A METHODOLOGY TO ESTIMATE THE REMAINING SERVICE LIFE TIME OF GREY CAST IRON WATER DISTRIBUTION MAINS BY ANALYZING THE CORROSION DAMAGE

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Degree of Master of Science

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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.

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Mr. V. Sivahar.

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Abstract

The water distribution main in the Colombo south area itself experiences around about 3000 failures per year and these causes emergency situations where in some cases it causes disruptions in water supply and require emergency repairs at very short notice.

One of the major causes to this type of failures is the corrosion of the pipes.

About 95% of the total length of the installed water main, the pipe material is grey cast iron. Here the corrosion of the external surface is assumed to be negligible as the outer surface is coated. Therefore only the corrosion of the inner surface of the pipes is considered and the readings related to the inner surface was obtained for further analysis purpose.

Due to the internal corrosion of the cast iron water distribution main the thickness of the pipe will reduce gradually over time. When the thickness reduced with time, the bearing capacity (Ability to withstand water pressure) of pipes will reduce eventually and as a result of this there is a greater tendency of pipes to burst. The wastage of water is another un-addressable problem to the peoples of country especially as a utility service at the current socio-economic conditions.

In this report an equation was developed to calculate the corrosion penetration rate. Several assumptions were made to apply this equation. Therefore to check the reliability of this equation it was analyzed by statistically. To predict the bursting thickness of the pipes use code of practice AWWA C101-77.

According to the equation a utility service like the National Water Supply and Drainage Board can take proactive decision that would benefit financially as well as in an environmentally viable way. Another important thing is from these findings, this can be used as a tool to the future development of distribution system.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBRIVIATIONS

Abbreviation	Description
ANSI	American National Standard Institute
Ave	Average
AWWA	American Water Work Association
AWWARF	American Water Works Association Research Foundation
CC/L	Colombo City Leaks
CI	Cast Iron
CIPRA	Cast Iron Pipe Research Association
CPR	Corrosion Penetration Rate or the thickness loss of material per unit of time
CPR_{eqa}	Corrosion Penetration Rate Equation.
CPR_{obs}	Corrosion Penetration Rate Observed.
DC	Direct Current
df	Degrees of freedom
Dia	Diameter
e.m.f	electromotive force
Ft	Feet
GCI	Grey Cast Iron
Hr	Hour
In	Inch
Km	Kilometer
M	Meter
Mpy	Millimeter per year
MSC	Master in Material Science
NBS	National Bureau Of Standard Canada
NEWWA	New England Water Work Association
NRCC	National Research Council in Canada
NWS&DB	National Water Supply And Drainage Board
O&M	Operation and Maintenance
pH	Usual notation for Alkalinity or Acidity
psi	Pounds per square inch
PU	Polyurethane
Ref No	Reference Number
SF	Safety Factor
USEPA	U.S. Environmental Protection Agency

LIST OF APPENDICES