

# Construction Labor Productivity Management

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and Methods Improvement

**Dr. Awad S. Hanna**

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ISBN-13: 978-0-9829042-0-6

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He has authored over 100 refereed journal articles and 15 major productivity-related books on construction-related topics, with special emphasis on labor productivity, construction methods, cumulative impact of change orders, and construction risk management.

Dr. Hanna has presented over 1000 one-day seminars and instructed more than 20,000 people in the U.S. and Canadian construction industry on how to improve construction labor productivity and site performance through proper pre-construction planning. His audiences have included NECA (National Electrical Contractors Association), MCAA (Mechanical Contractors Association of America), Canadian Mechanical Contracting Education Foundation, Electrical Contractors Association of Canada, Sheet Metal and Air Conditioning Contractor's National Association, and National Association of Boilermaker Construction Employees (NACBE). He has also served as consultant and/or expert witness on many major national claims cases that involved craft productivity evaluation, including such projects as the Massachusetts Central Artery "The Big Dig" and the New England Patriots Stadium.

Dr. Hanna was selected by a jury of internationally known experts as the winner of the Canadian Construction Research Board's 1990 international competition for the "Best Innovative Ideas in Construction". In 2006, Dr. Hanna was the recipient of the Construction Industry Institute's Outstanding Researcher Award, and in 2009 he was elected Fellow of the American Society for Civil Engineers. Most recently, Dr. Hanna was selected by the American Society of Civil Engineers Construction Institute Board of Directors to receive its 2010 Construction Management Award for his significant contributions as an educator and researcher in the construction industry.

# CONTENTS

Preface .....	i
Chapter 1: The Importance of Labor Productivity .....	1
1.1 Introduction.....	1
1.2 Defining Productivity.....	2
1.3 Efficiency .....	2
1.4 Trends .....	3
1.5 Factors Affecting Labor Productivity .....	6
1.5.1 Industry-level Factors.....	7
1.5.2 Company-level Factors.....	11
1.5.3 Worker-level Factors .....	12
Chapter 2: Methods for Identifying Ineffective Work and Lost Time .....	15
2.1 Work Sampling .....	16
2.2 Conducting a work sampling study.....	18
2.2.1 Setting Goals.....	18
2.2.2 Choosing a Location and Representative Crew.....	18
2.2.3 Training the Observers .....	18
2.2.4 Selecting Activities.....	19
2.2.5 Determining the Number of Observations .....	21
2.2.6 Labor Utilization Factor.....	22
2.2.7 Developing Random Observation Times .....	22
2.2.8 Example Work Sampling Study.....	23
2.3 Delay Surveys .....	26
2.3.1 Craftsmen questionnaires .....	26
2.3.2 Foreman Delay Surveys.....	29
2.4 Crew Balance Chart .....	30

2.5	Flow Diagram .....	32
2.6	Common Causes of Delays and Wasted Time.....	35
2.6.1	<i>Tools</i> .....	36
2.6.2	<i>Information</i> .....	37
2.6.3	<i>Materials</i> .....	39
<b>Chapter 3: Earned Value Analysis.....</b>		<b>41</b>
3.1	Goals of an Earned Value Management System.....	41
3.2	Designing an Earned Value Management System.....	41
3.2.1	<i>Engineering/Design</i> .....	42
3.2.2	<i>Estimate</i> .....	42
3.2.3	<i>Schedule</i> .....	42
3.2.4	<i>Manpower Loading</i> .....	43
3.3	Calculating Earned Value .....	43
3.4	Evaluating Percent Complete.....	44
3.4.1	<i>Subjective Evaluation</i> .....	44
3.4.2	<i>Binary Approach</i> .....	45
3.4.3	<i>Partial Complete Method</i> .....	46
3.4.4	<i>Quantity Installed as Measured Approach</i> .....	47
3.5	Using Earned Value .....	48
3.5.1	<i>Earned Value Spreadsheet</i> .....	49
3.5.2	<i>Performance Factors</i> .....	50
3.5.3	<i>Earned Value Forecasting</i> .....	52
3.5.4	<i>Project Time until Completion</i> .....	54
<b>Chapter 4: Benchmarking Productivity Indicators .....</b>		<b>55</b>
4.1	Manpower Loading Curves.....	55
4.2	The Trapezoidal Technique .....	58
4.2.1	<i>Using the Trapezoidal Technique</i> .....	60

4.3	S-Curves.....	66
4.3.1	<i>Cost and Schedule Variances.....</i>	68
<b>Chapter 5: Project Case Study .....</b>		<b>73</b>
5.1	Earned Value Tracking .....	75
5.2	Project Description.....	75
5.3	Quantitative Analysis.....	82
5.3.1	<i>Hanna’s Control Points .....</i>	82
5.3.2	<i>Manpower Loading Curve .....</i>	83
5.3.3	<i>S-Curves.....</i>	84
5.3.4	<i>Performance Factors .....</i>	87
5.3.5	<i>Manhour Forecasts for Project Completion.....</i>	90
5.4	Progress Reporting.....	95
5.5	Conclusions and Recommendations .....	96
<b>Chapter 6: Preconstruction Planning .....</b>		<b>97</b>
6.1	Planning for a Successful Project .....	97
6.1.1	<i>The Role of Preconstruction Planning.....</i>	98
6.2	Outcomes of the Preconstruction Planning Process.....	100
6.2.1	<i>The Turnover Binder.....</i>	101
6.2.2	<i>The Preconstruction Planning Binder .....</i>	102
6.3	Using this Chapter.....	102
6.4	The Preconstruction Planning Flow-Chart.....	103
6.5	Preconstruction Planning Activities.....	109
6.5.1	<i>Planning Kickoff.....</i>	109
6.5.2	<i>Scope Review .....</i>	113
6.5.3	<i>Value Engineering .....</i>	116
6.5.4	<i>Subcontracting .....</i>	118
6.5.5	<i>Detailed Scheduling.....</i>	120

6.5.6	<i>Quality and Safety Programs</i> .....	123
6.6.7	<i>Procuring Materials, Equipment and Tools</i> .....	126
6.5.8	<i>Labor Breakdown</i> .....	128
6.5.9	<i>Fabrication</i> .....	133
6.5.10	<i>Communicating and Reporting</i> .....	135
6.5.11	<i>Material Handling Plan</i> .....	139
6.5.12	<i>Construction Execution</i> .....	142
6.6	Strategies for Implementing a Preconstruction Planning Process .....	142
6.7	Obstacles to Preconstruction Planning.....	143
6.7.1	<i>Reasons for Less-than-Successful Projects</i> .....	144
<b>Chapter 7: Schedule Compression</b> .....		<b>147</b>
7.1	Organization.....	148
7.2	Materials .....	159
7.3	Equipment and Tools .....	164
7.4	Labor .....	165
7.5	Construction Methods.....	172
7.6	Managing Planned Schedule Compression.....	175
<b>Chapter 8: Best Practices to Improve Construction Productivity</b> .....		<b>177</b>
8.1	Best Practices: Labor .....	177
8.1.1	<i>Incentives</i> .....	177
8.1.2	<i>Participative Management</i> .....	179
8.1.3	<i>Performance Evaluations</i> .....	180
8.1.4	<i>Training Programs</i> .....	188
8.1.5	<i>Learning Curve Theory</i> .....	189
8.2	Best Practices: Lean Construction .....	191
8.2.1	<i>Lean Tools and Techniques</i> .....	192
8.3	Best Practices: Material Handling .....	197

8.3.1	<i>Creating a Productive Site Layout</i> .....	198
8.3.2	<i>Establishing Procedures for Material Deliveries</i> .....	199
8.3.3	<i>Identifying and Purchasing Required Materials and Equipment</i> .....	200
8.3.4	<i>Prefabrication of Components</i> .....	201
8.4	<b>Best Practices: Scheduling</b> .....	203
8.4.1	<i>Creating a Schedule</i> .....	204
8.4.2	<i>Collaborative Scheduling</i> .....	204
8.4.3	<i>Documentation of Schedule Changes</i> .....	205
8.4.4	<i>Improving Productivity through Scheduling</i> .....	205
8.4.5	<i>Integrated Material Handling</i> .....	206
8.4.6	<i>Short Interval Scheduling</i> .....	207
8.5	<b>Best Practices: Technology</b> .....	207
8.5.1	<i>Emerging Measurement Technologies</i> .....	209
8.5.2	<i>Building Information Modeling</i> .....	210
<b>Chapter 9: Project Management and the Role of Leadership</b> .....		213
9.1	<b>What Are the Skills and Qualities of a Leader?</b> .....	213
9.2	<b>What Leaders of Organizations Do</b> .....	217
9.2.1	<i>Leaders Set and Achieve Goals</i> .....	217
9.2.2	<i>Leaders Make Decisions</i> .....	218
9.2.3	<i>Leaders Manage Risks</i> .....	218
9.2.4	<i>Leaders Ensure Quality</i> .....	219
9.2.5	<i>Leaders Advance the Organization’s Interests</i> .....	219
9.2.6	<i>Leaders Create a Safe Working Environment</i> .....	220
9.2.7	<i>Leaders Create a Collaborative Culture</i> .....	220
9.2.8	<i>Leaders Assemble the Best Team for the Job</i> .....	221
9.2.9	<i>Leaders Motivate People</i> .....	221
9.3	<b>Developing Leadership</b> .....	224



References.....	225
Appendix A: Preconstruction Planning Forms .....	229
Appendix B: Employee Evaluation Forms .....	277
Equations.....	297
Glossary .....	301

## PREFACE

In the last 50 years, construction labor productivity has consistently lagged behind productivity in the business sector. It is widely reported that, on a typical project, the percentage of productive work ranges between 30 and 40 percent as a result of a lack of proper tools and information, poor material handling, inadequate management and other related factors.

Furthermore, construction durations have decreased for similarly sized projects and types of work that would have taken more time in the past. This trend is primarily driven by owner request and the increased use of fast-track or phased project delivery systems. Decreased durations have resulted in increased manning levels on construction sites, which further contribute to poor labor productivity.

This book focuses on creating a companywide system of productivity. It encompasses many topics, ranging from improving material handling to productivity measurement to effective leadership. A comprehensive system of productivity can increase profitability and control labor costs. A productivity system allows management to:

- measure and improve labor productivity and efficiency;
- plan and manage more efficient and profitable projects; and,
- predict and resolve labor and productivity problems during a project.

Managers in the construction industry are often very knowledgeable about the technical aspects of their trade, but lack training in management skills. This book provides management tools that can be used to improve the efficiency of the entire construction organization, including sections on preconstruction planning, productivity measurement and performance evaluations.

The concepts introduced here are applicable to all types of construction. However, many of the examples cited in this book are from the electrical, mechanical and sheet metal trades. This is due to the labor-intensive nature of their trades: any improvements in productivity will therefore have wide-ranging effects in terms of increased profit and reduction of claims. This book provides the tools to plan, organize, quantify and improve labor productivity at both the worker and company levels.

**Chapter 1** defines productivity and efficiency, describes productivity trends in the construction industry, and outlines a few of the factors that contribute to poor productivity.

**Chapter 2** provides methods for identifying ineffective work and lost time. These methods are used to highlight sources of inefficiency within a project. The techniques in this chapter are not intended to measure productivity; however, once the sources of inefficiency are identified, the contractor can work to minimize wasted time. Techniques such as work sampling, delay surveys, crew balance and flow charts are described, along with implementation methods.

**Chapter 3** provides methods and quantitative techniques for the implementation of an earned value system. Earned value is a method for comparing the work actually completed on a project to the estimated amount of work. Completed work is quantified using percent complete, a measurement of the actual physical completion of a project or task. Earned value and the associated performance factors provide a way to forecast how the remainder of the work will proceed on the project.

**Chapter 4** covers benchmarking productivity indicators. This chapter involves tracking labor costs and project completion, with the goal of comparing current projects to industry benchmarks and historical data. These methods allow for better resource planning and progress tracking on a project. Techniques are provided for calculating the average and peak manpower, as well as estimating project duration and total work hours. Tools for quantifying and presenting this information are covered, including the creation of manpower-loading curves and S-curves.

Any productivity system begins at the pre-construction planning stage. **Chapter 5** provides a system of effective pre-construction planning, allowing for early identification of potential problems that may impact productivity.

Later chapters concern the impact of schedule compression on productivity. **Chapter 6** quantifies the productivity effect of common schedule compression labor techniques, including overmanning, overtime and shift work. **Chapter 7** is a set of “concepts” which can be used to improve productivity in a schedule compression situation.

**Chapter 8** is a collection of best practices designed to improve productivity by category, such as managing labor, scheduling, material handling and the integration of new technologies. Finally, **Chapter 9** discusses theories of worker motivation and the development of leadership skills.

No matter how productive a project or company is, there is always room for improvement. This book provides the information and tools needed for any contractor to effectively manage labor and improve labor productivity.