Influence of Foundry Sand Waste in the Clay Soil on Designing of Flexible Pavements & its Analysis

Dushyant Singh Tomar[1] Sandeep Gupta[2]
[1]Research Scholar [2]Assistant Professor
[1,2]Department of Civil Engineering
[1,2]SIRT-E, Bhopal, India

Abstract— In this study completely different geogrids were use different height of subgrade, so a series of California Bearing ratio (CBR) tests were conducted to evaluate the strength of subgrade soil. Geogrid at a different height of California Bearing Ratio (CBR) mould at 0.2H, 0.4h, 0.6h and 0.8h were used for improving soil strength. Results from the CBR tests established that addition of that material in subgrade soil gives efficient strength to subgrade soil. It was observed that the CBR value increases with increase the height of geogrid and after that decrease the value of CBR. The pavement sections have been designed with the modified subgrade using geogrid.

Key words: Black Cotton Soil, Waste Foundry Sand, OMC and MDD, CBR Value, Pavement Design, Subgrade Thickness

I. INTRODUCTION

Black cotton soil is a type of expansive soil and covers very large area of world, mostly found in the arid and semi-arid region. In India it covers about 20% of land area and includes approximately the entire Deccan Plateau, Maharashtra, Karnataka, Andhra Pradesh and part of Gujarat and Madhya Pradesh. It exhibit low bearing capacity and high volume change due to the presence of montmorillonite clay mineral. The poor engineering properties of soil have forced engineers to improve the properties of soil by various stabilizing techniques. Recently various polymer stabilizers have emerged and are being used for soil stabilization.

Soil stabilization is a method of improving soil properties by blending and mixing other materials. To study the change in Geotechnical properties of black cotton soil by stabilizing it with Waste Foundry Sand. To study the effect of different dosage of Waste Foundry Sand on Geotechnical properties of Black cotton soil. And design of flexible pavement before and after stabilization of soil

II. LITERATURE REVIEW

Rabindra Kumar (2015) describes the implications for the plate load take a look at on fibre rein forced cohesive soils. This report discusses the load settlement response from 3 plate tests (0.3m x 0.3m sq. twenty five millimeter deep) disbursed on a thick solid stratum of compacted cohesive soil, bolstered with arbitrarily distributed plastic fibres and fibre fibres, in addition as on constant soil while not the bolstered. The plate load take a look at on the soil fibre layer was performed to comparatively high pressures, and yielded an evident stiffer response than that disbursed on the bolstered stratum. it's all over from plate load tests that the settlement below a selected load in bolstered soil in way more compared to the bolstered soil, minimum settlement being ascertained for the soil bolstered with plastic fibres. the last word load for the unreinforced soil is found to be forty two KN and therefore the values for soil bolstered with fibre fibres' and plastic fibres' square measure seventy KN and 80KN severally. Thus, the last word load of the soil bolstered with zero.8% fibre fibres' and zero.5% plastic fibres' will increase by sixty seven and ninetieth severally as compared to unreinforced soil. Fibre bolstered soil is capable of engrossing a lot of strain energy before failure. Thus, soil fibre could also be used as improved materials within the field of geotechnical engineering.

N. Vijay Kumar (2014) mentioned the properties of commercial waste (slag) bolstered plastic composites. An honest deal of waste is formed by industries which they're going to stack on soil that makes state and surroundings problems. Government policies and laws force USA to look for alternatives. The stick has been accustomed study the friction and wear behavior of the compound composites. The damage and tear loss and constant of friction square measure premeditated against the conventional masses and slippery speeds. it's noted from the graphical illustration of the result that with the rise in load weight loss decrease and increase in slippery speed weight loss additionally increase.

Vaishali Sahu (2014) according the property employ of stabilised and fibre bolstered fly ash-lime sludge (FALS) as pavement sub-base materials. Within the building, the planet is facing a serious downside of standard building materials. Within the gift study, a material created from ash and lime sludge (FALS) was tried as sub-base material. Stabilization of FALS with commercially on the market lime and mineral was disbursed and any the result of adding plastic fibres to stabilised FALS was studied. A series of unconfined compression tests were done on specimens of fibre-reinforced fly ash-lime sludge composite (FRFALS) to assess the influences of fibre on the sturdiness and malleability characteristics of the composite. The consequence of fibre bolstered on the Golden State Bearing quantitative relation (CBR) and shear strength parameters, cohesion (c) and internal friction angle (Φ) is additionally talked concerning. Supported the results, it's been reasoned out that the addition of low amounts of plastic fibre (0.1%) increase the sturdiness and ductibility of the FRFALS for the various natural action amount. The cosmic radiation values of FALS raised by fifty four with fibre addition {and the|and therefore the|and additionally the} shear parameters c and Φ also increase. Thence the FALS composite is appropriate in sub-base layers of versatile pavement, if it's bolstered with plastic fibre.

III. RESULTS

A. The Liquid Limit Using Foundry Sand Content

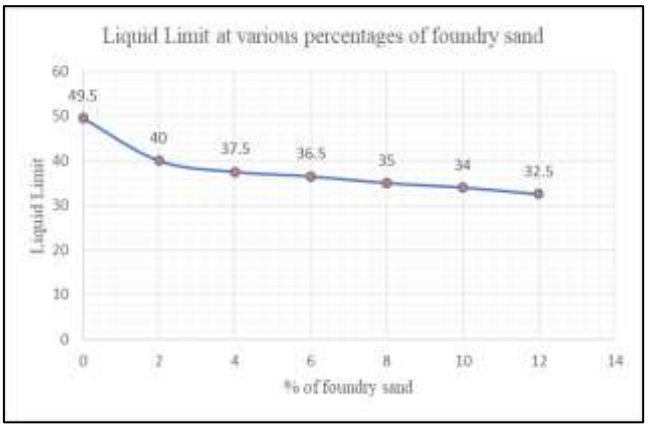

Fig. 1: Result of the liquid limit using Foundry Sand content

B. The plastic limit using Foundry Sand content

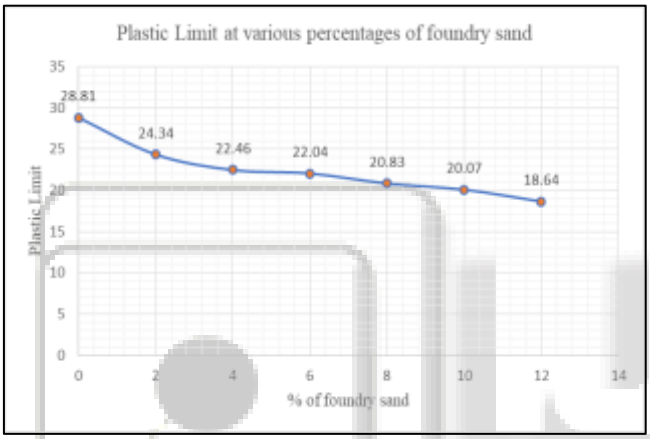

Fig. 2: Result of the plastic limit using Foundry Sand content

C. The Plasticity Index using Foundry Sand content

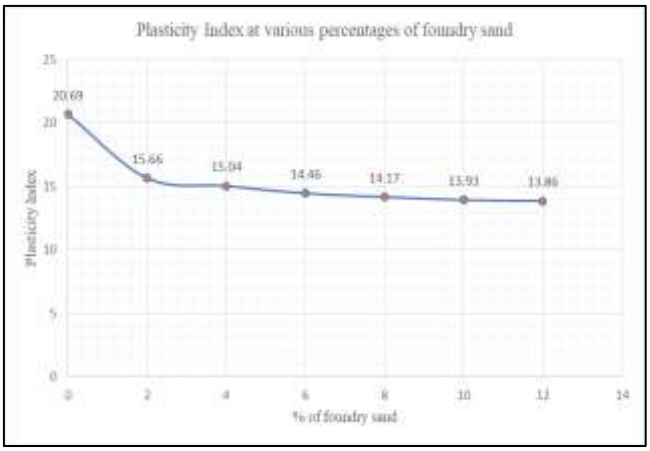

Fig. 3: Result of Plasticity Index using Foundry Sand content

D. The Optimum Moisture Content using Foundry Sand content

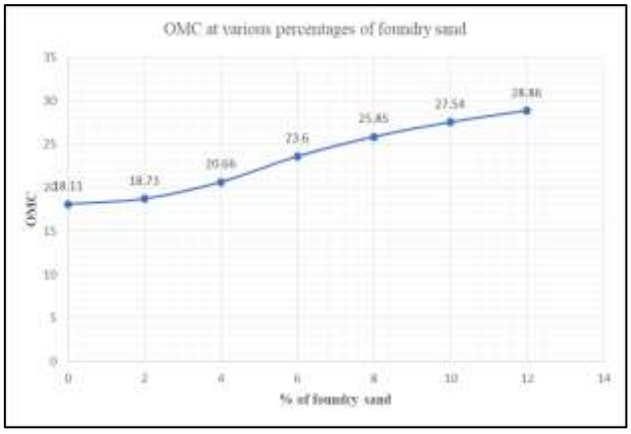

Fig. 4: Variation of Optimum Moisture Content (OMC) with Foundry Sand content

E. The Maximum Dry Density using Foundry Sand content

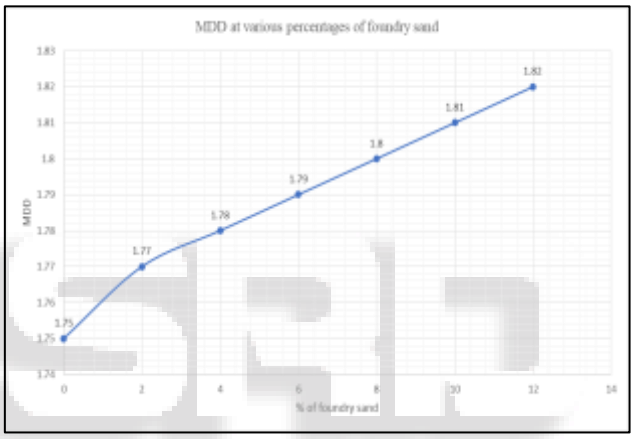

Fig. 5: Variation of Maximum Dry Density (MDD) with Foundry Sand content

F. UN Soaked CBR test result

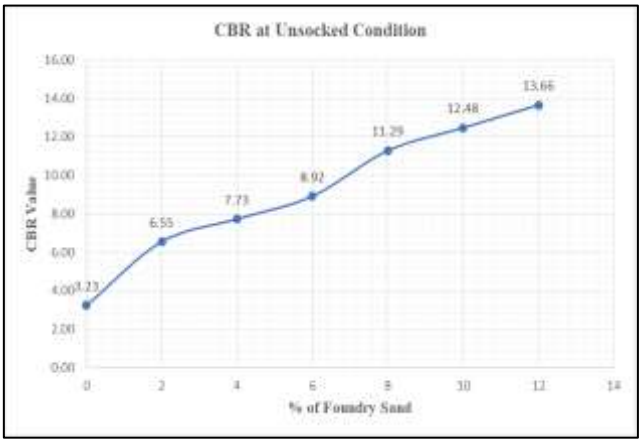

Fig. 6: UN Soaked CBR test result using Foundry Sand

G. 4DAY Socked CBR Test Result

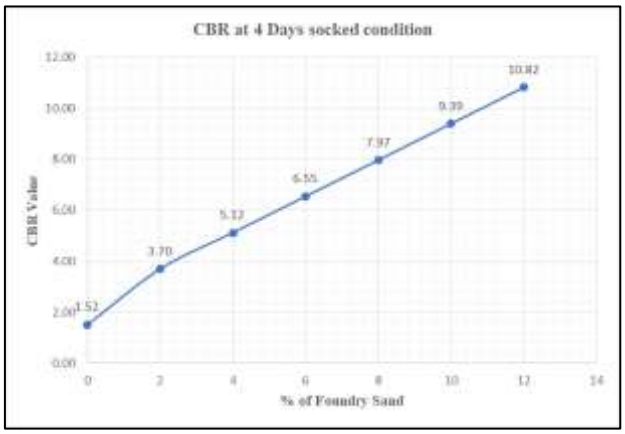

Fig. 7: 4Days Soaked CBR test result using Foundry Sand

IV. CONCLUSION

- The liquid limit is decreased
- Virgin soil liquid limit is 39.50 and 12 % foundry sand use in soil than liquid limit is 32.5.
- And also plastic limit also decrease.
- OMC is increase (18.11 to 27.54) at 0 to 12 % use foundry sand.
- MDD is also increase (1.75 to 1.82) at 0 to 12 % use foundry sand
- The result implies that when sub-grade is reinforced with Foundry Sand its CBR increases as for virgin soil CBR is 3.23 and it increases to 13.66 with Foundry Sand under un-soaked condition.
- For 4 days soaked condition CBR of Foundry Sand as 10.82 which is higher than virgin soil CBR of 1.52 under soaked condition.
- Design of flexible pavement at CBR value at 3.23 and 13.66.
- Pavement thickness is reduce 655 mm to 480 mm.
- Result of design is 36.45 % overall material and also cost saving.

REFERENCES

[1] Kaur, H., Kumar, R., Babu, J.N. and Mittal, S., 2015. Advances in arsenic biosensor development–A comprehensive review. Biosensors and Bioelectronics, 63, pp.533-545.
[2] Vandana, K.R., Raju, Y.P., Chowdary, V.H., Sushma, M. and Kumar, N.V., 2014. An overview on in situ micronization technique–An emerging novel concept in advanced drug delivery. Saudi Pharmaceutical Journal, 22(4), pp.283-289.
[3] Sahu, V. and Gayathri, V., 2014. The use of fly ash and lime sludge as partial replacement of cement in mortar. International Journal of Engineering and Technology Innovation, 4(1), pp.30-37.
[4] IS: 2720-5, 1985 Methods of test for soils, Determination of liquid and plastic limit.
[5] IS: 2720-7, 1980 Methods of test for soils, Determination of water content dry density relation using light compaction.
[6] IS: 2720 (Part 16) - 1987, Methods of Test for Soils, "Laboratory determination of CBR" , Bureau of Indian Standards, New Delhi.

