describe the salient features of the investigation that have been done by researchers.

Mishra et.al(2020) : Studied that using locally available laterite soil, rice husk ash and areca husk fiber to make paver blocks which is then stabilized using some percentage of cement could improve the performance of the building elements. Further its performance is enhanced by usage of SBR latex. The pavers were cast and tested for compressive strength, abrasion resistance and water absorption. The mixture of soil with 20% replacement of rice husk ash and 0.4% addition of areca husk fiber by the weight of soil and ash, with addition of 30% cement and constant 2% latex showed satisfactory results.

Modou and Jarju(2019) : Studied that Interlocking stabilised soil blocks (ISSB) would be an alternative sustainable construction material in the flood prone regions in the Gambia. They had analysed how ISSB has been used in other African countries and especially in regions, most susceptible natural disaster like in Malawi an Earthquake prone regions. ISSB is an exceptional high quality construction alternative with very low production and construction cost. It is as well environmentally friendly and can greatly influence the sanitary health of the people by the constructing water tanks.

J.S.Trivedia et.al(2013) : Studied variation in the values of CBR of the Sub-grade Soil with the addition of a specific percentage of Fly Ash. The input values for this study were those which directly affect the CBR values i.e., directly proportional to CBR. It includes Liquid Limit (LL), Plasticity Index (PI), Optimum Moisture Content (OMC) & Fraction of Fly Ash added (F.A in %).For analysis of stabilization of soil using fly ash, Evolver 5.7 an add-in software of excel is used. Properties used for analysis are Liquid Limit, Plastic Limit, Optimum Moisture Content and California Bearing Ratio

Karim et.al (2020) : Studied the optimum mix ratio of soil to fly ash to enhance the engineering properties of clayey sand that can potentially be used as a road subgrade. Grain size distribution and Atterberg limits tests were conducted to classify the soil and to study the effects of the fly ash on the soil plasticity. The Proctor test was conducted to determine the optimum moisture content and maximum dry density of soil--fly ash mixtures with arbitrarily selected 0%, 40%, 50%, and 60% fly ash content.

Somaiya et.al (2013) : Studied the improvements in the properties of expansive soil with fly ash in varying percentages. As the locally available borrow soil has generally high plasticity (LL > 50) it was difficult to construction on it. The inclusion of different percentage of fly ash in natural soil generally resulted in some increasing in unconfined compressive stress.

Pasupuleti et.al (2015) : Studied the effect of curing time on the strength characteristics of cement treated soil and also to show the engineering behavior in various properties which includes the compaction, compressibility and the shear strength parameters. To achieve this,

laboratory tests had been conducted for various types of soils treated with different types of cements, varying the percentages were performed. The results showed that the curing time has a significant effect on the unconfined compressive strength and it is found that on the addition of cement content, the engineering properties are also affected.

C. Methodology

The details of the materials used and test procedure followed to determine the index properties are described below under respective heading. Following tests had been carried out on Gadhi soil to determine index properties.

- Determination of moisture content by oven drying method.
- Grain size distribution by sieve analysis.
- Determination of specific gravity of soil by pycnometer.
- Determination of liquid limit.
- Determination of plastic limit.
- Standard proctor test

Procedure

1. For soil sample of soil retained on 75micron I.S. sieve

a. The proportion of soil sample retained on 75 micron I.S. sieve weighed and record. Weight of soil sample is as per I.S. 2720 part 4.

b. I.S. sieves are selected and arranged in the order.

c. The soil sample is separated into various fractions by sieving through above sieves in the same order. d. The weight of soil retained on each sieve is recorded.

e. The moisture content of soil if above 5% it is to be measured and recorded.

2. No particle of soil sample shall be pushed through the sieves.

3. Draw a grain size distribution curve on the semi-log graph paper. Fig shows a graph of standard particle size distribution curve

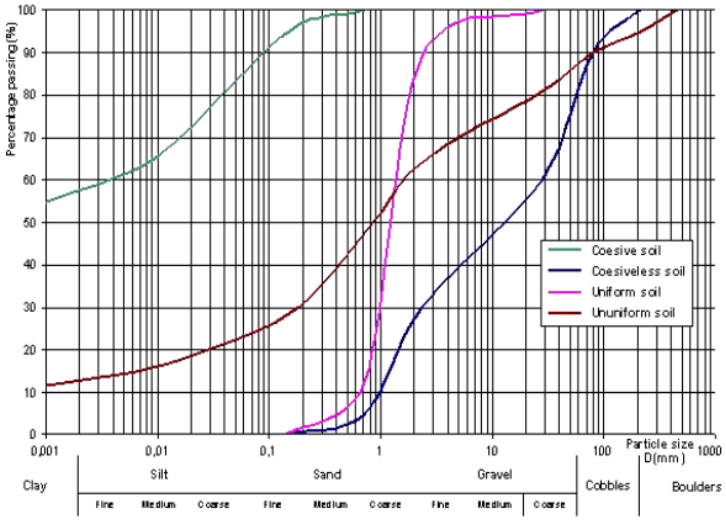

Figure 2 : Standard Particle Size Distribution Curve

D. Result and Discussion

a) Effect of fly ash

To determine the effect of fly ash on dry density of Gadhi soilthe percentage of fly ashvaries as 0% to 20% are shown in table 4.7.

Table 4.7 OMC and MDD of Gadhi Soil on Adding Varying % of Fly Ash

Sr. No	Fly Ash Content (%)	OMC in %	MDD in gm/cc
1	0	16.27	1.45
2	10	13.63	1.62
3	15	13.17	1.58

From table 4.7, After performing Standard Proctor Test , it was observed thatafter adding varying % of fly ash the OMC and MDD increases at 10% of flyash and Decreases at 20% of fly ash than plain soil block . The Optimum percentage of fly ash is found to be 10% .

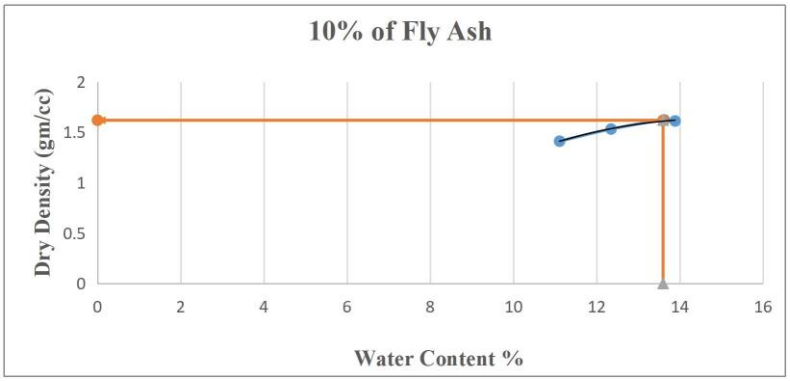

Figure 4.4 OMC and MDD for Gadhi soil +10% fly ash

b) Effect of Cement

To determine the effect of cement on dry density of Gadhi soil the percentage of cement varies as 5% to 10% are shown in table.

Table 4.8 OMC and MDD of Gadhi Soil on Adding Varying % of Cement

Sr. No	Cement (%)	OMC in %	MDD in gm/cc
1	0	16.27	1.45
2	5	11.60	1.55
3	10	12.86	1.38

From table 4.8 After performing Standard Proctor Test , it was observed that after adding varying % of cement the MDD increases at 5% of cement and Decreases at 10% of cement than plain soil block and OMC decreases at 5% and increases at10% . The Optimum percentage of fly ash is found to be 10% .

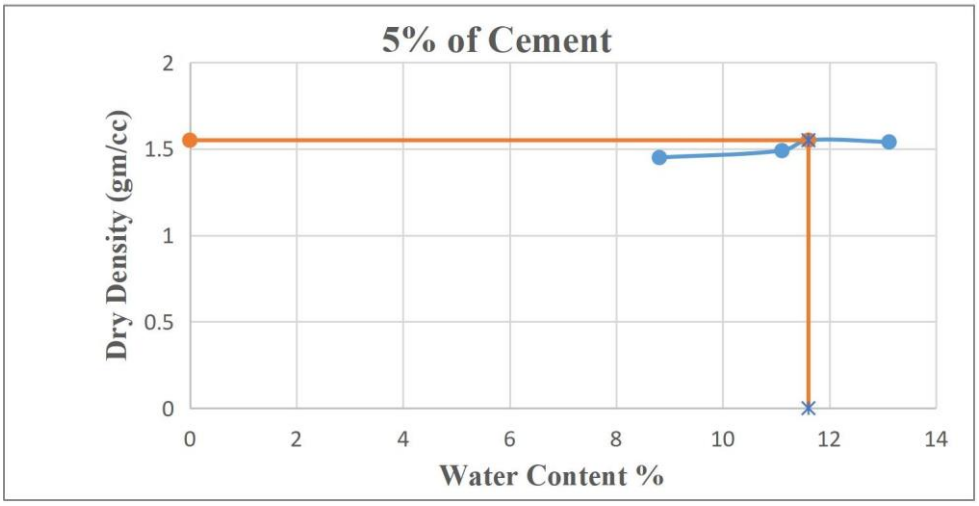

Figure 4.5 OMC and MDD for Gadhi soil +5% cement

C) Performance of Stabilized Mud Block

The performance of stabilized mud block was determined for three combinations as shown in table 4.9 the stabilized mud block was prepared for optimum percentage of cement(5%),fly ash(10%) and admixture. The failure load after 7days of curing curing was determined for blocks with coating and without coating, for coating of block Ultima Protek top coat was used.

Table:4.9 Performance of Stabilised Mud Block

Combinations

Sr. No	Stabilised Mud Block Combination	Failure Load (KN) After 7 Days Curing	
		Without Coating	With Coating
1	Soil Block	19.7	28.8
2	Soil + Cement +Fly ash	30.8	69.4
3	Soil + Cement + Fly ash + Admixture	53.4	69.3

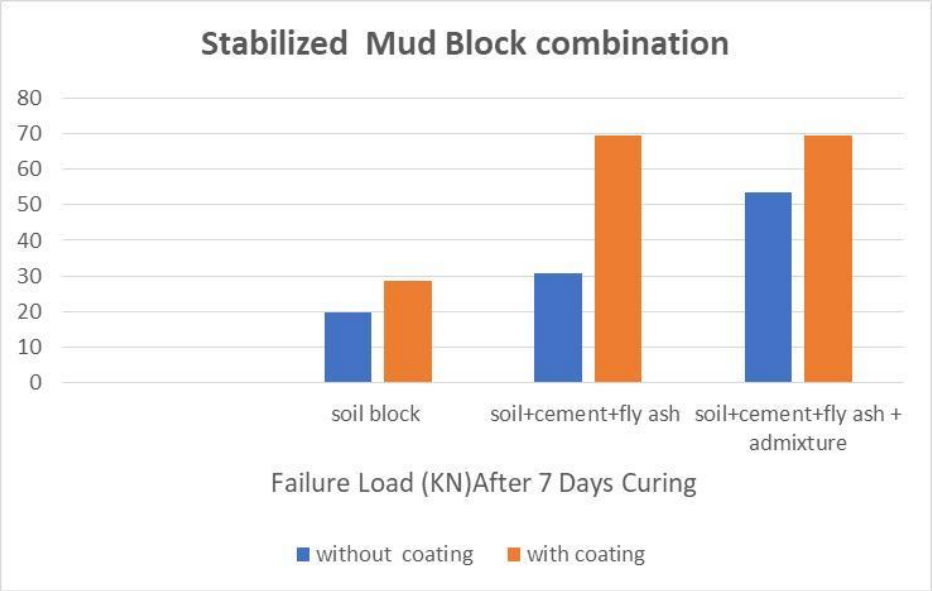

Figure 4.6 Combination of stabilized mud block

From the above graph it was observed that the failure load was increases after applying coat to the stabilized mud block, and when the cement and fly ash were added the failure load was increased, and when the cement, fly ash and admixture were added it was again increased.

CONCLUSION

From the study following conclusions can be made:

1. The Gadhi soil used is Poorly Graded Sand with low plasticity.
2. The optimum percentage of cement and fly ash is found to be 5% and 10% respectively.
3. The failure load of soil block was increased by 271% and 241% with coating after adding

optimum percentage of cement, fly ashand admixture.

REFERENCES

4. M. A. Karim 1,*, Ahmed Sami Hassan 2, Adam Kaplan - Optimization of Soil to Fly-Ash Mix Ratio for Enhanced Engineering Properties of Clayey Sand for Subgrade Use (October 2020)
5. Tuan A. Pham a,b,*, Junichi Koseki b, Daniel Dias c,d - Optimum material ratiofor improving the performance of cement-mixed soils (13 April 2021.)
6. J Ongpeng, E Gapuz, J J S Andres, D Prudencio, J Cuadlisan, M Tadina, A Zacarias, D Benauro and A Pabustan
7. J Ongpeng, E Gapuz, J J S Andres, D Prudencio, J Cuadlisan, M Tadina, A Zacarias, D Benauro and A Pabustan - Alkali-activated binder as stabilizer in compressed earth blocks(2020)
8. Shivnath Jangid1, Milind Darade2 - Study on Compressed Stabilized Earth Block(2017).
9. Satyanarayana.P.V.V1, Rahul.Ch2, Uday Kiran.Ch3, Raghava Rao E.V4 - A Study On The Performance Of Fly Ash And Sand Mixes As Sub-Grade And Fill Material(2016).
10. Lillian Gungat1*, Fulgentius Anthony1, Abdul Karim Mirasa1,Hidayati Asrah1, Nurmin Bolong1, Nurul Ariqah Ispal2and Siti Jahara Matlan1 - Development of Paver Block Containing RecycledPlastic (2020)
11. Tanu H M, Minakshi Mishra, Sunitha M, Reshma T V, SankalpasriS S, - A Study On Cement Stabilized Laterite Paver Blocks(2020)
12. Tuan A. Phama,b , Hiroyuki Kyokawaa, Junichi Kosekia and Daniel Diasc - A new index for the strength analysis and prediction of cement-mixed soils(2022)

Pasupuleti Ravi Kumar Teja1, K. Suresh 2, Dr. K V Uday 3 -Effect of Curing Time on Behaviour and Engineering Properties of Cement Treated Soils(2015