

**STABILIZATION OF SOIL WITH PLASTIC WASTE
AND LEAF ASH**

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Degree of Master of Philosophy

Department of Civil Engineering

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Thesis submitted in partial fulfillment of the requirements for the degree Master of
Philosophy in Civil Engineering

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ABSTRACT

This study aims to investigate the stabilization of three sandy soils with the addition of waste plastics, Bamboo Leaf ash (BLA), Banana Leaf ash (BALA) and a leaf ash mixture based on the enhancement in the MDD (Maximum Dry Density), OMC (Optimum Moisture Content), Soaked CBR (California Bearing Ratio), Shear strength parameters and Atterberg Limits. The soil stabilizers used in the study are the plastics strips from waste plastic file folders, BALA, BLA and a pozzolanic leaf ash mixture of five commonly available pozzolanic leaves in Sri Lanka. Plastics used in the study have 5 mm width and Aspect Ratios (ARs) of 1, 2, 3, and 4 in the weight percentages 0.5, 1, 2, 4, and 8. BALA, BLA and the leaf ash mixture used in the study are in the weight percentages 2, 4, 6, 8, and 10. The most significant improvement in MDD was achieved when 2 % of plastics with an AR 02 was mixed with soil 01. For soil 02, the best improvements in MDD with almost similar values were observed with the addition of 6 % of all the considered ashes. For soil 03, the best improvements in MDD with almost similar values were achieved with the addition of 6 % of BLA and the leaf ash mixture. The optimum improvement in soaked CBR for each soil was around (2-3) times compared to the virgin state. The optimum improvement in soaked CBR was observed with the addition of 6 % of BLA for all three soils. Shear strength parameters improved in almost all cases of the addition of plastics and ashes. A reduction of plasticity index (PI) was noted on all three soils with the addition of 2, 4 and 6 % of ashes. Soil 03 mixed with 2 % plastics of AR 03, 8 % BALA, 6 % BLA and 6 % mixture of pozzolanic ashes showed satisfactory results to be used for the upper subbase layer in flexible pavement constructions in Sri Lanka.

Keywords: Soil stabilization, Shear strength, Plastics, Leaf ashes, Geotechnical properties

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LIST OF ABBREVIATIONS

Abbreviation	Description
AR	Aspect Ratio
ASTM	American Society for Testing and Materials
BALA	Banana Leaf Ash
BLA	Bamboo Leaf Ash
CBR	California Bearing Ratio
C_c	Coefficient of gradation
C_u	Coefficient of uniformity
GSMB	Geological Survey and Mines Bureau
HDPE	High Density Polyethylene
ICTAD	Institute for Construction Training and Development
LL	Liquid Limit
MDD	Maximum Dry Density
OMC	Optimum Moisture Content
PC	Plastic Content
PI	Plastic Index
PL	Plastic Limit
RDA	Road Development Authority
UCS	Unconfined compressive strength
USCS	Unified Soil Classification System
XRF	X-Ray Florescence

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