

TABLE OF CONTENTS

ABSTRACT	i
VALIDITY SHEET	ii
ORIGINALITY STATEMENT SHEET	iii
PREFACE	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	vii
LIST OF TABLES	viii
CHAPTER 1 INTRODUCTION	1
I.1 Background	1
I.2 Alternative Solution	7
I.3 Problem Definition.....	8
I.4 Research Objective	8
I.5 Benefits of Research	8
I.6 Systematics	9
CHAPTER II LITERATURE REVIEW	11
II.1 Theoretical Basis	11
II.1.1 Ergonomics	11
II.1.2 Anthropometry	11
II.1.3 Work Physiology.....	13
II.1.4 REBA (Rapid Entire Body Assessment)	14
II.1.5 Analysis of Forces, Moments, and Trigonometric Functions.....	16
II.1.5 Grip Analysis	17
II.1.6 Rational Approach	18
II.2 Selection of Standard Design Framework	21
II.3 Previous Studies	22
II.4 Current Studies	23
CHAPTER III PROBLEM SOLVING METHODELOGY	24
III.1 Systematic Design	24
III.1.1 Description of the data collection mechanism.....	25

III.1.2 Design Processing.....	26
III.1.2 Verification Mechanism	28
III.1.3 Validation Mechanism.....	28
III.2 Identification of Integrated System Components	29
III.3 Scope of Problem And Assumption	29
CHAPTER IV DATA COLLECTING AND DATA PROCESSING.....	30
IV.1 Data Collection	30
IV.1.1 Interview Data	30
IV.1.2 Anthropometric Data.....	30
IV.1.3 Worker Shovel Dimension Data.....	31
IV.1.4 REBA Analysis Before Redesign.....	32
IV.1.5 Work Physiology Analysis Before Redesign	35
IV.2 Data Processing	36
IV.1 Design with the Rational Approach	39
IV.1.1 Purpose Clarification	40
IV.1.2 Function Arrangement.....	41
IV.1.3 Determining the Specification	41
IV.1.4 Determining the Characteristic	42
IV.1.5 Alternative Selection	48
IV.1.6 Alternative Evaluation.....	49
IV.1.7 Design Improvement	54
CHAPTER V ANALYSIS.....	56
V.1 Verification and Validation	56
V.1.1 Shovel Innovation Product.....	56
V.1.2 Implementation	56
V.1.3 Implementation Process Details.....	57
V.2 Result Analysis.....	57
CHAPTER VI CONCLUSION AND SUGGESTION.....	62
VI.1 Conclusion	62
VI.1 Suggestion.....	62
REFERENCES	63
ATTACHMENT	66