

CE 01/19

019

UNIVERSITY OF MORATUWA

PLANNING TECHNIQUES APPLIED IN
CONSTRUCTION INDUSTRY IN
SRI LANKA



BY
University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk
G. H. S. BANDULA

PERMANENT
REFERENCE
NOT TO BE
REMOVED FROM
THE LIBRARY.

SUPERVISED BY

MR. M. W. J. A. DE SILVA



UNIVERSITY OF MORATUWA
THESES & DISSERTATIONS

DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF MORATUWA,
MORATUWA, SRI LANKA.

PLANNING TECHNIQUES APPLIED IN CONSTRUCTION INDUSTRY IN SRI LANKA

පුස්තකාලය
මහවැලි විශ්ව විද්‍යාලය, ශ්‍රී ලංකාව
මොරටුව,

BY

G. H. S. BANDULA

THE THESIS SUBMITTED IN PARTIAL FULFILMENT
OF
THE REQUIREMENT FOR THE DEGREE OF
MASTER OF ENGINEERING



PERMANENT
REFERENCE
NOT TO BE
REMOVED FROM
THE LIBRARY.
University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrtin.lk

THE FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING

0708

63050

SUPERVISED BY MR. M. W. J. A. DE SILVA

658

We accept this thesis as confirming to the required standard

63050

University of Moratuwa

February 1994

CONSTRUCTION & STRUCTURAL
ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF MORATUWA.

ACKNOWLEDGMENT

I must express my gratitude to Mr. Justin de Silva of University of Moratuwa for supervising, co-ordinating and guiding the work and sparing no pains to complete this report successfully.

I also thank Dr. Priyan Dias for his guidance and cooperation given to me throughout this research study.

I also acknowledge the assistance of various organisations from whom interpretations, current practices, data and helpful comments have been obtained and incorporated in to this report.

My appreciation and sincere thanks to my wife Geetha for her part in preparation of the final document and to Miss Savithri Geevananthan for her assistance in preparation of original draft.

Finally, thanks are extended to all who directly and indirectly assisted me in the preparation of this report.



University of Moratuwa, Sri Lanka.

Electronic Theses & Dissertations

www.lib.mru.ac.lk

ABSTRACT

This report attempts to identify the application of planning techniques in construction industry in Sri Lanka. A comprehensive study of planning aspects presently practiced in randomly selected organisations engaged in the construction work was undertaken to ascertain the realistic picture in the industry.

Formal and informal discussions had with personnel responsible in planning sections of various organisations revealed many facts indicating the true status.

In the past, contractors have often exceeded the time targets which could be attributed to many reasons beyond their control.

Civil disturbances, Natural calamities, Scarcity of resources and Bureaucratic red tapes are few contributory factors that has been emerged at the discussions.

The observation further revealed that the inadequate planning has been a vital factor for the non achievement of desired targets.

Feed back for the questionnaire given in annexure 1 was compiled together with the information gathered during discussions. Few programs for completed works were also collected and attached herewith. A chapter was dedicated to discuss the construction industry in Sri Lanka and classification of construction organisations used for the study was tabled.

Attempts were made to cover the majority of the organisations active in the industry representing different classes, governmental and non governmental organisations in order to obtain reasonable conclusion.

The conclusions are derived from the results of the analysis, which draw our attention to the fact that planning in its true form is not applied in the local construction industry as expected.

Therefore recommendations are forwarded to lay more emphasis on planning in contract documents at the tendering stage and close monitoring at the site level by executive authority.





University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

TABLE OF CONTENTS

	PAGE	No.
ABSTRACT	2	
TABLE OF CONTENTS	4	
LIST OF FIGURES	9	
1.0 INTRODUCTION	10	
1.1 Background	10	
1.2 Aims and Objectives	12	
1.3 Methodology	13	
2.0 REVIEW OF PLANNING TECHNIQUES	14	
2.1 History of Planning	14	
2.2 Advantages of Planning	15	
2.2.1 Advantages to the Contractor	15	
2.2.2 Advantages to the Client	16	
2.2.3 Advantages to the Architect or Engineer	17	
2.2.4 Advantages to other parties connected with the contract	17	
2.3 Bar or Gantt Chart	18	
2.3.1 Simple Bar Chart	18	
2.3.2 Mile Stone Method	21	
2.3.3 Linked Bar Chart	22	
2.4 Location Chart	24	
2.5 Critical Path Method	26	
2.5.1 The Effect of Network Methods on Management	26	

2.5.2	Process of Network Planning	31
2.5.3	Theoretical Aspects	32
2.5.3.1	Dummy Activities	32
2.5.3.2	Looping	33
2.5.3.3	Unconnected Activities	33
2.5.3.4	Net Work Computation	33
2.6	Precedence Diagram	36
2.6.1	Comparison of Precedence Diagram with Arrow Diagram	36
2.6.2	The Technique	37
2.6.2.1	Forward Pass	37
2.6.2.2	Backward Pass	38
2.6.2.3	Delays, Leads & Lags	38
2.6.2.4	Lag Times	38
2.6.3	Float Calculation	43
2.6.3.1	Total Float	43
2.6.3.2	Free Float	43
2.6.3.3	Interfering Float	43
2.6.3.4	Independent float	44
2.6.4	Crash Costing	44
2.6.5	Resource Scheduling	45
2.7	Program Evaluation & Review Technique	47
2.7.1	Technique	48
2.7.2	Difference between PERT and CPM	49
2.7.3	Disadvantages of PERT	49
2.8	Line of Balance Method	50
2.8.1	Preparation of a Line of Balance Schedule	50
2.8.2	Advantages of Line of Balance Method	51



2.8.3	Disadvantages of Line of Balance Method	51
2.9	" S " Curve	51
2.9.1	Advantages	52
2.9.2	Disadvantages	52
3.0	PLANNING DONE IN PROJECT STAGES	55
3.1	General	55
3.2	Feasibility Stage Plan	55
3.3	Pre-tender Stage	56
3.3.1	Pre-tender Plan done by Client Organisation	56
3.3.2	Pre-tender Plan done by Prospective Contractor	57
3.4	Pre-construction Stage Plan	59
 3.4.1	Delays	61
 3.4.2	Procedural Check List	62
3.5	Construction Stage Plan	67
4.0	CONSTRUCTION INDUSTRY IN SRI LANKA	68
4.1	General	69
4.2	Present status	69
4.3	Post Construction Boom	69
4.4	Planning in Construction Industry	70
4.5	Consequences of Foreign contractors.	72
4.6	Failures	73
5.0	DATA OBTAINED FROM INDUSTRY	74
5.1	Scope of Survey	74
5.2	Organisations Considered	74
5.2.1	Classification of Organisations	79
5.3	Details of Survey	80

5.4	Data Obtained through Interviews	81
5.4.1	State Sector Organisations coming under Civil Engineering Industry	81
5.4.2	State Sector Organisations coming under Building Industry	83
5.4.3	Semi Government Organisations coming under Civil Engineering Industry	84
5.4.4	Semi Government Organisations coming under Building Industry	86
5.4.5	Private Sector Contracting Organisations	87
5.4.6	Private Sector Consultancy Organisations	89
5.4.7	Observations	90
6.0	ANALYSIS	92
6.1	Use of Planning	92
6.2	Planning Section	92
6.3	Review and Monitoring	93
6.4	Planning of Finance and Resources	93
6.5	Use of Computer Software	94
6.6	Summary of Survey Data	95
7.0	DISCUSSION	98
7.1	Discussion	98
7.2	Characteristics of Planning	99
7.3	Selection of Planning Techniques	100



University of Moratuwa, Sri Lanka.

Electronic Theses & Dissertations

www.lib.mrt.ac.lk

8.0 CONCLUSIONS AND RECOMMENDATIONS	102
8.1 Conclusions	102
8.2 Recommendations	103
9.0 FURTHER WORK	104
10.0 ANNEXURES	105
11.0 REFERENCES AND BIBLIOGRAPHY	128
11.1 References	128
11.2 Bibliography	129



University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

LIST OF FIGURES

FIG. No.	DESCRIPTION	PAGE
2.1	Bar Chart Program for Bridge Construction	20
2.2	Linked Bar Chart	23
2.3	Location Bar Chart for a Road Project	25
2.4	Net Work Diagram	27
2.5	Representing Logical Relationship	34
2.6	Looping	34
2.7	Unconnected Activities	34
2.8	Formation of Diagram	39
2.9	Analysed Network	39
2.10	Key Diagram	39
2.11	Lead Factor	40
2.12	Lag Times	41
2.13	Lag Times Bar Chart & Presentation	41
2.14	Lag Times Forward Pass & Backward Pass	42
2.15	Bar Chart Presentation	42
2.16	Bar Chart & Resource Histogram Before resource Scheduling	46
2.17	Bar Chart & Resource Histogram After resource Scheduling	46
2.18	S-curve	53
2.19	Typical S-curve	54
5.1.a	Organisation "L"	76
5.1.b	Organisation "K"	76
5.1.c	Organisation "B"	77
5.1.d	Organisation "S"	77
5.1.e	Organisation "R"	78
5.1.f	Organisation "D"	78
5.2	Typical Progress Chart	82



University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk