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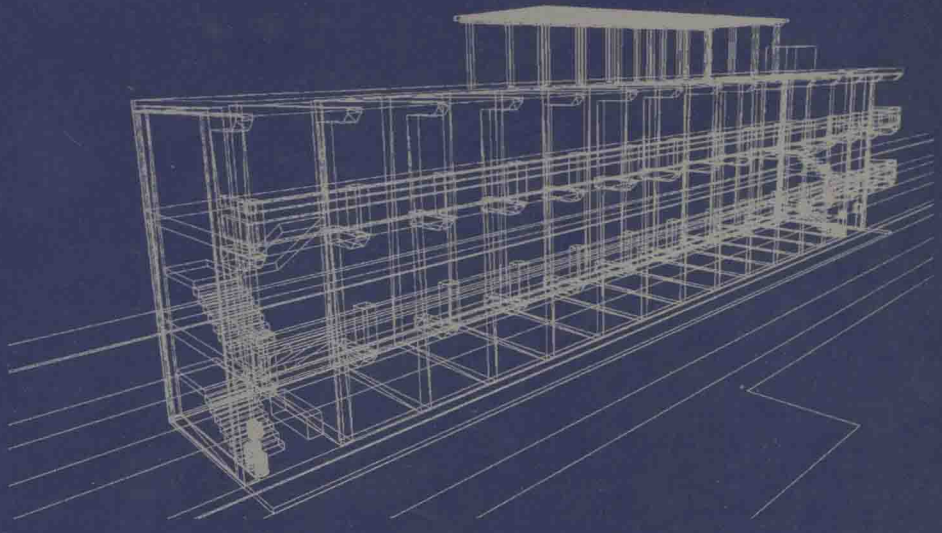
Construction Management Fundamentals

施工管理基础

[美] Clifford J. Schexnayder　Richard E. Mayo 著

姚　刚　关　凯 缩编



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Construction Management Fundamentals
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缩编说明

长期以来，我国的建筑工程专业本科教学都不太重视学生专业英语的能力培养，特别是在施工专业的教学中，基本没有英语方面的教学内容。很多学生毕业后，在涉外工程和对外专业交流中，都碰到很多困难。中国已进入 WTO，建筑业正在逐步开放，对学生的专业英语水平要求越来越高，这也是现在我们的高等教育强调双语教学的主要原因。

现代工程施工，需要复合型人才，这就要求学习土木工程施工专业的学生，一方面要掌握比较完善的施工技术知识，同时又要具备工程管理的相关知识。传统的施工教学，工程管理方面的知识比例较小，这都要求我们在教学改革中不断予以增强。缩编这本书的目的之一，就是要加强学生项目管理能力的培养。

本书根据美国 Clifford J. Schexnayder, Richard E. Mayo 所著的《Construction Management Fundamentals》一书缩编而成。原书共分为 17 章，从承包商的角度，分别就施工项目管理的发展历史、基本功能、招投标工作、计划技术、工料测算、项目合同、施工会计、设备选择、费用估算、建筑材料、施工安全、质量控制以及施工管理发展趋势等方面的主要工作进行了介绍。

在缩编中，我们主要把原书中关于美国施工管理发展历史的内容，以及不太适合我国现行施工管理体系的施工会计、合同法律、机械设备使用等几部分做了删减，力求把承包商进行项目管理的主要内容（合同管理、质量控制、施工方法、安全管理等）以及项目管理的常用方法等内容保留。希望本书能够为读者提供一个比较完整的项目管理框架。

本书不仅注意理论知识的阐述，同时紧密结合实际工作的需要，语言通俗易懂，实用性强，是一本工科学生学习施工管理知识和专业英语的好书。

本书可用作高等院校建筑工程和工程管理相关专业的教材，也可供工程技术人员、项目管理人员学习和参考。

由于学识与时间有限，缩编教材仍有欠妥及疏漏之处，诚望读者不吝赐教。

利用书末的教师反馈表，教师可以向麦格劳-希尔教育出版公司申请相关的教学课件和资料。

姚 刚　　关 凯

2005 年 2 月

Richard E. Mayo was a good friend, the kind of friend who was always there to help you. We shared many joys, triumphs, and times of stress together, and through it all, his positive attitude supported us. Along with this book, his legacy lives on through his wife and seven children.

CLIFF SCHEXNAYDER

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ABOUT THE AUTHORS

Clifford J. Schexnayder holds the Eminent Scholar position at the Del E. Webb School of Construction, Arizona State University. He received his Ph.D. in Civil Engineering (Construction Engineering and Management) from Purdue University, and a Masters and Bachelors in Civil Engineering from Georgia Institute of Technology. A construction engineer with over 35 years of practical experience, Dr. Schexnayder has worked with major construction contractors as field engineer, estimator, and corporate Chief Engineer.

As Chief Engineer he was the qualifying party for the company's Contractor's License, and had direct line responsibility for the coordination and supervision of both the estimating and construction of projects. He provided management, administrative, and technical direction to the company's operations and represented the company in project meetings and negotiations.

Additionally he served with the U.S. Army Corps of Engineers on active duty and in the reserves, retiring as a Colonel. His last assignment was as Executive Director, Directorate of Military Programs, Office of the Chief of Engineers, Washington, D.C.

He has taught construction courses at Arizona State University, Louisiana Tech, Purdue, Universidad de Piura in Peru, the U.S. Air Force Academy, Virginia Polytechnic Institute and State University, and at the U.S. Army Engineer School. In 2003 he was a Fulbright Scholar Awardee to the Universidad de Piura, Piura, Peru.

Dr. Schexnayder is a registered professional engineer in eight states, as well as a member of the American Society of Civil Engineers. He served as chairman of the ASCE's Construction Division and on the task committee, which formed the ASCE Construction Institute. From 1997 to 2003 he served as chairman of the Transportation Research Board's Construction Section.

Richard E. Mayo (1940–2002) was a Structural Engineer for Communications Services, Inc. (CSI), Mesa, Arizona, and taught in the Del E. Webb School of Construction at Arizona State University. He received his Ph.D. in Civil Engineering (Construction Management) from Stevens Institute of Technology. He also held a Master's of Science degree in Management from Rensselaer Polytechnic Institute and a Master's of Science degree in Civil Engineering from Purdue University. He was a 1962 graduate of the U.S. Military Academy at West Point, New York.

Dr. Mayo was a construction engineer with nearly 40 years experience. He served in the Corps of Engineers for 22 years, completing his service as the Deputy District Engineer in New York City. Following his retirement from the

Army, he was the Director of Construction Services for the RBA Group in Morristown, New Jersey, for seven years. At RBA he supervised the widening of the New Jersey Turnpike and bridge repairs on the Garden State Parkway.

In 1975 *Engineering News-Record* recognized Dr. Mayo at the Construction's Man of the Year Dinner for his service in the construction of a fibrous concrete Army tank motor pool pavement at Foot Hood, Texas. At that time the project was the largest fibrous concrete facility in the country.

Dr. Mayo taught Construction Management at Stevens Institute, Roger Williams University, and in the Del E. Webb School of Construction at Arizona State University. He was a registered professional engineer in several states. He is the author of much of the management material in this construction text.

PREFACE

The construction industry has changed dramatically in the last 25 years and, driven by the capabilities of the computer chip, change is continuing at an even more rapid pace. We are in the age of the laptop computer and the Internet. With our computer systems we now move data directly from the designer's computers to the field. This abundance of data must, however, be turned into information that will help us better manage construction operations. The challenge is to do things not only faster but better. Technology improvements will greatly enhance the constructor's ability to make better decisions relating to equipment, planning, and construction methods.

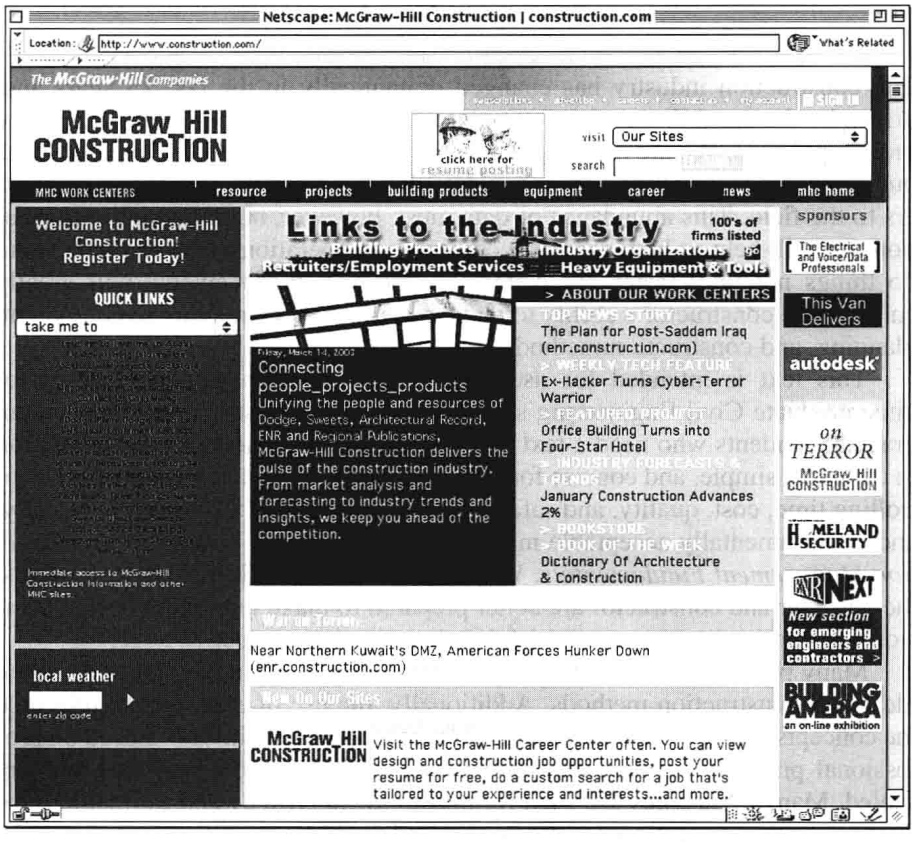
This text is intended for use in Constructing Management courses for undergraduate Civil Engineering students or for the Construction Management graduate students who need a text that covers the fundamentals of construction in a logical, simple, and concise format. Construction management is about controlling time, cost, quality, and safety, and about acting in a socially, politically, and environmentally acceptable manner. These tenets are covered in *Construction Management Fundamentals*. With a solid understanding of these concepts, the designer and constructor are better prepared to make intelligent design decisions, and to interact in a meaningful and productive manner.

Many photographs from actual projects are included in the text to illustrate ideas and construction methods. Additionally, the use of examples to reinforce the concepts through application has been incorporated in the text. Based on professional practice, standard formats for analyzing common problems are presented. Many companies use such formats to avoid errors when estimating production during the fast-paced efforts required for bid preparation and closing.

To enhance the value of *Construction Management Fundamentals* as a college textbook, problems and questions are provided at the close of each chapter. The solutions to some problems are included in the text at the end of the problem statements. Together with examples, they facilitate learning and give students the confidence that they can master the subjects presented. There are some questions that require the student to search construction publications or Web-based sources to locate basic information in support of construction management decisions. These questions expose the student to the process of independently locating necessary information. At the close of each chapter there are names, addresses, and in many cases the Internet address, for sources of additional information.

Engineering News-Record (ENR), the primary weekly publication serving the construction industry, is a recommended information source to support a construction management course using this book. *ENR* provides the latest information concerning developments in the industry. Use of the magazine provides the student with an exciting view of construction and a source of critical infor-

mation. Students should be particularly encouraged to read the "Legal" column that regularly appears in *ENR* as it provides practical management information. Visit *www.construction.com* for links to *ENR* and other McGraw-Hill construction resources.



This book benefited from the advice provided by many people actively engaged in the construction industry. Additionally many professors who are teaching construction in universities around the world gave freely of their counsel. Without the many hours of guidance by my good friend William A. (Wink) Ames, of the Minard-Ames Insurance Group, Chapter 9, "Construction Accounting," would not be a reality. Likewise Chapter 4, "Scheduling Techniques for Construction Projects," was much improved by the efforts of Sandra Weber, of the Del E. Webb School of Construction. She is one of my lifelong friends and collaborators. Her critical review and insightful advice added much to this text. Aviad Shapira, of the Technion-Israel Institute of Technology, Haifa, Israel, helped draft the section on Tower Cranes in Chapter 11, "Equipment Selection and Utilization." Many other individuals and firms supplied information and illustrations for this text; however, I take full responsibility for all material.

I would like to express my thanks for many useful comments and suggestions provided by the following reviewers:

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Finally, I wish to acknowledge the comments and suggestions for improvement received from students using the draft manuscript. We are all aware of how much our students help us to sharpen the subject presentation. For that and much more, we want to thank our students at the Air Force Academy, Arizona State University, Louisiana Tech, Purdue University, Roger Williams University, Stevens Institute, Virginia Tech, and the Universidad de Piura in Piura, Peru, who have over the years witnessed our classroom escapades explaining construction and who have contributed so much helpful advice for clarifying the subject matter.

Most importantly I thank my wife, Judy, who typed chapters, proofread too many manuscripts, and who otherwise got pushed further into the exciting world of construction than she probably wanted. Without her support this text would not be a reality.

Comments on this edition are solicited.

Cliff Schexnayder
Del E. Webb School of Construction
Tempe, Arizona

教师反馈表

McGraw-Hill Education，麦格劳-希尔教育公司，美国著名教育图书出版与教育服务机构，以出版经典、高质量的理工科、经济管理、计算机、生命科学以及人文社科类高校教材享誉全球，更以网络化、数字化的丰富的教学辅助资源深受高校教师的欢迎。

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PART 1

Construction Management

CHAPTER 1

Construction Management Functions

The purpose of operating a business is to earn a profit by providing a valuable service. In that respect, construction companies are no different from any other kind of company. They bid or negotiate for work to earn a profit. To be successful, they must know how to estimate the cost of construction projects accurately, predict the schedule of the work, control the progress and expenditures during construction, and complete projects safely and on time. They have a responsibility to construct the project in accordance with the plans and specifications, and to satisfy the customer's cost, quality, and time expectations. The construction project team is organized for the purpose of accomplishing those objectives.

PROJECT PLANNING AND DESIGN

Construction management can be addressed on several levels. The owner of the project has some key construction management functions such as defining the scope of the project, planning and financing the project, and ensuring the project team understands the project goals. There are construction companylevel construction management functions such as selecting the right jobs to bid, preparing the cost estimate and submitting the bid, procuring the payment and performance bonds, scheduling the work, and securing project operating capital. At the site, the construction management functions are setting the standards for quality and safety, planning the sequence of construction, controlling progress and expenditures, communicating effectively with the owner and architect/engineer, coordinating the work of the subcontractors, managing submittals, managing change orders, submitting **periodic pay estimates,** and closing out the project.

periodic pay estimates
Payments to the contractor during the work, normally monthly, and based on the progress to date.

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