BUSITEMA UNIVERSITY

Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

FINAL YEAR PROJECT REPORT

Investigate and Establish Bench Parameters for Re- Design of Tororo Limestone Quarry

By

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proposition submitted in partial fulfillment of the requirements for a bachelor's degree of science in Mining Engineering

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ABSTRACT

This final year research project aimed at investigating and establishing bench parameters for re-design of Tororo limestone quarry. Design of open pit slope angles is more important as the depths of open pits continuously increases. Small changes in the overall pit slope angles have large consequences on the overall economy of the mining operation.

Tororo quarry has comparable geological formations along the carbonatite complex, for this reason detailed fieldwork was performed to determine the properties (spacing, roughness, weathering, karst etc.) of the discontinuities of the rock slope in the study area. The uniaxial compressive strength (UCS) of rock samples obtained from the study area were tested in the laboratory.

The stability of the slope was assessed using orientation–independent slope stability probability classification (SSPC) system in order to determine maximum slope height. The re- design geotechnical parameters were determined using both empirical mathematical equations and the existing equipment in Tororo quarry.

The research also gives the logical conclusion inferred from the research activities and goes ahead to give recommendations based observations, empirical and analytical data.

DECLARATION

I OGALA OSCAR, declare that this final year project is my own original work and that it has not been presented to any other University for a similar or any other degree award. I take full responsibility over it and any other person mention here is not responsible.

Student's name.....OGALA OSCAR.....

Signature.....

DEDICATION

This report is dedicated to my parents Mr. Ekitwi Romano and Mrs. Titin Margaret, and above all to the whole family for the assistance rendered to me throughout my life of education ever since I joined school up to today at university may God bless them all for their support and reward them abundantly.

APPROVAL

This final year research project report presented to my office has been compiled, read, understood and produced under my full guidance and supervision with all my concentration and passion.

Signature.....

Date.....

Supervisor: Ms Nangendo Jacqueline

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Finally, thank you to my family and friends who have enabled me to reach this point. Without their encouragement, I would not be in the position I am currently.

LIST OF ABBREVIATIONS

MEMD – Ministry of Energy and Mineral Development

ISRM – International Society of Rock Mechanics

UCI – Uganda Cement Industry

UDC – Uganda Development Corporation

TCL – Tororo Cement Limited

RQD – Rock Quality Designation index

TC – Condition factor

CD – Condition of the discontinuities

DS – Average spacing's of the joint sets

IRA – Inter Ramp Angle

BSA – Bench Stack Angle

OSA – Overall Slope Angle

IOSA – Indicative Overall Slope Angle

ROFRAQ – Rock fall Risk Assessment for Quarries

UCS – Uniaxial Compressive Strength

SPA – Spacing Parameter

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either mining of dimension stone or aggregate (Morrison and Russell, 1973). It is preferable, however, to restrict this term to production of dimension stone only (Hartman and Britton, 1992). The products of quarries are prismatic blocks of rock such as marble, granite, limestone, sandstone, slate, etc.,

Open pit or open cast mining is used to exploit a deposit near the earth's surface that has a relatively low stripping ratio, is preferably large in extent, and is reasonably uniform in value (Hartman and Britton, 1992).

1.1.2 Mine Design

At the preliminary design stage, decisions are made about general quarry slope alignments and the likely working sequence. Geological and geotechnical data will be required since these may affect considerations. The alignments and position of final quarry slopes may be determined by other constraints on development however (e.g. available land, topography etc)(Jarvis *et al.*, 2014).

The principal aim of the preliminary design is to select a working method that minimise geotechnical hazards whilst maintaining an economic and efficient operations. Several alternative methods and slop alignments should be considered and the geotechnical and operational implications of each assessed. A useful method is the preparation of a geotechnical hazard plan in which the potential mode of failure, likelihood of failure and operational implications of failure are used to classify slopes. Such plans should also be prepared for development issues to be made (Ruth *et al.*, 2014).

In order to maximise production in quarries and to minimise the overall stripping ratio, the steepest feasible overall slopes are generally required. The first step in the design of such slopes is to identify the maximum overall slope for the depth of operation projected. All materials that that are to be excavated must be considered.

Most quarry slopes are benched and the overall slope depends on the relationship between width, height and face angle of the benches. The stability of benches with different combinations of height, width and face angle should be analysed for each material and each geotechnical setting identified and in combinations that do not exceed the maximum allowable overall slope angle. Bench considerations will depend on both operational and stability considerations (Ruth *et al.*, 2014).

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