

Instructor's Manual

to Accompany

**MANAGEMENT OF
CONSTRUCTION PROJECTS:
A CONSTRUCTOR'S PERSPECTIVE**

Second Edition

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Introduction to the Instructor's Manual

1. Origins of Book

Thank you for choosing *Management of Construction Projects: A Constructor's Perspective* as your teaching tool. Before we provide some suggestions regarding its use in your classroom, we thought it might be appropriate to provide some background on its development. The selection of topics for the first edition was made after interviewing construction industry leaders in Washington State. We were unable to find a suitable text that was written from a contractor's perspective, as most existing textbooks discuss project management from an owner's perspective. The first edition was published in 2002 by Prentice-Hall/Pearson and received world-wide popularity, even being translated into Mandarin. This second edition is with a new publisher, Routledge, and incorporates a new complicated \$60 million dollar engineering and research building as our case study. Many new and current project management concepts and tools such as BIM, LEED, Commissioning, IPD, and Lean have all been incorporated. New chapters such as Pre-Construction Planning, Business Aspects of Project Management, and Construction Leadership have also been added which will stretch the learning process for advanced students. And because many construction management undergraduates are now entering the industry through field supervision ranks, additional discussion and responsibility of the project superintendent is threaded throughout the text.

2. Organization of Text

This book was developed based on the premise that students would have previously completed courses in construction materials and methods, construction contracts, cost estimating, safety, and scheduling before taking a course in project management. While many of these introductory topics are addressed in this book, they were intended to be a review of material covered in other courses, and therefore are not discussed in depth. Topics are addressed in the sequence that a project manager and superintendent would address them in managing a construction project. The focus is on the individual management processes and techniques needed to manage a project, and tools are provided to assist in the performance of these processes.

Each chapter has a similar organization. Topics are first discussed in general terms, then individual issues are discussed in detail and illustrated. In Chapter 2, we introduce the reader to a specific project, the NanoEngineering Building that was constructed on the University of Washington campus in Seattle, Washington. All of the project management tools discussed in the text are illustrated with applications from the NanoEngineering project. Progress photographs are included on the companion website, to illustrate the actual physical construction of the case study project. Completed contract documents, including

selected drawings and specifications, are also on the website. Each chapter concludes with a set of review questions that emphasize the major points covered. These questions also are suitable for use in the development of quizzes or tests. Exercises are also provided to allow students to apply the principles learned, many of which are based on our case study, but any construction management or construction engineering program or course could customize or substitute their own quarter or program-long case study where applicable. Answers to all the review questions and many of the exercises are contained in this instructor's manual.

3. Suggested Classroom Use

Introductory Project Management Course

The book is suitable as a text for an introductory project management course. The instructor may choose to use the exercises and the NanoEngineering Building as a context for assigning student work, or may choose to use a separate project, as we do at the University of Washington. Our faculty selects a different commercial project each year, and the students develop detailed cost estimates in one course and project schedules and safety plans in others. In the project management course, all student requirements are based on the project used in the estimating, scheduling, and safety courses. Web-based project management techniques could be used and students required to use electronic formats for submitting their work. We require students to correct each graded assignment and create a project management manual that can be used as a reference portfolio. All of the exercises from the text could be slightly modified with a different case study and/or changing the timeframes or dollars slightly, yielding unlimited possibilities for homework or in-class examples. Case studies can be used to supplement the information contained in the text. Several case studies from "Who Done It? 101 Case Studies in Construction Management", an inexpensive accompaniment book available on Amazon, are provided at the end of this instructor's manual that can be used for additional classroom discussion.

Capstone Project Management Course

Most undergraduate construction programs have a senior capstone course. Such courses often are structured for students to independently analyze a project and develop cost estimates, construction schedules, and project management plans. This book would make an excellent reference resource for such a course. In our capstone course, we require each student to identify an actual project with an estimated construction value of at least \$5 million. The student develops a detailed cost estimate and construction schedule for the project. He or she also develops a subcontracting plan, organization chart for the project management team, site management plan, and other project management documentation. At the end of the quarter, each student is required to present a detailed project briefing to a panel of industry leaders.

4. Author Feedback

This manual provides answers to the review questions and selected exercises. We have carefully checked these answers, but would welcome any feedback or comments regarding them or any other aspect of the text. Please feel free to contact either of us by email (Len Holm: holmcon@aol.com or John Schaufelberger: jesbcon@u.washington.edu) or the publisher, Routledge. We hope you and your students find the book an effective educational resource. We have enjoyed creating it.

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***Answers to Review Questions
and Selected Exercises***

Chapter 1

Introduction

Review Questions:

1. *What are four critical project attributes that the project manager must integrate?*
Cost, schedule, safety, and quality
2. *What are the major phases of a construction project, and what occurs during each phase?*
There are five major phases of a construction project: (1) planning, (2) start-up, (3) control, (4) close-out, and (5) analysis. Cost, schedule, management organization, and risk analysis take place during the planning stage. During start-up, a field office is established, the management team is mobilized to the project site, and mechanisms for project management, such as accounting, communication, and documentation, are implemented in the field. During the project control phase, the schedule and costs are tracked and adjusted to minimize risks, accommodate changes, and maximize profit. Project close-out entails physical completion, documentation and accounting of the project. Project analysis compares the estimated to actual costs and schedules, evaluates changes, and the effectiveness of project controls that were implemented to take advantage of or minimize the effects of those changes.
3. *What is the difference between the traditional and the construction management delivery methods?*
In the traditional delivery method, the general contractor and designer have separate contracts with the owner. The formal chain-of-command flows through the owner, although informal communication lines may be established directly between the designer and contractor. In the construction management delivery method, design, construction, and management teams each have separate contracts with the owner. The construction management firm selects and manages the design team and general contractor on the owner's behalf.
4. *What is the difference between the construction manager-at-risk and the design-build delivery methods?*
In the construction manager-at-risk delivery method, the general contractor is involved with planning, estimating, and value engineering during the design process, but does not develop the design. In the design-build delivery method, the contractor designs and builds the project, either with internal resources or through a joint venture. Both delivery methods accommodate fast track techniques, with construction possibly beginning before design is complete.

5. *What is the difference between the design-build delivery method and the integrated project delivery method?*
 In the D-B delivery method, the owner has only one contract with the designer-builder, a two-party agreement. The designer-builder carries all of the risk associated with cost and schedule. In the Integrated method the owner and the designer and the contractor (three parties) sign the same agreement and mutually sharing project risks.
6. *How do the responsibilities of the project manager differ from those of the project superintendent?*
 The project manager is responsible for the global cost and schedule development, while the superintendent coordinates the overall schedule and prepares detailed schedules with subcontractors. The superintendent interfaces with the subcontractors and reports to the project manager, who interfaces with the owner and design team. The project manager manages on a global scale, what the superintendent implements on a detailed level.
7. *What are the major duties of the project or field engineer?*
 A project engineer prepares transmittals, submittals and field questions, maintains submittal and field question logs, maintains the contract files, reviews subcontractor invoices, etc.
8. *What is bid shopping and why is it considered unethical behavior?*
 Bid shopping occurs when a client shares one general contractor's bid with another in attempt to lower prices. This also occurs when a general contractor shares subcontractor bids with other subcontractors. Contractors submit their bids, their best estimate for project cost, in confidence that the recipient will not share that information with others. Not only is this unethical, but in some instances, particularly with public work, it may be considered against the law.

Exercises:

2. *Describe the advantages and disadvantages of the project management organization shown in Figure 1.12 as compared with the organization shown in Figure 1.11.*
 One disadvantage of the organization presented in Figure 1.11 is the separate chain-of-command for the project engineer and superintendent. Furthermore, the officer-in-charge is responsible for managing the superintendent directly and has greater involvement with day-to-day activities than Figure 1.12. The organization in Figure 1.12 allows the project manager to integrate the day-to-day information collected by the superintendent with the overall project before presenting that information to the officer-in-charge. The structure presented in Figure 1.11 places more of the burden of day-to-day management on the officer-in-charge, competing for his or her commitment with other contractual and corporate responsibilities.

Chapter 2

Construction Contracts

Review Questions:

1. *Why is it essential that a project manager fully understand the requirements and procedures specified in the contract documents?*

A project manager must understand the requirements and procedures in the contract, because he or she is responsible for satisfying all contract requirements and following specified procedures.

2. *What types of information would you find in each of the following contract documents?*
 - a. *Agreement*
 - b. *General Conditions*
 - c. *Special Conditions*
 - d. *Technical Specifications*
 - e. *Contract Drawings*

(a) The agreement identifies the parties involved in the contract; defines the project, cost, and penalties; and serves as the cover document in a contract.

(b) General conditions provide a set of operating procedures that the owner typically uses on all projects. They describe the relationship between the owner and the contractor, the authorities of the owner's representatives or agents, and the terms of the contract.

(c) Special conditions provide site-specific or project-specific contractual requirements or define site restrictions.

(d) The technical specifications provide criteria for the materials to be used in the project and standardized techniques for assembly, quality control, and workmanship.

(e) The contract drawings depict how the different elements of the project fit together.

3. *What is the difference between contract addenda and a contract change order?*

Contract addenda are issued before the contract is awarded, and change orders are issued after the contract is awarded.

4. *Why might an owner decide to include a special conditions section in a construction contract?*

An owner may include special conditions in a contract to define equipment that the owner will provide or special insurance requirements. In addition, if the owner were a public entity, special conditions may stipulate prevailing wage requirements for labor.