Discussion on Papers

Mechanical Stabilization of Lateritic Soil for Improving Subgrade*

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The authors are to be commended for their interesting work on the improvement of Lateritic soil for purposes of subgrade with cinder ash. In this regard the writer has the following comments to offer:

The authors used Rothfuch's method for modifying the natural soil to improve density by graphically proportioning mixtures of material retained on I. S. Sieve 120 and that passing through the same sieve. The results obtained indicate that there is just a 7 percent increase in dry density by such a modification. But the authors' comment that "Though this is a small increase it is commendable since the increase is brought about by merely readjusting the soil" is questionable because such a "mere readjustment" is obtained in the field only at a great expense (For. eg. Sherard et al 1963). Thus the modification attempted by first gradation or sieving the soil and then proportioning it properly, is hardly a worthwhile exercise in the field, and possibly other methods of stabilization may prove to be cheaper, including the method the authors have attempted viz. addition of cinder ash.

The maximum dry density values as reported in Table-3 generally show a decrease with increase in ash content. This the writer feels is due to the basic fact that the specific gravity of ashes obtained by burning of coal is generally very low. But in the present investigation as the authors used material passing I. S. sieve 480, it will be appreciated if the authors could present *Gs* of the cinder ash used, along with its grain size distribution. Further, just as there is a regular trend in the variation in maximum dry density with ash content, a similar trend may be expected with respect to optimum moisture content also. But such a trend is absent, as may be seen from Table 3. Hence the writer is of the opinion that presentation of the complete moisture—dry density curves may throw some light on this aspect. Further, the shapes of the dry and wet sides of the compaction curves, may yield some more interesting features.

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* Published in the Indian Geotechnical Journal, Vol. 5, No. 1, January 1975 issue, pp. 57-65.

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Regarding the *CBR* values (Table 4) it is interesting to find that with increase in ash content, there is an increase in CBR upto 10 percent ash content, but beyond this, there is a clear decrease in CBR, in difference to what has been stated by the authors. Further, the authors state that as there is reduction in unconfined compressive strength with ash content, direct shear tests were conducted to investigate about the "angle of internal friction". But the results presented in Table 5 do not indicate any such reduction. Instead what is clearly observed is that, initially for an ash content of 8 percent, there is a reduction in q_u in comparison to that of natural soil, but q_u increases steadily with increase in ash content till 14 percent, when it shows a clear peak which is much higher compared to that of the natural soil. But when the ash content was increased further, *there is again a sharp decline in* q_u. *This behaviour in fact is more or* less what has been noticed for *CBR* behaviour (Table 4). Thus there is good consistency between these two types of tests. A comparison of the typical strength results by the different methods is tabulated below (by rearranging data from Tables 4, 5, and 6):

Soil used	*CBR*(%)	q_u (Kg/cm²)	$\phi°$
Natural soil	12.2	1.696	35
Modified Soil	14.3	0.708	48
Natural Soil + 10% ash	15.3	1 056	42
Natural Soil + 12% ash	15.2	1.608	—

A study of the above table indicates that addition of 10-12 percent fly ash to natural soil is definitely more promising in view of the general increase in strength (either in the form of *CBR*, q_u or ϕ) which conclusion is not in line with that arrived at by the authors. Further, it should be kept in mind that the ultimate aim of mechanical stabilization with or without additives is to obtain better strength/volume change characteristics, but not just a mere increase in maximum dry density.

The writer further seeks details regarding the procedure adopted regarding the direct shear tests employed to obtain the angle of internal friction, because the angle so obtained is greatly a function of the mode of testing (drainage conditions and the speed of testing) and the sample used. In case compacted (partly saturated) samples have been employed, the total strength obtained will not only be a function of ϕ, but also of c.

Reference

SHERARD, J.L.; WOODWARD, R.J., GIZIENSKEI, S.F. and CLEVENGER, W.A. (1963): "*Earth and Earth-Rock Dams*", John Wiley; New York, Chapter 1, p.4.