

Instructor's Manual

to Accompany

**INTRODUCTION TO
CONSTRUCTION PROJECT
ENGINEERING**

First Edition

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Introduction to the Instructor's Manual

1. Origins of Book

Thank you for choosing *Introduction to Construction Project Engineering* 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. We both felt that there were a few gaps in available teaching materials for introductory construction management (CM) and construction engineering (CE) courses. Almost all CM and CE programs have an introductory cure. Most textbooks used for those courses are bot a) commercial general contractor biased, and b) construction project management (PM) textbooks.

Many programs and courses choose a PM book and then use only limited portions of it which places a financial burden on the students. Also students who take these introductory courses are typically sophomore or junior level and are not yet prepared for PM topics. Upon graduation, these students will likely begin their professional careers as construction project engineers (PEs), whether that be in the civil, commercial, or residential industry sectors, and will not become PMs for 5-7-10 years later. This book therefore bridges these two gaps and is well-suited for sophomore or juniors and beginning project engineers.

The third gap we are bridging is providing a book which also serves construction engineering programs. We have included both a commercial and civil case study project threaded throughout the chapters, including examples and exercises for both industry sectors.

2. Organization of Text

This book was developed based on a progression of more basic and introductory chapters in the beginning, transition through field engineering, office project engineering, and advanced project engineering concepts; each chapter and each section is more advanced than the last. Our last few chapters also bridge the gap from basic project engineering tools to introductory project management topics.

Each chapter has a similar organization. Topics are first introduced in general terms, and then individual issues are discussed in detail and illustrated. In Chapter 1, we introduce the reader to two specific projects that we use as case studies and connect to example documents and exercises woven through the text. 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 studies, 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.

There is a companion website for the textbook with two levels of access. The first is open to all students and includes many expanded figures such as detailed estimates and detailed schedules for our case study projects. An entry code, available from Routledge, allows instructors' access to this instructor's manual, with answers to the books' review questions, as well as basic lecture slides for each chapter. These slides can be customized to fit any specific program, course, or instructor's preference.

3. Suggested Classroom Use

Introductory Construction Management and/or Construction Engineering Course

The book is suitable as a text for an introductory construction management or introduction to construction engineering course. The instructor may choose to use the exercises and either of our two case studies 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. 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", third edition, 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. This book will be republished in 2019 by Routledge with the title "101 Case Studies in Construction Management".

We have likely provided more material than can be presented in one quarter course. The provision of additional chapters also bridges a gap for programs that use a two-quarter long introductory course or a semester course. These last few advanced chapters provide support semester-based programs as well as programs which have more-advanced students who may have already served an industry internship. If introductory estimating and courses are being offered in parallel to an introductory construction management course, chapters 17 and 18 may be omitted. There are many other ways to customize a course and use this textbook.

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 via email (Len Holm: holmcon@aol.com or Giovanni Migliaccio: gianciro@uw.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. Other than examples we listed in this chapter, what are three additional elements of the built environment according to our definition and three others which would not be included in that set?
A: Include: airport, highway, skyscraper fixed amusement park ride
Exclude: airplane automobile, refrigerator, traveling circus tent
2. List another design firm which might work for a commercial project beyond those listed in this chapter.
A: Interior designer, mechanical engineer, electrical engineer, geotechnical engineer, acoustical consultant
3. When might a heavy-civil project hire an architect as a sub-consultant?
A: Architectural features on a bridge or dam or interior occupied spaces such as a bridge tender's office
4. Carpenters and plumbers have hammers and wrenches in their toolboxes. What sorts of tools do project managers and project engineers use?
A: Computers, contracts, estimates, schedules, printers, copy machines
5. Why do you suppose a new CM or CE graduate does not start their careers on day 1 as a PM?
A: Not yet qualified; must learn the ropes; gain respect of peers, subcontractors, field supervision

Chapter 2

Built Environment Projects

Review Questions:

1. What are two characteristics that define a project?
A: Construction projects are unique and temporary.
2. What are the four typical design phases of a construction project?
A: Conceptual design, schematic design, design development, construction documents
3. What are the four dimensions to measure project success?
A: cost, time, safety, quality
4. What other factors act as the foundation to project success?
A: document control, communications, project organization
5. Provide three examples of preconstruction activities during planning.
A: scope definition, selection of design team, selection of project delivery.
6. Provide three examples of preconstruction activities during planning.
A: Many options available out of a long list including estimating, scheduling, constructability review, quality control plan, safety plan, identify long lead materials, and others
7. List the construction sub-phases of a project.
A: Startup and planning, controls and administration, project execution and close-out.
8. When do less experienced project engineers get involved on a construction project?
A: project execution, control and administration

Chapter 3

Participants to Built Environment Projects

Review Questions:

1. Who is a journey level craftsman?
A: Journey level craftsmen are experienced workers who have been recognized to be fully qualified to perform the skills of their trade through a process whose formality varies across jurisdictions and trades.
2. Who is an apprentice?
A: Apprentices are entry-level workers who are learning a trade through on-the-job training (OJT) under the supervision of other highly skilled workers.
3. Who is a MEP coordinator?
A: On building projects, a MEP coordinator is a project engineer who is fully vested in overseeing MEP specialty designers and contractors.
4. What are the characteristics of a general partner?
A: General partners share responsibilities, and profits and losses of the business.
5. What is the liability exposure of a proprietor?
A: A proprietor is exposed to unlimited personal liability.
6. Why would a project owner request a payment bond from the general contractor?
A: To receive assurance the general contractor will pay subcontractors, direct labor, and material suppliers on the project.
7. Among a general contractor's employees, who is mainly responsible for setting up the job site, including utilities and trailers?
A: The project superintendent.