

ENGLISH

高等学校专业英语系列教材

工程管理专业

张水波 主编 何伯森 主审

中国建筑工程出版社
CHINA ARCHITECTURE & BUILDING PRESS

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图书在版编目(CIP)数据

工程管理专业/张水波主编. —北京: 中国建筑工程
出版社, 2007

(高等学校专业英语系列教材)

ISBN 978-7-112-08904-8

I. 工… II. 张… III. 建筑工程—管理—英语—高
等学校—教材 IV. H31

中国版本图书馆 CIP 数据核字(2007)第 069376 号

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中国建筑工程出版社出版、发行(北京西郊百万庄)

新华书店经销

北京天成排版公司制版

北京云浩印刷有限责任公司印刷

*

开本: 787×1092 毫米 1/16 印张: 15 1/2 字数: 390 千字

2007 年 7 月第一版 2007 年 7 月第一次印刷

印数: 1—3000 册 定价: 22.00 元

ISBN 978-7-112-08904-8

(15568)

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(邮政编码 100037)

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本书是为满足高等学校工程管理专业英语教学需要而编写的一本专业英语教材。

本书选材来源广泛, 风格多样。素材均取自国外最近几年工程管理各个领域的经典教材、专著、论文以及网络信息, 内容涉及工程管理的应用现状及最新进展。本书主要内容包括: 建筑业(Construction Industry)、项目建设模式(Project Delivery System)、建筑管理(Construction Management)、工程项目招标与投标(Bidding/Tendering)、设计管理(Design Management)、进度管理(Progress Management)、成本管理(Cost Management)、质量管理(Quality Management)、安全管理(Safety Management)、风险管理(Risk Management)、合同管理(Contract Management)、项目经理(Project Manager)、项目中的激励(Motivation in Project Environment)、项目谈判(Project Negotiation)、工程索赔(Claim)等, 涵盖工程建设的全过程, 并且顺序安排与工程管理工作的一般过程大体相同。

本书可作为高等学校工程管理专业英语教材, 也可供工程管理及土木工程领域从业人员和研究生作为提高专业英语阅读和写作能力的参考读物。

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前言

经济全球化不断推动工程管理的国际化和专业化,对工程管理从业人员的专业外语水平也提出了更高的要求。我国不少高等院校的工程管理服务专业课程也逐步尝试采用双语教学。作为工程管理服务专业英语教材,本书旨在使读者掌握工程管理专业的英语术语,培养和提高读者阅读、理解以及翻译专业英语文献资料的能力,开阔专业领域的国际视野,为将来从事工程管理工作,尤其是涉外的工程管理工作打下一个坚实的语言基础。同时可作为高等院校工程管理服务专业开设相关双语教学课程的基础材料。

本书选材来源广泛,风格多样。素材均取自国外最近几年工程管理各个领域的经典教材、专著、论文以及网络信息,内容涉及工程管理服务的应用现状及最新进展。本书主要内容包括:建筑业(Construction Industry)、项目建设模式(Project Delivery System)、建筑管理(Construction Management)、工程项目招标与投标(Bidding/Tendering)、设计管理(Design Management)、进度管理(Progress Management)、成本管理(Cost Management)、质量管理(Quality Management)、安全管理(Safety Management)、风险管理(Risk Management)、合同管理(Contract Management)、项目经理(Project Manager)、项目中的激励(Motivation in Project Environment)、项目谈判(Project Negotiation)、工程索赔(Claim)等,涵盖工程建设的全过程,并且顺序安排与工程管理工作的一般过程大体相同。

在编写体例上,由于选材的限制,为了让读者获得完整的知识与相关专业术语,有的单元可能由几个部分构成。有些单元根据内容的需要还配有阅读材料。每单元内,除对文中重点、难点一一指出并加以注释外,也对文中出现的部分背景知识进行了介绍。

为树立学生的专业意识,本书在每单元后设“Professional Organization”栏目,遴选工程管理界的权威国际组织进行介绍,如英国皇家特许建造师学会(CIOB)、国际咨询工程师联合会(FIDIC)、世界银行(World Bank)、美国建筑管理学会(CMAA)等,提供了各国际组织的标志及网站地址,以便学生课下进一步学习。

为提高本书的可读性,在每单元后均选编了英汉对照的名人名言,可在专业教育过程中提升学生的管理理念与文化素质。

本书既可供高等院校的工程管理服务专业和土木工程相关专业师生使用,

也可作为工程管理领域从业人员及其他对工程管理专业英语感兴趣人员的学习参考读物。

本书由天津大学管理学院工程管理系张水波教授主编，杨秋波、段志成任副主编，何伯森教授主审，参加本书编写工作的还有仇乐、梁学光、隋海鑫。尹宜罡、陈维崇、季国忠为本书做了一些文字输入工作，南开大学外国语学院刘英博士在文字方面提出了一些宝贵意见，编者在此一并表示感谢。

限于编者水平和时间，本书不足乃至错误之处在所难免，敬请广大读者指正。

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LESSON 1

Construction Industry

1. The Nature of the Construction Industry

The construction industry is a paradox in many ways. In its roughly 8.3 percent, \$418 billion-plus share of the United States' gross national product (1988), it is the largest industry, but the vast majority of its hundreds of thousands of participants are small businesses.^[1] There are over half a million construction firms in the United States alone. These firms are intensely competitive among themselves in the best traditions of the free enterprise system, yet, compared with other industries, construction's technological advances sometimes appear trivial.

Construction has many characteristics common to both manufacturing and service industries. Certainly, as in other manufacturing, there are physical products, and often these are of mind-boggling size, cost, and complexity. But in other ways, construction is more like a service industry because it does not accumulate significant amounts of capital when compared with industries such as steel, transportation, petroleum, and mining. One sees this in comparative financial surveys, such as the *Forbes* and *Fortune* magazines' listings of the "top 500" businesses. Although several of construction's largest firms are listed each year on the basis of sales (cumulative annual contract awards or revenues), and sometimes on the basis of profits, few, if any, are even near the "top 500" on the basis of assets. Also, as in other service industries, success or failure in construction is by far more dependent on the qualities of its people than it is on technologies protected by patents or on the sheer availability of capital facilities, though the latter, in particular, is often also very important.^[2]

Construction is highly fragmented and sometimes divisive, yet in response to pressing national needs, such as a major war effort, few industries can mobilize resources more quickly. Each of its elements—designers, constructors, regulators, consumers, suppliers, crafts—can be highly skilled in its own area, yet there is little general perspective on how all the pieces fit together. There really is no central focus.

Indeed, there is no clear definition as to just what the construction industry is. Certainly it must include the hundreds of thousands of general and speciality construction contractors. But to understand the industry really, one must extend its scope to include designers of facilities, materials suppliers, and equipment manufacturers. Labor organizations add still another dimension, as do public and private consumer of construction services, many of whom have considerable construction expertise of their



own.^[3] Government regulatory agencies in such areas as safety, health, employment practices and fair trade also play an increasingly important role.

The construction industry is very custom-oriented; there is a strong feeling that if something is unique, it is better. Yet, this orientation also means that the industry has been slow to respond to the benefits of mass production. Its structure is highly specialized and layered, with complex interlocking interests and traditions. Its character makes it highly effective on practical or project matters, yet often ineffective on general or program matters.

Research and development fall in the latter category of the less practical and more general and speculative. Accurate data are not available, but it is generally assumed that only a fraction of 1 percent of the industry's gross revenues is invested even in applied research, let alone basic research. This is in strong contrast to industries, such as electronics, where an estimated 10 to 20 percent of revenues goes into research and development. This investment, in turn, at least partially accounts for the quantum leaps the high-technology industries have taken in recent years.^[4]

It has been observed that the construction industry is almost completely incentive-oriented. If there is little programmatic activity, it is likely that there is little incentive for investing in it. This reluctance to invest probably results in part because advances in construction tend to develop from innovations, or "better ideas". Most of these cannot be protected by either secrecy or patents, and therefore disseminate rapidly through the industry. Thus, there is little incentive for one firm to invest heavily in new developments that can soon be expected to benefit its competitors equally.

Owing to the comparatively large numbers and small sizes of its businesses, its fragmentation and divisiveness, and its service characteristics, the construction industry, as a whole, cannot significantly influence the demand for its output or control the supply. The consequent instability of demand thus dominates everything. For example, seasonality is chronic, and construction has an amplified reaction to basic business and economic cycles. Other economic problems in the industry relate to the lack of mobility of resources. Consequently, there is often too much work in some regions at the same time that others are suffering localized recessions. Major problems recur in funding both large and small projects, and these difficulties can be aggravated by government competition for and manipulation of the finite funds that are available.^[5] Construction also is often placed in the forefront of government fiscal and social policy.^[6]

2. The Construction Project

Construction projects are intricate and time-consuming undertakings. The total development of a project normally consists of several phases requiring a diverse range of specialized services. In progressing from initial planning to project completion, the typical job passes through successive and distinct stages that demand inputs from such disparate directions as financial organizations, governmental agencies, engineers, architects, lawyers, insurance and surety companies, contractors, and building tradesmen.





During the construction process itself, even a structure of modest proportions involves many skills, materials, and literally hundreds of different operations. The assembly process must follow a natural order of events that, in total combination, constitutes a complicated pattern of individual time requirements and restrictive sequential relationships among the many segments of the structure.^[7]

To some degree each construction project is unique, and no two jobs are ever quite alike. In its specifics, each structure is tailored to suit its environment, arranged to perform its own particular function, and designed to reflect personal tastes and preferences. The uniqueness of the construction site and the possibilities for creative and utilitarian variation of even the most standardized building product combine to make each construction project a new and different experience.^[8] The contractor sets up its “factory” on the site and, to a large extent, custom builds each job.

The construction process is subject to the influence of highly variable and sometimes unpredictable factors. The construction team, which includes architects, engineers, building tradesmen, subcontractors, material dealers, and others, changes from one job to the next. All the complexities inherent to different construction sites such as subsoil conditions, surface topography, weather, transportation, material supply, utilities and services, local subcontractors, and labor conditions are an innate part of construction.

As a consequence of these circumstances, construction projects are typified by their complexity and diversity and by the nonstandardized nature of their production. The use of factory-made modular units may diminish this individuality somewhat, but it is unlikely that field construction will ever be able to adapt itself completely to the standardized methods and product uniformity of assembly-line production.

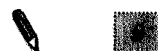
A construction project generally proceeds in rather definite order with the following stages of development being typical.

A. Planning and Definition

Once the owner has identified a need for a new facility, it must define the requirements and delineate the budgetary constraints. Project definition involves establishing broad project characteristics such as location, performance criteria, size, configuration, layout, equipment, services, and other owner requirements needed to establish the general aspects of the project. Conceptual planning stops short of detailed design although a considerable amount of preliminary architectural or engineering work may be required. The definition of the work is basically the responsibility of the owner, although a design professional may be called in to provide technical assistance and advice.

B. Design

This phase involves the architectural and engineering design of the entire project. It culminates with the preparation of final working drawings and specifications for the total construction program. In practice, the design, procurement, and construction often overlap, with procurement and construction proceeding as various stages of the design are





completed and drawings and specifications become available.

C. Procurement and Construction

Procurement refers to the ordering, expediting, and delivering of key project equipment and materials, especially those that may involve long delivery periods. This function may not be handled separately from the construction process itself. Construction is, of course, the process of physically erecting the project and putting the materials and equipment into place. This involves providing the manpower, construction equipment, materials, supplies, and supervision necessary to accomplish the work.

3. Types of Construction Projects

Construction intersects almost all fields of human endeavor, and this diversity is reflected in its projects. Designers of hospitals interact closely with medical professionals best to serve the needs of patients. Educational philosophies and practices take shape in the architecture of schools and colleges, while governments and corporations express their "images" with structures that house their offices and production facilities. The design and construction of refineries, factories, and power plants generally require that the builders be more knowledgeable of the related industrial technologies than the manufacturers and utilities that operate them. Builders of dams, tunnels, bridges, and other civil works today must be geologists, ecologists, and sociologists as well as architects, engineers, and managers.^[9] And most of us recognize how intimately the design and quality of our constructed environment either enhance or frustrate our personal lives.

It is difficult, if not impossible, to categorize neatly so great a spectrum of projects. The exceptions, the ones that transcend the boundaries, often seem to outnumber those that are clearly recognizable. What follows, nevertheless, are four somewhat arbitrary but generally accepted major types of construction. In large measure, these categories parallel the general specialties into which designers and constructors tend to group themselves.^[10]

Residential Construction

Residential construction includes single-family homes, multiunit town houses, garden apartments, high-rise apartments and condominiums^[11]. The latter, in particular, are technologically less closely related to residences than to the following description of non-residential building construction and are sometimes incorporated as part of multipurpose commercial developments. They are classified here from the users' point of view.

Residential construction accounts for about 30 to 35 percent of construction expenditures in an average year. Although largely financed by the private sector, the supply and demand for residential construction are heavily impacted by governmental regulation and fiscal policy. There are a few very large firms, but as a rule the low capital and technology requirements in this sector of the industry mean that it is characterized by





large numbers of very small firms.^[12] Demand instability, among other things, causes a high rate of business failures among them. Designs are generally done by either architects, home designers, or the builders themselves, and construction is usually handled by either independent contractors or developer-builders. Whether in single units or in large developments, traditional construction has been field-labor-intensive, with onsite hand fabrication and installation of literally thousands of pieces per dwelling unit. In recent decades, however, there has been a small but growing trend toward industrialization and factory mass production of at least some major components, and even of complete modular homes.

Building Construction

Building construction produces structures ranging from small retail stores to urban redevelopment complexes^[13], from grade schools to complete new universities, hospitals, churches, commercial office towers, theaters, government buildings, recreation centers, light manufacturing plants, and warehouses. For most of us, these structures form our nonresidential environment during our commercial, educational, institutional, governmental, social, religious, and recreational activities. Economically, this sector typically accounts for 35 to 40 percent of the construction market. Though labor-and-materials-intensive^[14] like residential construction, the scope and technology of these buildings are generally much larger and more complex.

Most of these structures are financed and built by the private sector of the economy. Design is typically coordinated by architects working together with engineering specialists for the structural, mechanical, and electrical subsystems. Construction is usually coordinated by general contractors or construction managers, who, in turn, subcontract substantial portions of the work to specialty firms. In some cases, such as hospitals and schools, design requires a good working knowledge of the activities to take place within them. In others such as commercial office space, an in-depth knowledge of the tenants' businesses is less important.

Heavy Engineering Construction

Though accounting only for some 20 to 25 percent of the market, heavy engineering construction includes many of the structures for which the industry is best known. Dams and tunnels provide hydroelectric power, flood control, and irrigation; bridges range from footpaths to internationally famous landmarks such as that spanning San Francisco's Golden Gate^[15]; other transportation structures include interstate railways, airports, highways, and urban rapid transit systems; ports and harbor structures fall into this category, as do many of those in the deep open sea. Pipelines are included here, as are some of our more utilitarian structures, such as water treatment and distribution systems, sewage and storm water collection, treatment and disposal systems, power lines, and communication networks.

Both the design and construction phases of heavy construction are primarily the





domain of civil engineers, though almost all disciplines play important roles. The construction phase is much more equipment-intensive, characterized by fleets of large earthmovers, cranes, and trucks, working with massive quantities of basic materials such as earth, rock, steel, concrete, timber, and pipe. Another major distinction is that many, if not most, heavy construction projects are publicly financed, and this fact in turn limits the alternative contractual arrangements in this sector. Typically, design is done either by, or under contract with, a public agency, and construction is by competitive open bidding. Construction contractors here usually require much greater expertise in engineering and geology than to those in building and residential construction.

Industrial Construction

Industrial construction represents only about 5 to 10 percent of the market, but it has some of the largest projects and is dominated by some of the largest engineering and construction firms. These projects include petroleum refineries and petrochemical plants; synthetic fuel plants; fossil-fuel and nuclear power plants; mine developments, smelters, steel mills, and aluminum plants; large heavy-manufacturing plants; and other facilities essential to our utilities and basic industries.

Both design and construction require the highest levels of engineering expertise, from not only civil, but also chemical, electrical, mechanical, and other disciplines, and typically all phases of the project are handled by the same firm on a negotiated design-construct or "turnkey" contractual arrangement^[16], with considerable overlap between design, procurement, and construction. The design-constructors must be intimately familiar with the technology and operations of the facility from the owner's point of view, and often they hold some of the key patents for advanced process technologies needed therein. In the Western free-enterprise countries, most of this work is privately financed.

In contrast with the basic materials characteristic of heavy engineering construction, the major factors in industrial construction generally consist of large amounts of highly complex mechanical, electrical, process piping, and instrumentation work. This work tends to be much more labor-intensive, though some of the largest hoisting and materials-handling equipment is also required.

Words and Expressions

assembly-line *n.* 生产流水线, 装配线

assets *n.* 固定资产

budgetary constraint 预算约束

building construction 房屋建筑

capital facilities 固定资产设施

concrete *n.* 混凝土

construction industry 建筑业

contract awards 合同额

corporation *n.* 公司, 企业, 法人

crane *n.* 起重机

custom-oriented *adj.* 定制导向的

earthmover *n.* 重型推土机

free enterprise system 自由企业制度

gross national product 国民生产总值(GNP)

heavy engineering construction 重型工程建设

incentive-oriented *adj.* 利益驱动的





in-depth *adj.* 深入的, 彻底的
 industrial construction 工业建筑
 interlocking *adj.* 相互关联的
 layout *n.* 布局, 规划
 manufacturing industry 制造业
 mass production 大规模生产
 mind-boggling *adj.* 令人难以置信的
 modest *adj.* 少量的, 有限的
 nonstandardized *adj.* 非标准的
 paradox *n.* 自相矛盾的事物, 悖论
 patent *n.* 专利
 physical product 有形的产品
 preliminary *adj.* 预备的, 初步的
 procurement *n.* 采购
 profits *n.* 利润
 programmatic *adj.* 有规划的, 计划性的
 regulators (政府)管理部门; 管理者

residential construction 住宅建筑
 revenues *n.* 营业额
 seasonality *n.* 周期性, 季节性
 service industry 服务业
 short of *adv.* 缺乏, 只要没有, 除……以外
 specification *n.* 规范, 说明书, 详述, 规格
 speculative *adj.* 推测的, 纯理论的, 投机
 机的
 subcontractor *n.* 分包商
 successive *adj.* 连续的
 tailored *adj.* 定制的, 裁缝做的
 timber *n.* 木材
 topography *n.* 地形, 地貌
 tradesman *n.* 技术工人
 undertaking *n.* 事业, 企业, 承诺, 保证
 utilitarian *adj.* 实用的

Notes

[1] In its roughly 8.3 percent, \$418 billion-plus share of the United State's gross national product (1988), it is the largest industry, but the vast majority of its hundreds of thousands of participants are small business.

根据 1988 年的统计数据, 建筑业以超过 4180 亿美元的产值占据了当年美国国民生产总值的 8.3%, 从而成为各行业之首, 但是建筑业内成千上万的企业中, 大部分却是小企业。

[2] Also, as in other service industries, success or failure in construction is by far more dependent on the qualities of its people than it is on technologies protected by patents or on the sheer availability of capital facilities, though the latter, in particular, is often also very important.

此外, 和服务业一样, 虽然受到专利保护的技术或者建设资金的可获得性对建筑业意义重大, 但仅仅依靠这些是不够的, 建筑业的成败更大程度上取决于员工的素质。

[3] Labor organizations add still another dimension, as do public and private consumer of construction services, many of whom have considerable construction expertise of their own.

劳工组织以及建筑设施的服务对象(公共部门或私人)也要考虑进来, 这些参与方分别具有某项独特的建筑业专门知识。

[4] This investment, in turn, at least partially accounts for the quantum leaps the high-technology industries have taken in recent years.

近年来, 这些投资在很大程度上成为推动高新技术产业飞跃式发展的重要力量。

[5] These difficulties can be aggravated by government competition for and



manipulation of the finite funds that are available.

政府部门对于有限资金的争夺和人为操纵,更使得建筑业雪上加霜。

[6] Construction also is often placed in the forefront of government fiscal and social policy.

在政府各种财政和社会政策的改革中,建筑业也常常首当其冲。

[7] The assembly process must follow a natural order of events that, in total combination, constitutes a complicated pattern of individual time requirements and restrictive sequential relationships among the many segments of the structure.

建造过程必须遵循自然顺序,在全面整合的情况下,这将形成包含有各单项工作的时间要求以及建筑物各组成部分之间确定顺序关系的复杂模式。

[8] The uniqueness of the construction site and the possibilities for creative and utilitarian variation of even the most standardized building product combine to make each construction project a new and different experience.

施工现场各不相同,而且,即使最标准化的建筑产品也可能有许多充满创意的应用方法。因此,每个建设项目都是全新的、与众不同的。

[9] Builders of dams, tunnels, bridges, and other civil works today must be geologists, ecologists, and sociologists as well as architects, engineers, and managers.

大坝、隧道、桥梁以及其他土木工程的建设者不仅仅是建筑师、工程师和管理者,还必须是地质学家、生态学家和社会学家。

[10] In large measure, these categories parallel the general specialties into which designers and constructors tend to group themselves.

以下分类与(建筑业中的)设计者和建设者们通用的分类方法基本一致。

[11] condominiums 共有房产,如:公寓中的某个房间或车库中的车位,在与其他地产单位的所有人共享时所有人要按各自的份额收取费用。

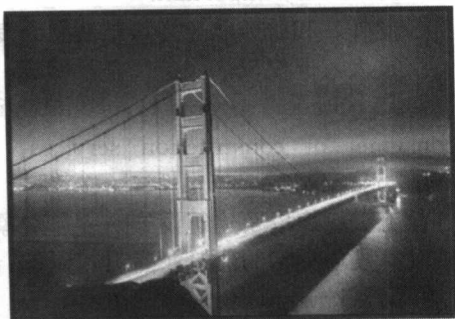
[12] There are a few very large firms, but as a rule the low capital and technology requirements in this sector of the industry mean that it is characterized by large numbers of very small firms.

住宅建筑领域确有少数的超大企业,但是由于行业对于资本和技术的要求较低,占统治地位的还是大量小型企业。

[13] urban redevelopment complexes 城市再开发综合楼群。

[14] field-labor-intensive 施工现场劳动力密集型。

[15] San Francisco's Golden Gate 旧金山的金门大桥。金门大桥是世界著名大桥之一,是旧金山的象征,被誉为近代桥梁工程的一项奇迹。大桥的设计者是工程师约瑟夫·斯特劳斯。金门大桥于1933年动工,1937年5月竣工,用了4年时间和10万多吨钢材,耗资达3550万美元。



[16] design-construct or "turnkey" contractual arrangement 设计建造或交钥匙的合同方式。





Questions For Review And Discussion

1. What characteristics does construction have in common with manufacturing and services industries?
2. What specialized services are needed to complete a project?
3. What do you think is the main reason for the slow development of construction industry?
4. According to the author, why is it difficult for construction to be standardized?
5. What are the general patterns of a construction project?
6. What are the major types of construction projects?

Reading Materials

The Parties In Construction Project

The Owner

The owner, whether public or private, is the instigating party that gets the project financed, designed, and built. Public owners are public bodies of some kind ranging from the federal government down through state, county, and municipal entities to a multiplicity of local boards, commissions, and authorities. Public projects are paid for by appropriations, bonds, or other forms of financing and are built to perform a defined public function. Public owners must proceed in accordance with applicable statutes and administrative directives pertaining to advertising for bids, bidding procedure, construction contracts, contract administration, and other matters relating to the design and construction process.

Private owners may be individuals, partnerships, corporations, or various combinations thereof. Most private owners have the structure built for their own use; business, habitation, or otherwise. However, many private owners do not intend to become the end users. The completed structure is to be sold, leased, or rented to others. These parties may or may not be known to the owners at the time of construction.

The Architect-Engineer

The architect-engineer, also known as the design professional, is the party or firm that designs the project. Because such design is architectural or engineering in nature, or often a combination of both, the term "architect-engineer" is used to refer to the design professional, regardless of the applicable speciality or the relationship between the architect-engineer and the owner.

The architect-engineer can occupy a variety of positions with respect to the owner for

