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Construction Economies of Modern Construction Systems Technologies (Tilt-up System)

A thesis submitted in partial fulfillment of the requirement of the
Master of Science in Civil Engineering

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STATEMENT

This thesis is submitted as partial fulfillment of M.Sc. Degree in Structural Engineering, Faculty of Engineering, Ain Shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or qualification at any other scientific entity.

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ABSTRACT

In terms of the importance of economics of construction systems and the significance of construction time in terms of project feasibility, this study was initiated with the objective of elaborating construction methods and tilt up technique. The study focuses on the technique, its development from solid building (without architecture shapes) to irregular curves in panel in order to consider horizontally extended building or six stories building. A *case study* was designed. It is a project for residential villas of order port officers in Rub' El kale in kingdom of Saudi Arabia. Data were assembled and a cash flow was executed implanting three systems of construction for horizontal extension (i.e. cast in situ, pre-cast and tilt-up system). A *questionnaire* was designed to survey the opinion of experienced respondents. It was distributed among participants (i.e. different organizations, different companies' sizes, consulting offices and private companies. The questionnaire was to survey their experience and opinion. The responds were *assembled and analysed*. The economy of prefabricated systems factors were divided into four groups (i.e. administrative, financial, technical and general factors). A *quantitative statistical analysis* was executed to the output of the questionnaire via statistical tables to rank the severity of factors. A *comparison* was held among the mean values within the groups. This was achieved for overall sub factors (i.e. ranking of administrative, financial, technical, general, main Groups and top ten critical factors). A comparison was held among three systems by implementing Primavera software (to generate timeline), and cash flow. The analysis was achieved considering the engineering economy, Net Present Value (NPV), Internal Rate of Return, payback period for bank loans to cover the cash flow negative period and break even analysis. A *reasonable perspective* was obtained that would help in the comparison process between tilt-up and other systems. The study *highlighted recommendations* and recommendations for future research.

Keywords: Tilt-Up, Pre-cast, Pre-fabricated Systems, Construction Management, Engineering Economy.

STATEMENT	4
RESEARCHER DATA	5
ACKNOWLEDGMENT	6
ABSTRACT	7
CHAPTER 1: INTRODUCTION	19
1.1. PROBLEM DEFINITION	20
1.2. RESEARCH OBJECTIVES	20
1.3. RESEARCH METHODOLOGY	20
1.4. THESIS OUTLINE	23
CHAPTER 2: LITERATURE REVIEW	25
2.1 TYPES OF MODERN CONSTRUCTION SYSTEM WEB OPENINGS	25
2.2 PREFABRICATED CONSTRUCTION SYSTEMS	26
2.2.A. PRE-CAST SYSTEM	26
2.2.B. BENEFIT OF PRE-CAST	26
2.2.C. PRE-CAST CONSTRUCTION SEQUENCE	28
2.3 TILT-UP SYSTEM	33
2.3.A. TILT-UP CONSTRUCTION SEQUENCE	33
2.3.B. PREVIOUS RESEARCHES	34
2.3.C. HISTORY OF TILT-UP CONSTRUCTION SYSTEM	413
2.3.D. ADVANTAGES OF TILT-UP	42
2.3.E. PLANNING OF TILT UP BUILDING	43
2.3.E.1. THE DECISION TO MAKE TILT UP	43
2.3.E.2 MINIMUM SIZE OF TILT UP BUILDING	43
2.3.E.3 USING TILT UP SYSTEM FOR MULTI-STORY TILT UP BUILDING	44
2.3.E.4 PANEL SIZE AND SHAPE	46
2.3.E.5 CAST SPACE	47
2.3.F. STRUCTURAL CONSIDERATION	47
2.3.G FINISHING SHAPE	49
2.3.H FIRE RATING OF TILT UP WALLS	51
2.3.I THERMAL BEHAVIOR IN TILT-UP	51
2.3.I.1 CONSTRUCTION OF SANDWICH PANEL	53
2.3.J FLOORING AND FOUNDATIONS	53

2.3.J.1 FOUNDATION OF TILT-UP SYSTEM	53
2.3.J.1.A INTERIOR FOOTING PADS	55
2.3.J.1.B FOUNDATION SUPPORTING WALL PANELS	55
2.3.J.1.C CASES OF FOOTING	57
2.3.J.2 TILT –UP FLOOR SLAB	59
2.3.K. LAYOUT AND FORMING TO CONCRETE PLACEMENT	59
2.3.K.1 PANEL LAYOUT	59
2.3.K.2 LAYOUT OPERATION	61
2.3.K.3 PANEL FORMING	62
2.3.K.3.A FORMING PANEL FEATURE	62
2.3.L BOND BREAKER	69
2.3.M REINFORCEMENT, INSERTS AND EMBEDMENT’S	69
2.3.M.1 PLACING REINFORCEMENT	70
2.3.M.2 INSERTS ELEMENT FOR LIFTING AND WALL BRACING	71
2.3.N PLACING CONCRETE	72
2.3.O LIFTING PANEL, FIXED IT AND TEMPORARY BRACING	72
2.3.O.1 RIGGING THE PANEL	74
2.3.O.2 LIFTING STEPS	78
2.3.O.2.A PROBLEM FACING THE LIFTING OPERATION	80
2.4 FACTORS AFFECTING PRE-FABRICATED	80
2.4.A FACTORS AFFECTING PRODUCTIVITY IN SOUTH AFRICA	81
2.4.B PRODUCTIVITY IN PRECAST CONCRETE IN INDIA	83
2.4.C PREFABRICATION AND CAST IN-SITU CONSTRUCTION	85
CHAPTER 3: RESEARCH METHODOLOGY	88
3.1 QUESTIONNAIRE PROCESS	88
3.2 QUESTIONNAIRE DESIGN	89
3.3 MEASUREMENT SCALE	90
3.4 RESEARCH POPULATION	91
3.5 SAMPLE SIZE	91
3.5.A THE CONFIDENCE INTERVAL	92
3.5.B THE CONFIDENCE LEVEL	92
3.5.C. FACTORS AFFECTING CONFIDENCE INTERVALS	93

3.5.C.1 SAMPLE SIZE	93
3.5.C.2 PERCENTAGE	93
3.5.C.3 POPULATION SIZE	94
3.6. SAMPLE SIZE FORMULAE	94
3.7 QUESTIONNAIRE DISTRIBUTION	95
3.7.A DISTRIBUTION WAYS	95
3.8 DATA ANALYSIS	95
CHAPTER 4: TILT UP ECONOMY ANALYSIS	97
4.1 EVALUATION OF PREFABRICATED CONSTRUCTION IN KSA	98
4.2 RANKING ADMINISTRATIVE FACTORS	101
4.3. RANKING FINANCIAL FACTORS	102
4.4. RANKING TECHNICAL FACTORS	103
4.5. RANKING GENERAL FACTORS	104
4.6. RANKING MAIN GROUPS	105
4.7 TOP TEN CRITICAL FACTORS FOR ALL GROUPS	106
4.8. FIRST PROJECT DESCRIPTION	107
4.9. CAST IN SITU PROJECT	108
4.9.A. CAST IN SITU CASH FLOW	108
4.9.B. CAST IN SITU NET PRESENT VALUE (NPV)	112
4.9.C. CAST IN SITU INTERNAL RATE OF RETURN (IRR)	114
4.9.D CAST IN SITU PAY-BACK PERIOD	115
4.9.E CAST IN SITU BREAK EVEN ANALYSIS	116
4.10. PRE-CAST PROJECT	118
4.10.A. PRE-CAST CASH FLOW	118
4.10.B. PRE-CAST NET PRESENT VALUE (NPV)	123
4.10.C PRE-CAST INTERNAL RATE OF RETURN (IRR)	124
4.10.D PRE-CAST PAY-BACK PERIOD	125
4.10.E PRE-CAST BREAK EVEN ANALYSIS	126
4.11 TILT-UP	127
4.11.A TILT-UP CASH FLOW	128
4.11.B TILT-UP NET PRESENT VALUE (NPV)	129
4.11.C TILT-UP INTERNAL RATE OF RETURN (IRR)	130

4.11.D TILT-UP PAY BACK PERIOD	132
4.11.E TILT-UP BREAK EVEN ANALYSIS	133
4.12. SECOND PROJECT DESCRIPTION	135
4.13. CAST IN SITU PROJECT	135
4.13.A. PROJECT CAST IN SITU NET PRESENT VALUE	137
4.13.B CAST IN SITU INTERNAL RATE OF RETURN (IRR)	137
4.13.C CAST IN SITU BREAK EVEN ANALYSIS	138
4.14. PRE-CAST PROJECT	139
4.14.A. PROJECT PRE-CAST (NET PRESENT VALUE)	140
4.14.B PRE-CAST INTERNAL RATE OF RETURN (IRR)	141
4.14.C PRE-CAST BREAK EVEN ANALYSIS	142
4.15. TILT- UP PROJECT	143
4.15.A. TILT-UP PROJECT NET PRESENT VALUE	144
4.15.B TILT-UP INTERNAL RATE OF RETURN (IRR)	145
4.15.C TILT-UP BREAK EVEN ANALYSIS	145
CHAPTER 5: RESULTS AND DISCUSSIONS	148
5.1 WORKING WITHOUT FOLLOWING RISK MANAGEMENT PLAN	149
5.2 LIMITED NUMBER OF SPECIALIZED SUBCONTRACTORS	149
5.3 LACK OF TECHNICAL EXPERIENCE OF EMPLOYEES	150
5.4 PREFABRICATED DURING TENDER STAGE	150
5.5 ABSENCE OF TECHNICAL SKILLED LABOR	151
5.6 DELAY IMPACT ON FINANCING THE PROJECT BY OWNER	151
5.7 CONTINUOUS INCREASE IN TRANSPORTATION COSTS	152
5.8 LACK OF PREFABRICATED ADMINISTRATIVE EXPERIENCE	152
5.9 CONSTRUCTION MATERIALS PRICE INCREMENT	153
5.10 UNAWARENESS OF SITE CONDITIONS	153
5.11 TILT-UP VERSUS CAST IN SITU BUILDINGS	ERROR! BOOKMARK NOT DEFINED.
5.12 TILT-UP VERSUS PRECAST BUILDINGS	ERROR! BOOKMARK NOT DEFINED.
5.13 TILT-UP VERSUS METAL BUILDINGS	ERROR! BOOKMARK NOT DEFINED.
5.14 COMPARISON BETWEEN CASH FLOWS	153
5.14.A CAST IN SITU CASH FLOW	153
5.14.B PRE-CAST CASH FLOW	155

5.14.C TILT-UP CASH FLOW	156
5.15 NET PRESENT VALUE COMPARISON	157
5.16 INTERNAL RATE OF RETURN COMPARISON	158
5.17 PAYBACK PERIOD COMPARISON	159
5.18 BREAK EVEN ANALYSIS	160
CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS	163
6.1 CONCLUSIONS	164
6.2 RECOMMENDATIONS	165
LIST OF REFERENCES	167
الملخص العربي	
محتويات الرسالة	

LIST OF TABLES

Table Name	page
Table (2.1): panel area and thick	47
Table(2.2): Fire rate of tilt -up walls	49
Table(2.3): factors taken into consideration in South Africa.....	80
Table (2.4): Summary of work data collected from various (PPC) construction projects in India.....	82
Table (2.5) Total Duration for Prefabrication Construction.....	83
Table (2.6) Total Duration for Conventional Construction.....	84
Table (2.7) Total cost for prefabrication construction.....	84
Table (2.8) Total cost for conventional construction Material and labor cost for total project.....	84
Table(4.1): Administrative Factors Listed in the Questionnaire...	97
Table(4.2): Financial Factors Listed in the Questionnaire.....	97
Table(4.3): Technical Factors Listed in the Questionnaire.....	98
Table(4.4): General Factors Listed in the Questionnaire.....	98
Table (4.5) Ranking and mean of factors for Administrative....	99
Table (4.6) Ranking and mean of factors for Financial.....	100
Table (4.7) Ranking and mean of factors for Technical.....	101
Table (4.8) Ranking and mean of factors for General.....	102
Table (4.9) Ranking and Average Rating of Main Groups.....	103
Table (4.10) Top Ten Critical Factors.....	104
Table (4.11) Approximate Summary For Building Description In Housing Project (Al RUB AL KHALI PROJECT).....	105
Table (4.12) resource of cast in situ with cost and price.....	106
Table (4.13) cast in situ cash in distribution.....	107
Table (4.14) cast in situ cash out distribution	108
Table (4.15) cast in situ cash flow distribution.....	108
Table (4.16) represent the NPV of cast in situ method.....	111
Table (4.17) cast in situ break even analysis	114
Table (4.18) cast in situ break even Trend	115
Table (4.19) precast production cost.....	117
Table (4.20) precast Transportation cost.....	118
Table (4.21) precast erection cost.....	118
Table (4.22) precast cash flows.....	120
Table (4.23) The NPV of Pre-Cast method.....	121

Table (4.24) Pre-Cast Break Even Analysis	124
Table (4.25) Pre-Cast Break Even Trend	124
Table (4.26) Tilt-up cash flows line.....	127
Table (4.27) Tilt-up cash flows.....	127
Table (4.28) The NPV of Tilt-up method	128
Table (4.29) Tilt-up Break Even Analysis	131
Table (4.30) Tilt-up Break Even Trend	131
Table (4.31) represent cash flow of cast in situ.....	133
Table (4.32) represent the NPV of cast in situ method.....	135
Table (4.33) cast in situ break even analysis	136
Table (4.34) cast in situ break even Trend	136
Table (4.35) represent the cash flow of pre-cast method.....	137
Table (4.36) represent the NPV of pre-cast method.....	138
Table (4.37) Pre-Cast Break Even Analysis	140
Table (4.38) Pre-Cast Break Even Trend	140
Table (4.39) represent the cash flow Tilt-up method.....	141
Table (4.40) represent the NPV of Tilt-up method.....	142
Table (4.41) Tilt-up Break Even Analysis	143
Table (4.42) Tilt-up Break Even Trend	144
Table (5.1)The NPV of construction methods.....	157
Table (5.2)The NPV of second project construction methods	157
Table (5.3)The IRR of first construction methods.....	158
Table (5.4)The IRR of second construction methods.....	158
Table (5.5)The Pay Back period of construction methods.....	159
Table (5.6) Break Even Analysis Results	159
Table (5.7) Second Project Break Even Analysis Result.....	160

LIST OF FIGURE

Figure Name	Page
Figure (1.1): RESEARCH METHOD.....	20
Figure (2.1): Pre-cast construction System Components.....	27
Figure (2.2):Pre-cast Placing temporary corbel.....	28
Figure(2.3): Pre-cast The beams on the temporary corbel	28
Figure (2.4): Pre-cast Welding the top angles to beam and column.....	28
Figure(2.5): temporary ledges to support the hollow core plank.....	29
Figure(2.6): temporary ledges to support at each side	29
Figure(2.7): steel reinforcement in the beam pockets.....	29
Figure(2.8): Pre-Cast Construction System place the grout.....	30
Figure(2.9): place the second layer of reinforcement.....	30
Figure(2.10): Pouring top concrete.....	30
Figure(2.11): the temporary corbels and ledges are removed.....	31
Figure(2.12): tilt up construction sequence.....	32
Figure(2.13): Multi story tilt up building.....	43
Figure(2.14): Multi story tilt up building as one panel.....	43
Figure(2.15): panels stacked with joints at each floor level.....	44
Figure(2.16): consideration in panelize building.....	47
Figure(2.17): panel finishing bricks shape.....	48
Figure(2.18):Material wall R-value.....	50
Figure(2.19): footing type.....	52
Figure(2.20): shims or grout.....	52
Figure(2.21): Interior footing shape.....	53
Figure(2.22): alternatives supporting panels.....	54
Figure(2.23): Grout under panel.....	55
Figure(2.24): Footing linked with panel.....	56
Figure(2.25): slab terminology.....	56
Figure(2.26): panel layout.....	57
Figure(2.27): panelize the building.....	59
Figure(2.28): panel layout the tilt up building.....	59
Figure(2.29): form shapes.....	60