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# STUDY OF WATER TOWERS

THIS THESIS IS SUBMITTED TO THE DEPARTMENT OF CIVIL ENGINEERING  
IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR  
THE DEGREE OF MASTER OF ENGINEERING IN  
STRUCTURAL ENGINEERING DESIGN

By

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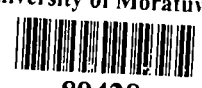
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SRI LANKA

SEPTEMBER 2007

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# STUDY OF WATER TOWERS

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This thesis is submitted to the Department of Civil Engineering of the University of Moratuwa, Sri Lanka, in partial fulfillment of the requirement of the Degree of Master of Engineering in Structural Engineering Design.

Department of Civil Engineering  
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September 2007

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## DECLARATION

I hereby declare that the work included in the thesis, in part or whole has not been submitted for any other academic qualification at any institution.

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## ACKNOWLEDGEMENTS

The writer wished to express her heartfelt appreciation and gratitude to Dr. (Mrs.) M.T.P. Hettiarachchi for her guidance, encouragement and all the support dedicated personally throughout the course of her thesis.

The author is grateful to Dr. S.M.A. Nanayakkara for his invaluable guidance to fulfill this study.

I am thankful Deputy General Manager, Eng. D.N.J. Ferdinando and the management of National Water Supply & Drainage Board for granting me leave and the encouragement to flow the course.

She is very grateful to the National Water Supply & Drainage Board – Sri Lanka for the financial support.

Finally, the writer wishes to express her appreciation and thanks to Eng. (Mrs.) Jesuthason Elsie, who helped to develop the programme in Excel.



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I am happy to say that my husband encouraged me in my thesis. I am presenting this thesis work for my loving mother.

## ABSTRACT

At present, there is little published literature for estimating the requirements of material, and cost of construction of elevated water tanks. The author has carried out a detailed analysis of costs and the requirements for material for elevated water tanks of various capacities, staging height, bearing capacities of soil and lateral forces due to wind.

This author has taken an opportunity to design elevated tanks of Intze, Conical and Cylindrical with the designer's requirements, such as capacity, dimensions, bearing capacity of soil, wind force, option of tank full or empty condition, and reinforcement details. The bar schedule details are also presented by this author. That particular designer's requirement is fulfilled and the cost is estimated with the present rate of materials and formworks.

The findings of this study are useful in the design process for deciding upon the cost optimization for the three types of elevated towers. On the one hand, for optimization of intze tower the horizontal angle of conical shell to be maintained between 40 degree and 50 degree. On the other hand, the cylindrical tower is the least costly tower at less than 400 m<sup>3</sup> capacities while the intze tower is least costly at more than 400 m<sup>3</sup> capacities. Although these comparisons are based on the condition of supporting structure height = 15 m, basic wind speed = 38 m/s, soil bearing capacity = 150 kN/m<sup>2</sup> and the National Water Supply and Drainage Board 'Rate book – 2007' prices.

In general for intze tanks, the cost for foundation is between 13% and 20%, supporting structure is between 10% and 26% and tank is between 55% and 75%. But for cylindrical tanks, the cost for foundation is between 15% and 21%, supporting structure is between 16% and 29% and tank is between 53% and 65%.

In view of material cost, steel has the greatest effect on tank and supporting structure while concrete has the greatest effect on foundation.

For proper planning and execution of a project, accurate estimates of the cost and requirements for materials for water towers are essential.

## List of Figures

- 3.1 Program layout
- 5.1 Horizontal angles to the conical part Vs Capacity
- 5.2 ULS Meridian stress varying with the horizontal angle
- 5.3 ULS Hoop stress varying with the horizontal angle
- 5.4 SLS Meridian stress varying with the horizontal angle
- 5.5 SLS Hoop stress varying with the horizontal angle
- 5.6 Cost Vs Horizontal angle for 500 m<sup>3</sup>
- 5.7 Cost Vs Horizontal angle for 1000 m<sup>3</sup>
- 5.8 Intze elevated water tank – dimension details
- 5.9 Intze elevated water tank – reinforcement details
- 5.10 Conical elevated water tank – dimension details
- 5.11 Conical elevated water tank – reinforcement details
- 5.12 Cylindrical elevated water tank – dimension details
- 5.13 Cylindrical elevated water tank – reinforcement details
- 5.14 Cost comparison of elevated tanks
- 5.15 Intze tank for capacity of 750 m<sup>3</sup>
- 5.16 Cylindrical tank for capacity of 250 m<sup>3</sup>
- 5.17 Intze tank supporting height for capacity of 750 m<sup>3</sup>
- 5.18 Cylindrical tank supporting height for capacity of 250 m<sup>3</sup>
- 5.19 Intze elevated water towers for materials cost
- 5.20 Conical elevated water towers for materials cost
- 5.21 Cylindrical elevated water towers for materials cost
- 5.22 Tank material cost for different type of elevated tanks
- 5.23 Supporting structure material cost for different type of elevated tanks
- 5.24 Foundation material cost for different type of elevated tanks

## List of Tables

- 4.1 Dissimilarity parameters with the data book and program
- 5.1 Dimension details
- 5.2 Polynomial regression coefficients and  $R^2$  value for intze elevated tank
- 5.3 Polynomial regression coefficients and  $R^2$  value for conical elevated tank
- 5.4 Polynomial regression coefficients and  $R^2$  value for cylindrical elevated tank



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## TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	Title Page	i
	Declaration	ii
	Acknowledgment	iii
	Abstract	iv
	List of Figures	v
	List of Tables	vi
	Table of Contents	vii

### VOLUME I

<b>I</b>	<b>INTRODUCTION</b>	
	1.1 General	1
	1.2 Water tower	2
	1.3 Function of water tower	2
	1.4 Objectives	3
	1.5 Scope	3
<b>II</b>	<b>LITERATURE REVIEW</b>	
	2.1 Elevated water towers	4
	2.1.1 Intze	
	2.1.2 Conical	
	2.1.3 Cylindrical	
	2.2 Intze water towers	6
	2.3 Conical water towers	7
	2.4 Cylindrical water towers	7
<b>III</b>	<b>COMPUTER PROGRAMME</b>	
	3.1 General	9
	3.2 Programme	10
	3.3 Restrictions in the programme	12
	3.3.1. Intze	
	3.3.2. Conical	
	3.3.3. Cylindrical	
	3.4 Load and design considerations	13
	3.5 Codes for design and basic design parameters	14
	3.6 Method of Analysis	15
	3.6.1 Container	
	3.6.2 Staging design	
	3.6.3 Foundation design	
	3.7 Assumptions	18
	3.8 Sign conversions	19
	3.9 Specimen calculation	19



<b>IV</b>	<b>METHODOLOGY</b>	
	4.1 Data collection	20
	4.2 Deviation in the programme Vs. final report	21
	4.3 Program verification	22
	4.4 Cost estimation	22
<b>V</b>	<b>RESULTS AND DISCUSSION</b>	
	5.1 Analysis of Intze tank	24
	5.1.1 Capacity changes	
	5.1.2 Stress along the conical part	
	5.1.3 Cost with conical shell horizontal angle	
	5.2 Program verification	29
	5.3 Cost comparison	29
	5.4 Cost components	36
	5.5 Materials and costs	39
<b>VI</b>	<b>CONCLUSIONS AND RECOMMENDATIONS</b>	
	6.1 Conclusions	47
	6.2 Recommendations	48
	<b>REFERENCES</b>	49



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## **VOLUME II**

### **APPENDIX – SPECIMEN CALCULATION**

A.	Intze water tower	A - 1
B.	Conical water tower	B - 1
C.	Cylindrical water tower	C - 1