

Barbara J. Jackson, PhD, FDBIA

Construction Management *JumpStart*

Third Edition

**The Best First Step
Toward a Career in
Construction Management**



WILEY

Construction Management

JumpStart

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To the many people who have purchased this book and used it to launch their career in construction, transition into management from the field, or used it to begin their studies as they prepare for a career in construction—one of the most rewarding and impactful paths a person can follow.

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About the Author

Barbara J. Jackson is Director of the Franklin L. Burns School of Real Estate and Construction Management, in the Daniels College of Business, at the University of Denver. She holds a BS in Housing and Design, an MS in Construction Management, and a PhD in Education and Human Resources. With over 20 years of experience as a licensed contractor and design-builder, she is a nationally recognized speaker and consultant on design-build project delivery, integrated teaming, and leadership and culture in the AEC industry.

Introduction

Congratulations! You are about to embark on an adventure. This book is about the processes, the people, and the practices that we call construction management—a term and a profession that may be unfamiliar to many people. Construction, as most individuals understand it, is an activity or a series of activities that involves some craftspeople, building materials, tools, and equipment. But you will learn that there is a great deal more to it than that. If you think that construction is all about brawn and not much about brains, then you probably haven't been paying very close attention to what has been going on in the built environment in the past several decades. Buildings today can be very complicated, and the building process has become extremely demanding. It takes savvy professional talent to orchestrate all of the means and methods needed to accomplish the building challenge.

This book's focus is not on construction per se. Its focus is on the construction process and those individuals who manage that process. Construction management involves the organization, coordination, and strategic effort applied to the construction activities and the numerous resources needed to achieve the building objective. Construction management combines both the art and science of building technology along with the essential principles of business, management, computer technology, and leadership.

Construction management as a profession is a relatively new concept, which may explain why you have not heard of it before. Up until the 1960s, the management tasks associated with large construction projects were typically handled by civil engineers. But in 1965, faculty from nine universities gathered in Florida to form the Associated Schools of Construction. What started as a movement to upgrade the status of construction education at universities evolved into a standardized construction management curriculum leading to an exciting new career choice, one for which there was increasing demand. Men and women who love the idea of transforming a lifeless set of plans and specifications into something real—a single-family home, a high-rise office building, a biotech facility, a super highway, or a magnificent suspension bridge—had found an educational program that provided both the academic course work and the practical management tools needed to plan, organize, and coordinate the increasingly complex construction process.

If you are one of the many individuals who desire the intellectual challenges of architecture, engineering, technology, and business, yet long to be outside in the thick of things, getting your hands dirty and ultimately producing a tangible result—something of lasting value—then construction management might just be the ticket for you.

The purpose of this book is to give you a jump-start on understanding what construction management is all about. After reading this book, you will have a good sense of what the job of a construction manager entails and what is needed to be good at it. You will learn about the diverse tasks associated with planning, organizing, and managing a construction project to a successful end. You will also discover the many opportunities available for an individual interested in pursuing a career in CM.

You can continue to explore these opportunities by reading other books about construction management, by taking construction management classes, and by networking with practitioners in the industry. And for those of you who want to take your interests and careers in construction to the next level, you can consider pursuing professional certification through either the American Institute of Constructors (AIC) or the Construction Management Association of America (CMAA). Both of these organizations and their certification programs are introduced in Chapter 1.

And after you've read this book, the next time you see some construction, I hope that, besides being fascinated by the activity, you will also be impressed by the ingenuity, creativity, and heart of the people who can achieve such feats. It's also my goal to give you a new appreciation for the men and women who built this nation in the past and who continue to contribute to the built environment in a significant way. Enjoy!

Who Should Read This Book

If you have picked up this book, I suspect that you have already experienced construction at some level and are curious about what construction management is. You may currently be working in construction on the building side as a craftsperson or laborer and want to know how you can move over to the management side. Or you may be a construction management student wanting a glimpse into the day-to-day challenges faced by the construction professional. On the other hand, you may currently have nothing to do with construction other than having a longtime interest in the building process. Some of you may have had a home built or a room added on and are simply interested in learning what the fuss was all about.

I hope that architects and engineers will pick up this book to get a better understanding of the contractor side of the equation. Some designers, tired of sitting behind a desk all day, may even contemplate giving construction management a try just for the heck of it. I suspect that there will be more than a few real estate agents, mortgage brokers, and interior designers who will use this book to become better informed regarding the construction process, integrating the new knowledge into the services they provide their clients. Then, of course, there are those of you who are already working in construction management but have been looking for a resource that will help explain what it is you do for a living!

No matter what your reason for buying this book, I feel confident that it will be money well spent. For those of you who have little or no experience with construction, I venture to guess that someday you will, and when you do, your knowledge and understanding of construction management will become quite valuable.

As for those of you who already have experience in construction, I have tried to write a comprehensive overview of the construction management process from the constructor's perspective. I'm sure you will relate to the Real World Scenarios presented throughout the text and enjoy the human aspects conveyed in the pages of this book. They are intended to drive home the challenges associated with construction and express the contribution that construction professionals make to the built environment. This book will assist you in communicating to clients, colleagues, and the public at large the significant role that the construction manager plays in the overall success of a construction project.

What This Book Covers

This book walks you through the construction management process—explaining how you take a project from a set of two-dimensional drawings to a three-dimensional wood, steel, or concrete building, bridge, or highway. Along the way, you will learn about the seven functions of construction management and how each of them contributes to the successful delivery of the construction project. Here's an overview of what this book covers:

Chapter 1 This chapter introduces you to the construction industry and the opportunities that it offers. Here you will learn about the different industry sectors and the roles of the various participants in the construction process.

Chapters 2–5 These chapters explain in greater detail what construction management is and how construction work is obtained in the first place. You will also learn about the construction contract and about each of the stages leading from design to post-construction.

Chapter 6 Nothing happens in construction without the efforts of a team of highly skilled and talented individuals—all of which are necessary to execute and deliver a successful project. In this chapter, the critical task of managing a diverse group of designers, contractors, subcontractors, vendors, and many other people who make up a project team, will be discussed. Critical aspects of team management such as trust, communication, and collaboration, to name a few, will be presented.

Chapter 7 As alternative project delivery approaches have become much more popular, pre-construction services have become much more critical. This chapter discusses many of the common pre-construction services that

are necessary to be successful with any of the integrated design and construction approaches. Services such as feasibility studies, constructability reviews, conceptual estimating, value engineering, and life-cycle cost analysis are some of the common services that will be explained.

Chapter 8 Figuring out what a project is going to cost is one of the first steps to getting a construction contract. This chapter deals with the estimating function of construction management. Here you will learn about the different types of estimates and how you price construction work.

Chapter 9 In this chapter, you will learn all about the conditions of the contract and what it takes to manage them. Contract administration is all about handling the red tape, business details, and paperwork of the construction project.

Chapter 10 Once the contract is signed and everything is a go regarding the project, you are ready to start construction. This chapter deals with organizing the job site and coordinating all of the manpower, materials, and equipment needed to get the work done.

Chapter 11 This chapter stresses the importance of good project planning and identifies the various tools used to schedule all of the activities associated with moving the project from startup to completion.

Chapter 12 The only way to know whether your project has met its goals for cost, time, and quality is to monitor and track individual components of performance. This chapter gets into the details of project control and explains how to get a job back on track if it should start to go off course.

Chapter 13 In this chapter, you will learn the importance of quality control and safety management throughout the construction process. No project can succeed without well-established quality and safety plans.

Chapter 14 Bottom line: Construction management is all about managing risk. In this chapter, you will learn about a standardized process for identifying, analyzing, and quantifying project risks so plans can be made to mitigate their impact.

Chapter 15 This chapter introduces you to building information modeling (BIM) and how it is commonly used in the design and construction process. BIM is expanding way beyond the 3D dimension to a whole new level by applying 4D, 5D, 6D, and even 7D dimensions to the building model. The chapter will also introduce some of the newest technologies being applied in construction such as virtual reality, augmented reality, and holograms.

Chapter 16 This final chapter discusses the impact that green building and sustainability is having on the entire building industry. The key principles of sustainable building design will be presented, along with the concept of achieving triple bottom line results associated with the economic, environmental, and social performance of building projects.

Making the Most of This Book

At the beginning of each chapter of *Construction Management JumpStart*, you'll find a list of the topics that I cover within the chapter.

In addition, several special elements highlight important information.

To help you absorb new material easily, I've highlighted *new terms* in italics and defined them in the page margins.

Notes provide extra information and references to related information.

You'll also find a list of "Terms to Know" near the end of each chapter to help you review the new terms introduced in the chapter. These terms are compiled in the Glossary at the end of the book. In addition, in Appendix A you'll find a list of the many acronyms commonly used in construction and mentioned throughout the book.

At the end of each chapter, you can test your knowledge of the chapter's relevant topics by answering the review questions. You'll find the answers to the review questions in Appendix B.

New terms

provide explanations of important concepts in the margin of the page, where you can easily spot them.

NOTE

Chapter 1

The Construction Industry

The construction industry is vast and varied. Just take a look around—from homes to highways to hospitals—and you see the results of this industry. Starting with the need for shelter, we first built primitive huts and houses. Then we constructed buildings for assembly and churches in which to worship. As our needs expanded, so did our building capabilities. We eventually built political capitals, great cities bustling with business and commerce. Though the means and the methods have changed over the centuries, the construction industry is still about building communities that serve people.

Construction is big, big business—reaching \$10.6 trillion in spending worldwide in 2017, and projected to reach \$12.7 trillion by 2022, and \$15.5 trillion by 2030, according to the Construction Intelligence Center, Orbis Research, and other sources. And there appears to be no slowdown in sight. The industry employs more than 7 million people directly (plumbers, carpenters, welders, and so on) and hundreds of thousands more indirectly. It gives rise to the steel industry, the lumber industry, the carpet industry, the furniture industry, the paint industry, the concrete industry, the paving industry, and so on. It goes even further than that if you consider the trucking, shipping, manufacturing, and mining industries. Architects, engineers, drafts people, building inspectors, code officials, and other professionals would not have jobs if it weren't for construction. As construction projects become increasingly more complex, the challenges associated with managing these projects become more complicated. The need for qualified construction managers is tremendous, and opportunities abound for those interested in the work.

Let's take a closer look at the construction industry and the position it has in our economy and our lives.

In This Chapter

- ◆ The economic impact of construction
- ◆ How construction was transformed from a craft to an industry
- ◆ The five primary sectors of the construction industry
- ◆ The roles of the project participants
- ◆ How the construction industry is transforming
- ◆ The advancement of technology in construction
- ◆ The construction industry's impact on sustainability
- ◆ Opportunities in construction management

The Scope of the Industry

Let's first make sure that you understand what construction is really all about. I have found that most people, including many who are already engaged in construction, do not understand the significance of the industry. So, let's start by considering the scope and the magnitude of construction and take a look at its impact on our society and our economy.

"It's Just Construction"

In my experience, the average observer of construction regards the process as rather insignificant and inconsequential—nothing special, nothing unique, not an industry of any major importance—mostly filled with non-influential blue-collar macho types. After all, when compared to medicine or law or even architecture, the common notion is “it's just construction.” This is why our great buildings and structures are typically identified only with the designer, and not with who built them. The contractor is incidental. Let me give you a few recent examples to drive home my point.

The distinctive architectural designs of Frank Gehry are known all over the world. One of his newest creations, the Walt Disney Concert Hall in Los Angeles, is “the most challenging of all Frank's buildings...an enormously complicated structure because of the curved shapes and intricate joinery,” according to Terry Bell, project architect for Gehry Partners, LLP, as quoted on the Walt Disney Concert Hall website. The website mentions that “extraordinary state-of-the-art construction techniques” were needed for the Concert Hall—“[o]ne of the most technically advanced structures in the world, [with] its lack of right angles and the overall sculptural quality.” At any one time as many as 550 construction workers were on-site to transform the concrete and steel into one of the most acoustically sophisticated concert halls in the world. However, you would be hard-pressed to find one mention of the building contractor of this magnificent construction feat in the popular press or on the Concert Hall's website. Not one single mention! This incredible construction challenge was accomplished by the M.A. Mortenson Company.

Let's consider another example. In 2002, the third-largest cathedral in the world and the first cathedral to be built in the United States in more than a quarter of a century was constructed in downtown Los Angeles. Designed by the world-renowned Spanish architect Professor Jose Rafael Moneo, the Cathedral of Our Lady of the Angels stands 11 stories tall and weighs a whopping 151 million pounds. The cathedral rests on 198 *base isolators* so that it will float up to 27 inches in any direction during an 8-point magnitude earthquake. It has been stated that the design is so geometrically complex that none of the concrete forms could vary by more than $\frac{1}{16}$ th of an inch. Having visited the cathedral

base isolators

Large shock absorbers made of alternating layers of rubber and steel attached to a building's foundation to allow movement of the structure without causing damage.