

Improvement of Urban Environment Through Sewer Network Monitoring Using CCTV Technology

S.P.N.D. Senarath

(169166N)

Research submitted in partial fulfilment of the requirements for the degree Master of
Science in Environmental Engineering and Management

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Dedication

This research is dedicated to those who have encouraged me all the way and those who have contributed to the betterment of life in the World.

Declaration of the Candidate & Supervisor

I declare that this is my own work, and this thesis does not incorporate without acknowledgment 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 acknowledgment is made in the text.

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.....
Signature: S.P.N.D. Senarath

Date:2023/01/12

The supervisor/s should certify the research report with the following declaration.

The above candidate has carried out research for the Master’s thesis under my supervision.

Signature of the supervisor: Prof. Asoka Perera

Date:2023/01/23

Abstract

The Colombo Municipality has recognized that the maintenance of the sewer network is an important part of upgrading the city's urban environment. However, The Maintenance of the Colombo Municipality Sewer Network is a challenging task due rapid deterioration of the pipe system. The city sewerage system which is 100 years old has frequently experienced collapses and overflows, operation failures due to Sulphide attacks, root ingress, and infiltration to the pipe. More ever, Prior identification of the Failure location and carrying out proactive maintenance work is vital and becomes extremely difficult due to limited budgetary provisions and the lack of actionable information on the underground sewer network. Apart from that, CMC does not possess advanced asset management software to predict the pipe renewal plan. So, it was a challenge to make immediate decisions on the underground utility service's rehabilitation and quickly attend to repair work.

This Thesis has presented a study for developing an asset Management framework that accurately assesses the condition of pipe segment, the status of sewer pipe, and lastly, identifies the most sustainable rehabilitation priorities of sewer network within the particular catchment. The catchment area has 40 km of sewer network has been assessed in this study, ranked according to the maximum grade of sewer lines, and identified potential risks within the sewer system. And scientifically derive pipe renewal schedules based on economic, social, and environmental aspects. The study of the pipe segments area has identified that the pipe distress is localized and randomly distributed, not depending on the age of the asset. It has been found that most of the pipe segments in the network need replacement within the next 10 years. In comparison, 63% of pipe segments require immediate action on rehabilitation within five years to prevent the failure of the pipe.18% of pipe segments require to be attended to within 5-10 years.14% of pipes require to be repaired within 10-20 years. Sound management of the underground pipe infrastructure can be achieved by paying more attention to environmental aspects than economic aspects. Every outcome of the study may be used by the municipality and other agencies handling underground pipe networks. Every outcome of the study may be used to sustain the city sewer network. It will be beneficial not only for delivering the service but also for improving the environment of the city.

Keywords: CCTV condition assessment, risk analysis, lifetime, Sewer rehabilitation Asset management systems; Risk management; Consequences; Prioritization

Table of Contents

DEDICATION	I
DECLARATION OF THE CANDIDATE & SUPERVISOR	II
ABSTRACT	IV
TABLE OF CONTENTS	V
LIST OF TABLES	VI
LIST OF FIGURES	VII
1 INTRODUCTION	1
1.1 Background of Study	1
1.2 Problem & Justification	2
1.3 Research Objectives.....	3
1.4 Scope & Limitation.....	4
1.5 Guide to Thesis	5
2 LITERATURE REVIEW	6
2.1 General.....	6
2.2 Impact of Pipe Failure on Environment and Public Health	6
2.2.1 Public Health Impact.....	6
2.2.2 Environmental Degradation of Water Bodies, Lakes, and Ecosystem	7
2.3 Pipe Failure Mechanisms	7
2.3.1 Factors Contributing to the Failure of the Pipe	7
2.3.2 Physical Factors Contributing to the Pipe Failure.....	9
2.3.3 Environmental Factors Contributing to the Pipe Failure	11
2.3.4 Operational Factors Contributing to the Pipe Failure	12
2.4 Sewer Line Investigation Pipe Failure Assessment	13
2.4.1 Camera Inspection.....	14
2.4.2 CCTV Technology	15
2.4.3 CCTV Analysis Software.....	15
2.4.4 WRc Condition Assessment Protocols and Guidelines.....	16
2.4.5 Important Parameters in Condition Assessment	17
2.5 Consequence of Pipe Failure.....	18
2.5.1 Consequence of Failure (COF) Analysis	18
2.5.2 Assessment of the Degree of Impact Factors	18
2.5.3 Performance Weights for the COF Impact Factors	20

2.5.4	Application of Triple Bottom Line Analysis in Pipe Repair Works	21
2.6	Developing Risk Matrix.....	23
2.6.1	Identify Risk and Consequence Assessment.....	23
2.6.2	Probability of Pipe Failure	23
2.7	Background in Similar Research.....	23
2.7.1	Deterioration Modeling	24
2.7.2	Sewer Deterioration-Related Studies	24
2.8	Importance of Developing a Framework	26
2.9	Selection and Justification	26
3	METHODOLOGY	27
3.1	Overview.....	27
3.2	Step 1 - Problem definition and model formation.....	27
3.3	Step 2 - Literature Survey	30
3.4	Step 3 - Data Collection	31
3.5	Step 4 - Development of Database - Pipe Inventory Database	32
3.5.1	Attributes of Pipe Properties Database	32
3.5.2	Attributes of Manhole Inventory Manhole	33
3.6	Step 5 - Developing Condition Assessment Database	34
3.6.1	Condition Assessment and Rating of Pipe Segment	34
3.6.2	Step - 1 Assessment of Condition Along the Pipe Segment	35
3.6.3	Step 2 - Assigning the Defect Code to the System	36
3.6.4	Step 3 - Preparation of Condition Grade Value Table	37
3.6.5	Step 4 - Preparation of Condition Grade Value	39
3.6.6	Step 5 - Assigning the Max Defect Code to the Pipe.....	39
3.6.7	Step 6 - Categorization of the Pipeline for Rehabilitation	40
3.6.8	Step 7 - Preparation of Condition Assessment Database	42
3.7	Development of Consequence Failure Model.....	43
3.7.1	COF Model	43
3.7.2	Step 1 - Identify the Impact Factors in the Event of Pipe Failure	44
3.7.3	Step 2 - Assign Numerical Weights to Each Impact Factor.....	46
3.7.4	Step 3 - Determination of weighting factor for relevant impact factor	46
3.7.5	Step 4 - Calculate the Overall Consequence of the Failure.....	48
3.7.6	Prioritize Sections Having a Higher Risk of Failure Ranking of Sewer.....	52
3.8	Data Analysis Using GIS Environment	54

4	DATA COLLECTION AND ANALYSIS.....	55
4.1	Introduction.....	55
4.2	CS3 Catchment	55
4.3	Data Collection Methodology.....	56
4.4	Data Acquisition to Pipe Inventory Model	56
4.5	Data Acquisition to Condition Model.....	58
4.6	Final Ranking for CS3 Catchment.....	59
5	RESULTS AND DISCUSSION.....	60
5.1	CS3 Catchment	60
5.2	General Sewer Network with Details.....	61
5.3	Condition Assessment.....	62
5.4	Identify Rehabilitation Need.....	63
5.5	Deliverable 1 - Quick Assessment of Sewer Pipe.....	65
5.6	Deliverable 2 - Ranking of Sewer Pipe in a Catchment.....	67
5.7	Deliverable 3 - Priorities List for Rehabilitation.....	68
6	CONCLUSION.....	70
6.1	Contribution to Practice	72
6.2	Limitations and Future Research	72
7	REFERENCES	74
Annex 1	CS3 Catchment Area Arial View.....	78
Annex 2	Building Layout - CS3 Catchment Area	79
Annex 3	Sewer Network - CS3 Catchment Area	80
Annex 4	Storm Water Network - CS3 Catchment Area.....	81
Annex 5	Pipe Property Details - CS# Catchment Pipe Property Details.....	82
Annex 6	Pipe Manhole Details - CS3 Catchment.....	91
Annex 7	Condition Assessment Survey Sheet-A49-4 A49-3 Pipe Segment.....	100
Annex 8	Condition Grade Value Summary - CS3 Catchment	101
Annex 9	Preliminary Criticality Weighted Factors	110
Annex 10	Performance Values and Predetermined Weights for the COF Factors...	111
Annex 11	Performance Score for Sub Factors – COF.....	112
Annex 12	Hydraulic Flow Details - CS3 Catchment.....	113
Annex 13	Consequences of Failure Analysis - (COF) @CS3 Catchment.....	119
Annex 14	Priority Rehabilitation List-Category 1 - CS3 Catchment	136
Annex 15	Priority Rehabilitation List Category 2 - CS3 Catchment.....	137

Annex 16	Priority Rehabilitation List - Category 3 - CS3 Catchment	139
Annex 17	Priority List Category 4 - CS3 Catchment	141
Annex 18	Priority List of Category 5 - CS3 Catchment.....	143
Annex 19	Priority Rehabilitation List Category 6 - CS3 Catchment.....	145
Annex 20	Priority Rehabilitation List - Category 7.....	146
Annex 21	Priority Rehabilitation List Category 8 CS3 Catchment.....	148
Annex 22	Priority List Category 9 - CS3 Catchment	150
Annex 23	Category List - CS3 Catchment	151
Annex 24	Sample CCTV	152

List of Tables

Table 2.1: Factors affecting sewer pipes deterioration (Mohammadi,2019)	9
Table 2.2: Types of Sewer Pipe Material.....	10
Table 2.3: Severity Condition Grade for WRC Protocol	16
Table 2.4: Impact Criteria for Pipe Rehabilitation.....	19
Table 2.5: Performance weights for the COF Impact Factors	20
Table 2.6: Performance Values and Predetermined Weights for The COF Impact Factors	20
Table 2.7: Criticality Sub-Factors and their Importance.....	22
Table 3.1: Important References Related to The Study	30
Table 3.2: WRC Condition Grade.....	37
Table 3.3: Condition Assessment Data - Pipe @ Olcott Mawatha,4th Cross St.	38
Table 3.4: Condition Grade Value-A49 Pipe Line.....	39
Table 3.5 Maximum grade Value, Average grade Value-Olcott Mawatha	39
Table.3.6: Categorization of Pipe Rehabilitation.....	41
Table 3.7: Impact Factors and Its Importance (Source EPA)	45
Table 3.8: Performance Values for The COF Impact Factors (Salman & Salem, 2011)	47
Table 3.9: The Weighted Value for Environmental. Economic Impact Factors.....	47
Table 3.10: The Weighted Value for Social Impact Factors.....	48
Table 3.11: COF Data-Andival Street.....	50
Table 3.12 The Impact Score, Performance Score relevant to the pipe	51
Table 3.13: Impact Sore, Performance Score -Andival Street	51
Table 3.14: COF Values Relevant to the Pipe Segment A19-2 to A19-1 @Andival Street	53
Table 4.1: Attribute Table of Pipe Property Database	57
Table 4.2: Attribute Table of Manhole Inventory Database	57
Table 5.1: Risk Categorizations Criteria.....	64
Table 5.2: Classification of Rehabilitation Needs.....	64
Table 5.3: Summary of the Final Ranking-CS3 Catchment	65
Table 5.4: Calculation of Condition Rank Based on Failure	66

List of Figures

Figure 1.1: Colombo Sewer Network, Pumping Station, and Main Sea Outfall	1
Figure 1.2: Case Study Area-CS3 Catchment.....	4
Figure 2.1: Condition Influence Factors	8
Figure 2.2: CCTV Camera and Output Images.....	14
Figure 3.1: Proposed Models and Output	28
Figure 3.2: Methodology for Developing a Framework	29
Figure 3.3: Proposed Inventory Database and Output to the Model.....	34
Figure 3.4: Proposed Condition Assessment Database and Its Output.....	34
Figure 3.5: CCTV Investigation at Site	35
Figure 3.6: Coding Process for a Pipe from CCTV Data	36
Figure 3.7: Condition assessment Report for a Pipe Segment.....	36
Figure 3.8: Condition assessment Table for Catchment CS3 (refer to Annex 8)	43
Figure.4.1: Pilot Project Area - CS3 Catchment-Colombo North	55
Figure.4.2: Aggregates collected at the Manhole in CS3 Area.....	56
Figure 4.3: A Map of Sewer Network in CS3 Catchment Area	58
Figure .5.1 Important Lank Marks in CS3 Catchment.....	60
Figure .5.2: (a) Building Map of The Area (b)Aerial View of The Area	61
Figure 5.3: Sewer Pipe Network in CS3 Catchment.....	61
Figure 5.4: Distribution of Pipe size in CS3 Catchment.....	61
Figure 5.5: Maximum Grade Value Distribution @ the Catchment.....	63
Figure 5.6: Rehabilitation Need @ CS3 Catchment	63
Figure 5.7: Ranking of Pipes	65
Figure 5.8: Olcott Mw - 4 th Cross Street.....	66
Figure 5.9: Failure Information -Olcott Mw (4 th Cross Street)-refer to Annex 25 ...	66
Figure 5.10: Illustration of Condition Grade Along Olcott Mawatha	67
Figure 5.11: Map of Pipe Failure in the Catchment.....	68