ANALYZING PARAMETERS IN CONCRETE THRUST BLOCKS OF HORIZONTAL BENDS IN UNDERGROUND PVC WATER PIPELINES: A REGRESSION APPROACH

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Master of Science in Financial Mathematics

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This dissertation is submitted in partial fulfillment of the requirements for the degree Master of Science in Financial Mathematics

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DECLARATION

I declare that this is my own work and this Dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

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Affectionately

Dedicated to

My ever-loving parents

And

All my teachers

Whose constant

encouragement

Made me "someone"

on this earth…

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to my internal supervisor Dr. Pasan Edirisinghe, Senior Lecturer, Department of Mathematics, Faculty of Engineering, University of Moratuwa, who guided me to complete my research project successfully. And I should be thankful for his kind supervision and help throughout the study period.

I would like to give my special thanks to Mr. U.S.V. Lakmal, Charted Engineer, National Water Supply & Drainage Board, for allowing me to do my research on the Katana water supply project, Negombo. And also, I like to thank the staff of the water board, Negombo especially Mr. Samantha, and Mr. Asitha who supported me in my research activities.

As well as my dear friends, especially Mr. Rohan, Mr. Akila, Mr. Saman, Miss. Deshani and Miss. Nethmi should be reminded of their friendliness and I would like to convey my heartiest thanks to my loving parents also.

ABSTRACT

The dispersion of drinking water is regarded as a key service offered by countries. There are management plans for this and for the proper piping system to be required for long-term projects in the city to reduce maintenance, repairs and to continue the construction cost-effectively. Water piping systems comprise transmitting and distributing to carry the adequate quantity of water from the pumping area to the tower and from the tower in the service area. There is a unique method whereby the pipes are placed underground. This method is practiced as a standard everywhere as it minimizes the damage that may occur. In piping networks, concrete blocks are applied to increase the stability of tees and bends which help to change the direction of water length. The purpose of this study is to enhance a parameter estimation model for concrete blocks of horizontal bends by developing a conceptual framework. There are two approaches to analyze the whole framework of the study, method 1 and method 2.

The height and width of the trench are quantified to identify the horizontal and vertical positions of the bend. Combining the cube test with the slump test introduces a quadratic regression model for the maximum load of the concrete cube, the mass of the concrete cube, and the slump of the concrete to build the inequality of the maximum bearable load of the concrete block. The compaction test results in a linear relationship between the optimum moisture content and the maximum dry density through regression analysis to find the maximum load of the compacted soil. Leaks on pipes and bends are determined by pressure testing to identify head loss and thrust force in the water. The factor of safety for bends is even the primary idea of estimating the parameters of concrete blocks. The seven algorithms are developed by using MATLAB codes to determine the main factors of the study. Each algorithm has its own pseudo code and diagrammatic representation. By using these algorithms that developed for the built-up constraints of each test and stage, the mean values of the block parameters are determined.

Keywords: bends, concrete blocks, conceptual framework, head loss, factor of safety

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LIST OF ABBREVIATIONS

Abbreviation	Description
ABC	Aggregate Base Coarse
FOS	Factor of Safety
DD	Dry Density
DI	Ductile Iron
DOC	Degree of Compaction
GL	Ground Level
MDD	Maximum Dry Density
NWS&DB	National Water Supply & Drainage Board
OMC	Optimum Moisture Content
PBM	Permanent Bench Mark
PE	Poly Ethylene
PNT	Pressure Nominal in Temperature
PVC	Poly Vinyl Chloride
TBM	Temporary Bench Mark
TS	Total Station
UOM	University of Moratuwa