Parametric study on Index property of soil by adding course sand for Granular Sub-base.

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Abstract: Most of the study were done in past for making expansive soil (like black Cotton soil or ordinary soil) suitable for embankment and sub grade construction work by adding one are more material in to the soil. For utilization of locally available gravel soil for sub base work and relevantly for reusing the wastage of dismantled material (obtained from dismantling of road pavements) there is a need of detail parametric study on index and other properties of local quarry soil/gravel soil/murrum/Garbage of dismantled road pavement material with admix of stone dust/river sand/fine aggregate on different percentage. In the present study we are investigating suitability of waste quarry soil obtained from disintegration of laterite stone by adding the soil with suitable percentage of river/nalla sand.

Keywords: Granular Sub Base, Murrum, Sand

1. Introduction

In India, the materials obtained from disintegration of laterite are extensively found in admixture of clay and coarse fraction and known as lateritic gravel. This material is known as moorum, Often the natural moorum contains plastic material and low strength, which decrease its value as a road pavement material for sub-base work, A suitable admixture of moorum with stone dust will not only improve its Index properties but also its strength. Experimental study is propose to carry out in laboratory by adding combination of moorum and course sand in various percentage to find suitable proportion on which local moorum will suit its parameter for granular Sub-base material of low traffic volume roads in rural area.

2. Review of Literature

Mr. Roy Tapash Kumar in the year 2010 suggested method for use of Jute-Textile in the Moorum - sand mixed layer as Granular Sub base of flexible pavement.

Mr. **Kumar Satander** and **Saxena Anukul** in the year 2010 suggested method for use of Black Cotton soil for Sub-base work by mixing RBI 81, Stone dust in ratio of 80% Black Cotton Soil + 20% Stone dust and 70% Black Cotton Soil + 30% Stone dust and RBI 81 3% to 6%.

Mr. Ali Sohail and Koranne Sunil had given their research paper in year 2011, according to their research it is concluded that at optimum percentages, i.e., 20 to 30% of admixture of stone dust and fly ash, it is found that the swelling of expansive clay is almost controlled and also noticed that there is a marked improvement in the other properties of soil.

Phanikumar, B.R. and Sharma, R.S. (2004) had given their study notes on "Effect of fly ash on engineering properties of expansive soil, Journal of Geotechnical and Geo environmental Engineering Vol. 130(7), 764-767".

Soosan, T. G., Sridharan A., Jose B.T, and Abraham B. M. had studied in year 2005. Under their study, effect of addition of quarry dust on properties of red earth and two different cohesive soils; viz. kaolinite, Cochin marine clay was studied in detail. The results indicate that compaction characteristics and CBR of soils are improved by addition of quarry dust. Problems associated with the construction of highways over clayey sub grade can be reduced significantly by mixing with quarry dust. Journal was published on "Utilization of quarry dust to improve the geotechnical properties of soils in highway construction" Geotechnical Testing Journal, Vol. 28(4), Paper ID GTJ11768, 391-400.

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Philadelphia, PA 19122 had studied and submits their study results in tear 2008 on Geotechnical Properties of Problem Soils Stabilized with Fly Ash and Limestone Dust in Philadelphia.

3. Experimental work The present investigation deals with the mechanical stabilization of murrum with mixtures of sand. The work presented in this contest results of index properties (liquid limit, plastic limit) and compaction characteristics (optimum moisture content and maximum dry density) for the murrum blended with varying percentages of sand (10 to 30 %).The tests conducted as per Indian Standard for Determination of liquid limit IRC: SP: 20-2002. "Rural Roads Manual", Indian Roads Congress, New Delhi. IS: 2720 (Part-I)-1983. and plastic limit", BIS New Delhi. IS: 2720 (Part-V)-1987.Indian Standard for Determination of liquid limit and plastic limit, BIS New Delhi. IS: 2720 (Part-VIII)-1983. Indian Standard for Determination of Water Content-dry density relation using heavy Compaction, BIS New Delhi. IS: 2720 (Part-XVI)-1974.Indian Standard for Laboratory Determination of CBR BIS, New Delhi.

Table 1 Relation in between Atterberg limit and % of sand

S.No.	Description of mix	LL	PL	PI
1	Natural Murrum	31	23.24	7.66
2	N.M. + 10% sand	29.5	22.19	7.31
3	N.M. + 15% sand	28.9	22.20	6.7
4	N.M. + 20% sand	27.0	21.37	5.63
5	N.M. + 25% sand	23.84	19.52	4.32

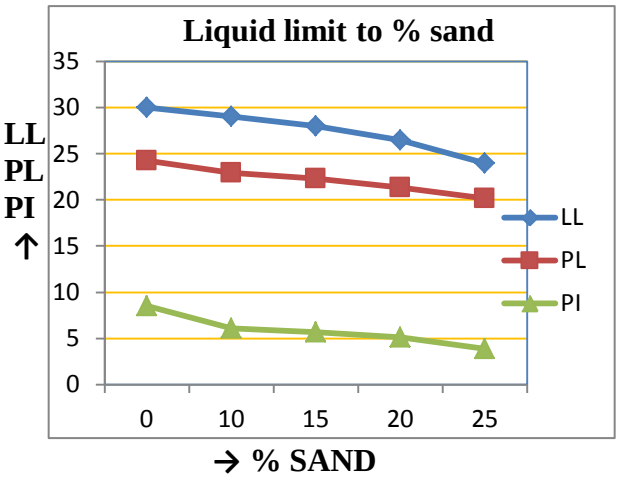
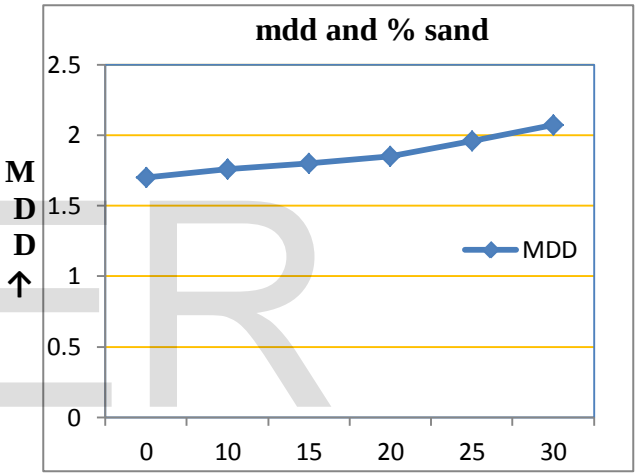


Fig.1 Relationship of LL, PL & PI with % sand

S.No.	Description of mix	mdd	omc
1	Natural Murrum	1.7gm/cc	11%
2	N.M. + 10% sand	1.75rm/cc	10.7%
3	N.M. + 15% sand	1.8gm/cc	10.0%
4	N.M. + 20% sand	1.90gm/cc	9.07%
5	N.M. + 25% sand	1.96gm/cc	8.63%
6	N.M. + 30% sand	2.02gm/cc	7.45%

Table 2 Relation between OMC and MDD of sand



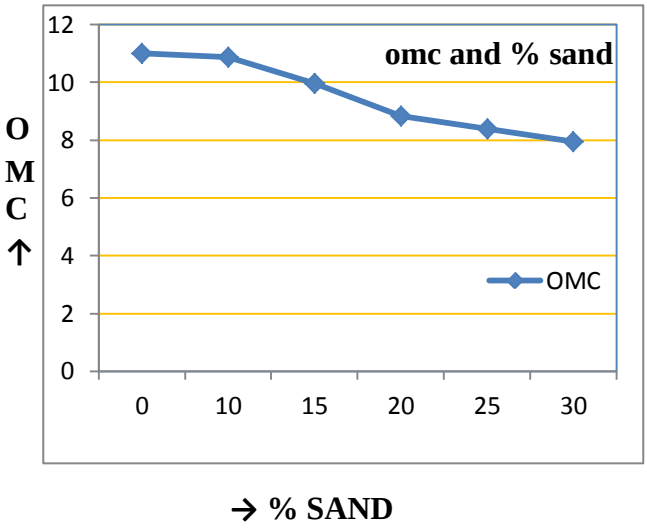


Fig.2 Relationship of OMC and MDD with % of sand

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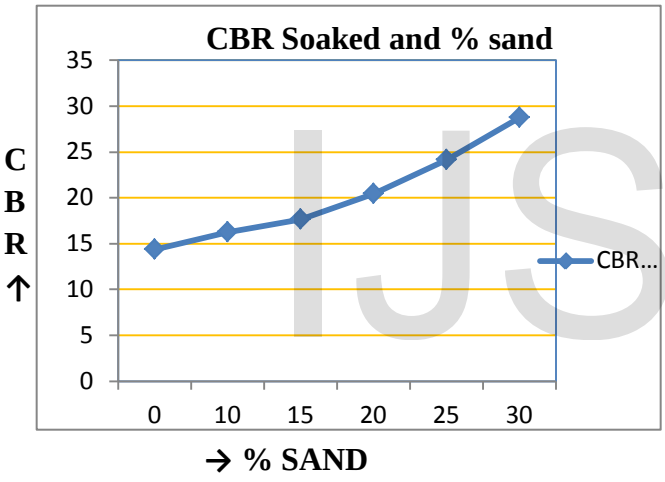
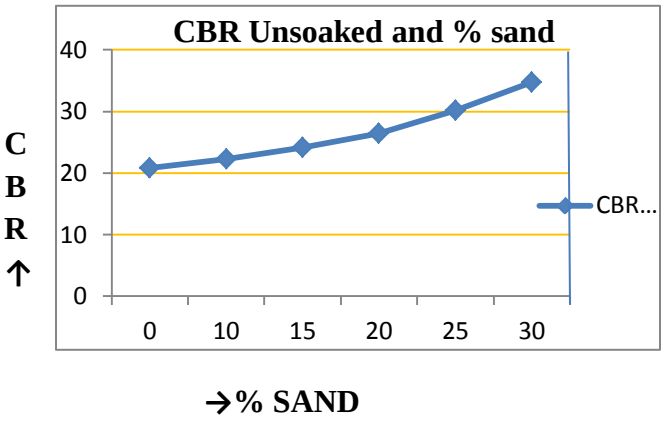
Table 3 Relation in between Soaked & Unsoaked CBR and % of sand

S.No.	Description of Mix	CBR soaked	CBR Unsoaked
1	Natural Murrum	14.37%	20.86%
2	N.M. + 10% sand	17.15%	21.32%
3	N.M. + 15% sand	18.54%	23.64%
4	N.M. + 20% sand	20.86%	25.96%
5	N.M. + 25% sand	24.57%	30.13%
6	N.M. + 30% sand	28.28%	33.84%





Curve in between Soaked & Unsoaked CBR and % of sand

Based on the laboratory test results, the following conclusions are drawn;

a. As the percentage of sand additive increases from 10% to 30% the plasticity of the murrum sand mixture decreases from 23.24% to 19.48%.

b. As the percentage of sand additive increases from 10% to 30% the MDD values of the murrum sand mixture increases from 1.70 gm/cc to 2.02 gm/cc and the corresponding omc values decreases from 11% to 7.45%.

c. As the percentage of sand additive increases the CBR values of the murrum sand mixture increases from 14.37% to 28.28%.

d. As the percentage of sand additive increases from 10% to 30% the Gradation of the murrum sand mixture moves towards upper limits of gradation value and at maximum of 30% sand just touches the upper limit of gradation.

It is observed that the mixture of the murrum mixed with 25% of sand full fill the requirement for granular sub base material recommended by Ministry of rural development (MORD). The values at 30% sand are also full fill the requirement of granular sub base material but when we are getting our suitability of admixes on lower % of sand i. e. 25% then seeing to economy of construction the 25% sand is recommended as additive. The detail comparisons of parameter recommended and of result obtained on 25% sand are as given in table below.

S. No.	Properties	Values Recommended by MORD	Values analyzed on mixture of murrum with 25% sand as additive
1	Liquid limit	Not more than 25	23.84 % (less than 25%)
2	Plasticity Index	Not more than 6	4.32% (Less than 6%)
3	MDD	Not less than 1.70 gm/cc	1.96gm/cc (More than 1.70gm/cc)
4	CBR	Not less than 20% after 96 hours soaked	24.57% after 96 hour soaked

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		condition	condition (More than 20%)
5	Gradation as per table 400.1	Should lies within prescribed range of table 400.1	Gradation curve lies in between Upper limit and lower limit of required gradation.

4. Conclusion

Hence we concluded that the 25% sand as additive by weight of murrum is more suitable and recommended for execution in the work of road pavement as granular sub base material for rural road works.

4.1 Recommendation for future work: - Following recommendation are recommended for future studies and researches.

a. The similar nature of investigation are also recommended for finding out use of existing plastic soil for other road construction material like embankment, sub grade and hard shoulder by adding suitable good engineering property material.

b. The similar nature of investigation are also recommended for finding out best use of existing plastic soil with additive of aggregate for base course material, soil with lime as additive in soil for embankment/sub grade purpose.

c. The similar nature of investigation are also recommended for the garbage obtained from dismantling of absolute existing road pavement or damaged layer of pavement, which can be used as sub grade or base course by adding stone dust/sand as additive or more than one additive like stone dust and clay or sand with clay and lime.

5. REFRENCES

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