Sub Base Improvements by Stabilization Techniques using Waste Materials

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Abstract

Improvements of rural roads are vital socio-economic pathways to a better quality of life for most of the Srilankan people living in rural areas. The fund allocated for low volume road project is limited, thus it is important to use existing resources for economic advantages. Also, adverse environmental impact can be reduced. Roads are designed for low-volume traffic and are constructed of local soils containing high percentages of fines and high indices of plasticity. These soils may not have characteristics appropriate for the sub base in the construction of flexible pavement in rural roads. Thus, it is necessary to modify or stabilize this kind of soil to make it suitable for construction. The soil modification process can be effectively used to meet the challenges of sustainability of the environment, to minimize the adverse effect of industrial wastes such as plastic, glass, paddy husks, etc. Wastes are increasing day by day leading to various environmental concerns. Therefore, the disposal of those wastes without causing any ecological hazards has become a real challenge. Thus using plastic waste, glass waste & paddy husks as stabilizing agents is an economical utilization since there are demand and shortage of good quality soil for sub-base. This research involves a detailed study on the possible use of the waste products for soil stabilization for the sub-base material in the North Central Province I-Road Project in Sri Lanka.

A series of field and laboratory tests were carried out for collected sub-base materials to identify the deficiency of sub-base material properties. ICTAD specification for the roads was referred and confirmed to the specification for the road projects in Sri Lanka. The specification says that Liquid Limit should be less than 40 (LL<40) and Plasticity Index should be lesser than 15 (PI<15). Sub-base materials from Polonnaruwa area were stabilized with different percentage of paddy husk ash, plastic waste and glass waste with weight-based mix proportions. But the experimental study demonstrated that with an 8 % mix of paddy husk ash as a reduction in Liquid Limit by 20 % and Plastic Index by 26 % was achieved. Also, California Bearing Ratio of the stabilized sample was improved by 10% as well. Finally, it was concluded that the stabilized composite soil can be used for the construction of flexible pavement in rural areas with low volume traffic.

Keywords: Sub base, Stabilization, Liquid Limit, Plastic Index, Waste Material, Paddy Husk Ash

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