



**FACULTY OF ENGINEERING**

**DEPARTMENT OF MINING & WATER RESOURCES ENGINEERING**

**FINAL YEAR PROJECT REPORT**

**ASSESSING THE EFFECTIVENESS OF USING HDPE, PP AND PET FOR  
SURFACE COURSE OF FLEXIBLE PAVEMENTS**

**BY**

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*A final year project Report submitted to the Department of Mining and Water Resources  
Engineering as a partial fulfillment of the requirements for the award of a Bachelor of Science  
degree in Water Resources Engineering*

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## **ABSTRACT**

Waste plastic disposal is a serious problem due to its non-bio-degradability. In order to overcome this issue, they should be reused in an effective way.

This paper therefore focused on assessing the effects of addition of High-density polyethylene(HDPE), Propylene(PP) and Polyethylene terephthalate(PET) as partial replacement of bitumen used in surfacing of flexible pavements. In this study wet process was utilized, pure bitumen grade (60/70) modified bitumen with additive content of 4%,6%,8% and 10% were prepared and tested for rheological parameters. Using Marshall mix design, specimens were prepared at different bitumen contents (5%,5.5%,6%,6.5%7%) and the obtained OBC was 6% for conventional asphalt mix. Marshall tests were conducted on HMA samples with plastic content varied from 4%,6%,8% and 10% by weight of OBC and optimum plastic ratio was obtained as 6%,8% and 8% for HDPE, PP and PET respectively. The results from the Comparative study between conventional and modified HMA mixtures shows that addition of plastic improves the properties of HMA and bitumen.

However, HMA with 8% PET showed better results of Marshall stability, volumetric properties, and tensile strength indicating better performance and durability of pavement. The use of PET in stone mastic asphalt helps mitigate the effects of plastic waste on to the environment as well as provide an alternative material to the road construction industry.

The data parameters from the tests carried out on the materials was analyzed using formulas input in Microsoft Excel.

## **DEDICATION**

This project report is dedicated to my dear parents in appreciation for their love, care and unflinching support provided to me throughout my life and studies to see that I achieve my career. May the Almighty God richly bless and reward you.

## **ACKNOWLEDGEMENT**

I am so grateful to the Almighty God for His divine love and protection in all aspects of my life. I sincerely thank my parents for their endless support offered to me. I am highly indebted to my project supervisor; Mr.Kajubi Enoch for his outstanding valuable technical guidance, encouragement, advice and positive criticism in execution of this Final Research Project.

I highly appreciate him for the undisputed technical report writing skills accorded to me. I extend my gratitude to Makerere University entire staff of the Highways Laboratory for their tireless effort towards the success of this research project. Sincere appreciation goes to my course comrades and friends for their continued support and motivation throughout this educative journey. May the Almighty God richly bless you.

## **DECLARATION**

I **AMUJAL CLARE** hereby declare to the best of my knowledge that this project report is an outcome of my efforts and has not been submitted to any institution of higher learning for any kind of academic award

Signature.....

Date.....

## **APPROVAL**

This research project has been conducted under my supervision and has been submitted with my approval for examination and award of a Bachelor of Science in Water Resources Engineering Degree at Busitema University.

### **MAIN SUPERVISOR**

MR. KAJUBI ENOCK

Signature.....

Date.....

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## ACRONYMS

PW	Plastic waste
LDPE	Low Density Polyethylene
HDPE	High Density Polyethylene
PP	Polypropylene
PET	Polyethylene terephthalate
OBC	Optimum bitumen content
PMB	Plastic Modified Bitumen
ASTM	American Secretary of Testing and Materials
AASHTO	American Association of State Highway and Transportation Officials
ITS	Indirect Tensile Strength
TSR	Tensile Strength Ratio
VMA	Voids in Mineral Aggregates
VFB	Voids filled with Binder
V <sub>a</sub>	Air voids
SBS	Styrene-Butadiene-Styrene
HMA	Hot Mix Asphalt
SMA	Stone Mastic Asphalt
BC	Bituminous Concrete