普通高等教育“十二五”工程管理类专业系列规划教材

工程管理专业英语

(第2版)

主　编　徐勇戈

赠送
电子课件

西安交通大学出版社
XI'AN JIAOTONG UNIVERSITY PRESS

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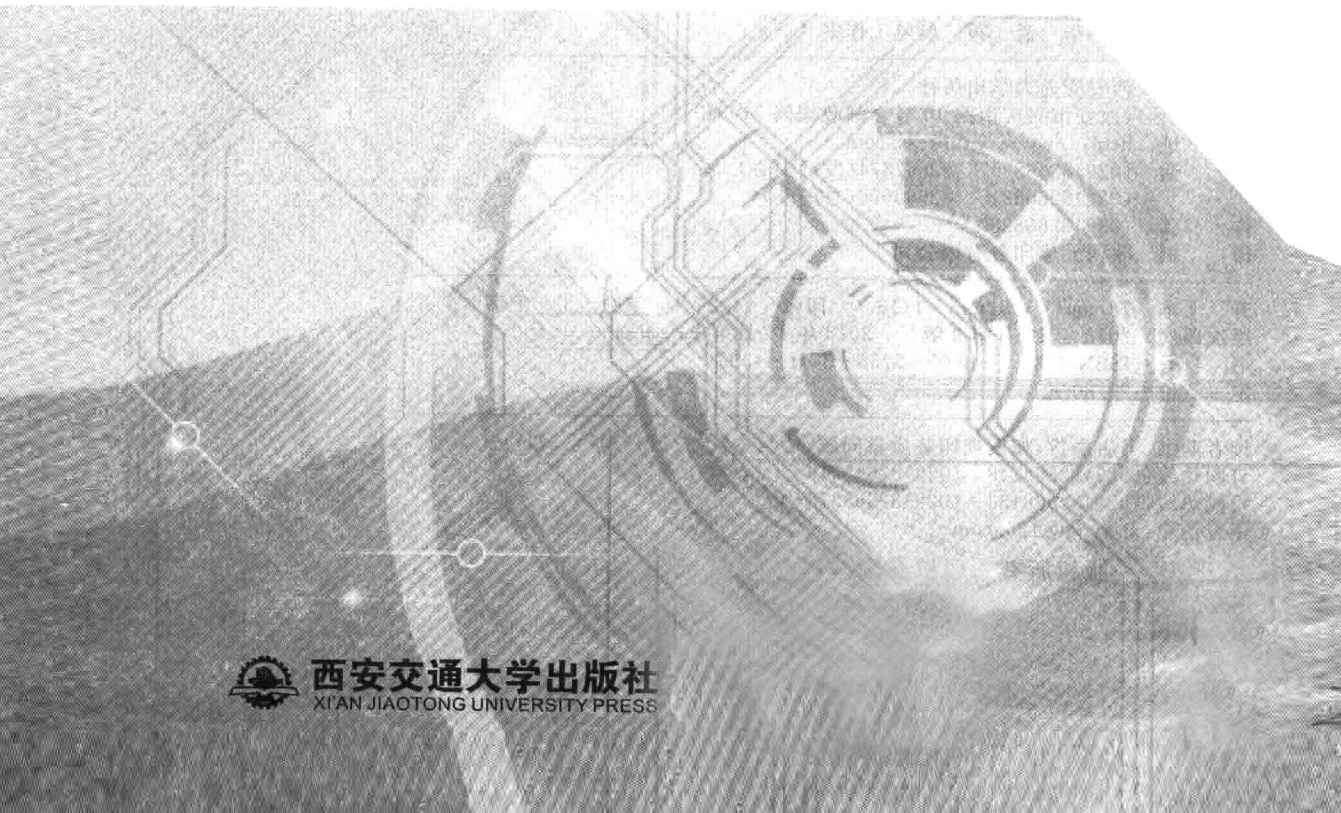

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内容简介

本书素材取自国外近年来工程管理各个领域的经典教材、著作、论文及计算机网络信息，内容涉及工程管理各领域当前的状况和最新进展。本书内容新颖、覆盖面广、系统性强、可读性好，是学习工程管理专业英语的实用教材。

本书既可作为高等院校的工程管理、造价管理及相关专业的教材，也可作为成人教育、网络教育的相关专业教材，还可作为工程管理专业人士及其他有兴趣人员的学习参考读物。

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普通高等教育“十二五”工程管理专业规划教材

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总序

高等学校工程管理专业是教育部1998年颁布的《普通高等学校本科专业目录》中设置的专业，是在整合原“建筑管理工程”、“国际工程管理”、“基本建设投资管理”及“房地产经营管理”等专业的基础上形成的，具有很强的综合性和较大的专业覆盖范围，主要研究工程项目建设过程中的计划、组织、指挥、控制、协调与资源配置等管理问题。工程管理专业旨在为国家经济建设和社会发展培养掌握土木工程技术、管理学、经济学及相关法律法规知识，掌握现代工程项目管理的理论、方法与手段，具备综合运用所学知识在国内外工程建设领域从事建设项目全过程的投资、进度、质量控制及合同管理、信息管理和组织协调能力的复合型高级管理人才。

随着我国建筑业、房地产业在国民经济中地位和作用的日益突显，工程管理人才需求呈明显增长趋势，同时也对工程管理专业毕业生提出了更高的要求。因此，如何进一步提高人才培养质量成为设置工程管理专业的高等学校面临的重要课题。而高水平的专业教材作为实现人才培养目标的载体，必将对人才培养质量的提高发挥重要作用。

西安建筑科技大学是全国最早设立工程管理专业的院校之一，该专业于1999年首批通过了“全国工程管理专业评估委员会”的评估，2004年和2009年分别以全票通过复评；2004年该专业被评为陕西省名牌专业，2008年又被评为国家级特色专业。近年来，西安建筑科技大学工程管理专业在人才培养模式创新方面进行的改革与实践取得了显著效果，得到了社会用人单位和同行的肯定。所以，西安交通大学出版社此次依托西安建筑科技大学工程管理专业的优质办学资源，联合省内外多所兄弟高校，编写出版了这套工程管理专业系列教材。

这套教材以专业必修课程为主，适当考虑专业选修课程。教材的作者都来自工程管理专业教学和科研第一线，对工程管理专业的教育教学与教材建设有切身的体会和感受，并有一些独到的见解。在教材编写过程中，编者结合多年的教学及工程实践经验，经过反复讨论斟酌，不仅从教材内容的准确性和规范性上下功

夫，而且从有效培养学生综合运用所学知识解决工程实际问题的能力出发，注重贴近工程管理实践，对教材内容和结构进行大胆创新，力求使其更加适合学生今后从事相关专业工作的学习需要，更有利于应用型高级工程技术与管理人才的培养。同时，这套教材注意吸收工程管理领域的前沿理论与知识。

由于院校之间、编者之间的差异性，教材中难免会出现一些问题和不足，欢迎选用本系列教材的教师、学生提出批评和建议，也希望参加这套教材编写的教师在今后的教学和科研实践中能够不断积累经验，充实教学内容，以使这套教材能够日臻完善。

建设部高等教育工程管理专业指导委员会委员
建设部高等教育工程管理专业评估委员会委员
西安建筑科技大学教授、博士生导师

2010 年 2 月

第 2 版前言

《工程管理专业英语》第 1 版自 2009 年 11 月出版面世以来，因其专业知识覆盖面广、系统性强和可读性好等特点受到了读者一定程度上的认可和好评，本书的作者深感欣慰。随着国际上工程建设领域新知识、新方法和新技术的不断涌现，加之读者对于教材在强化其相关能力，特别是通过英语文献攫取前沿知识信息，专业英文文献翻译和专业英文科技写作等能力上要求的不断提高，本书的作者深感应该对第一版教材进行修订，以适应本学科领域知识的更新和读者的需求。幸运的是，西安交通大学出版社给了作者通过对教材进行修订而更好地服务读者的机会。

本书的第 2 版内容涵盖了包括项目管理组织、投资项目的经济评价、建设工程项目融资、工程承包价格的确定与合同、高级进度计划技术、成本控制、质量控制以及工程项目信息的组织与应用等诸多内容在内的工程项目管理领域的理论体系和方法论的精粹，并附有几乎所有的工程管专业术语和专有表达，是对学生有关专业课知识的最好补充。此外还能够使读者对于工程管理的理论体系有一个系统而全面的认识。

本书的第 2 版和第 1 版相比，除了在内容上继续秉承原有的特色之外，较为突出的更新和变化主要体现在以下几个方面：

1. 删除了本学科领域一些较为陈旧的内容，增加了新的前沿领域的相关知识。最为显著的例子是，本书专辟章节介绍工程领域未来发展的主流技术——BIM(building information modelling)。

2. 为了提高读者撰写英文科技论文的水平，本书在附录中专门介绍了英文科技论文写作的知识，旨在提高读者规范撰写英文科技论文的能力。

3. 本书在每一单元的后面安排了大量不同类别而且灵活多样的练习，使得读者能够有机会通过课后训练而强化相关的能力。值得一提的是，鉴于英语口语的重要性，本书在每个单元的课后练习当中还专门安排了与该单元专业知识背景相关的情景对话练习，目的在于为读者提供训练和适应日益频繁的工程管理国际交流的语言环境。

本书的第 2 版依然分为 12 章，其中第 1、2、3、4、8、9、11、12 章，以及书后的附录 2、附录 3 和附录 4 等由西安建筑科技大学的徐勇戈老师编写，第 5、6、7、10 章及书后的附录 1 等由重庆大学的林熹老师编写，全书由徐勇戈老师最后统稿。

在本书第 2 版的修订过程中，作者竭尽全力，以期能够最大限度满足读者的要求。但由于能力所限，书中难免存在疏漏和不妥之处，恳请读者提出宝贵建议。

编者

2013 年 8 月

Contents

The Owner's Perspective

1.1 The Project Life Cycle

The acquisition of a constructed facility usually represents a major capital investment, whether its owner happens to be an individual, a private corporation or a public agency. Since the commitment of resources for such an investment is motivated by market demands or perceived needs, the facility is expected to satisfy certain objectives within the constraints specified by the owner and relevant regulations.[1] With the exception of the speculative housing market, where the residential units may be sold as built by the real estate developer, most constructed facilities are custom made in consultation with the owners.[2] A real estate developer may be regarded as the sponsor of building projects, as much as a government agency may be the sponsor of a public project and turns it over to another government unit upon its completion. From the viewpoint of project management, the terms "owner" and "sponsor" are synonymous because both have the ultimate authority to make all important decisions. Since an owner is essentially acquiring a facility on a promise in some form of agreement, it will be wise for any owner to have a clear understanding of the acquisition process in order to maintain firm control of the quality, timeliness and cost of the completed facility[3].

From the perspective of an owner, the project life cycle for a constructed facility may be illustrated schematically in Figure 1-1. Essentially, a project is conceived to meet market demands or needs in a timely fashion. Various possibilities may be considered in the conceptual planning stage, and the technological and economic feasibility of each alternative will be assessed and compared in order to select the best possible project.[4] The financing schemes for the proposed alternatives must also be examined, and the project will be programmed with respect to the timing for its completion and for available cash flows.[5] After the scope of the project is clearly defined, detailed engineering design will provide the blueprint for construction, and the definitive cost estimate will serve as the baseline for cost control. In the procurement and construction stage, the delivery of materials and the erection of the project on site must be carefully planned and controlled. After the construction is completed, there is usually a brief period of start-up or shake-down of the constructed facility when it is first occupied. Finally, the management of the facility is turned over to the owner

for full occupancy until the facility lives out its useful life and is designated for demolition or conversion[6].

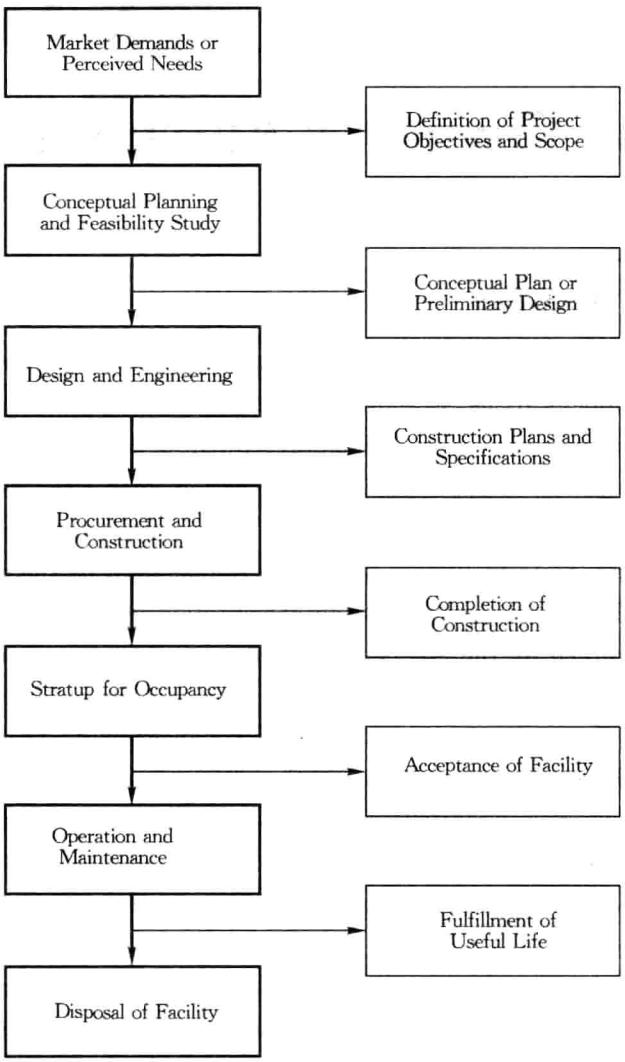

Figure 1-1 The Project Life Cycle of a Constructed Facility

Of course, the stages of development in Figure 1-1 may not be strictly sequential. Some of the stages require iteration, and others may be carried out in parallel or with overlapping time frames, depending on the nature, size and urgency of the project.[7] Furthermore, an owner may have in-house capacities to handle the work in every stage of the entire process, or it may seek professional advice and services for the work in all stages. Understandably, most owners choose to handle some of the work in-house and to contract outside professional services for other components of the work as needed. By examining the project life cycle from an owner's perspective we can focus on the proper roles of various activities and participants

in all stages regardless of the contractual arrangements for different types of work[8].

In the United States, for example, the U. S. Army Corps of Engineers has in-house capabilities to deal with planning, budgeting, design, construction and operation of waterway and flood control structures. Other public agencies, such as state transportation departments, are also deeply involved in all phases of a construction project. In the private sector, many large firms such as DuPont, Exxon, and IBM are adequately staffed to carry out most activities for plant expansion. All these owners, both public and private, use outside agents to a greater or lesser degree when it becomes more advantageous to do so.

The project life cycle may be viewed as a process through which a project is implemented from cradle to grave. This process is often very complex; however, it can be decomposed into several stages as indicated by the general outline in Figure 1-1. The solutions at various stages are then integrated to obtain the final outcome. Although each stage requires different expertise, it usually includes both technical and managerial activities in the knowledge domain of the specialist. The owner may choose to decompose the entire process into more or less stages based on the size and nature of the project, and thus obtain the most efficient result in implementation. Very often, the owner retains direct control of work in the planning and programming stages, but increasingly outside planners and financial experts are used as consultants because of the complexities of projects.[9] Since operation and maintenance of a facility will go on long after the completion and acceptance of a project, it is usually treated as a separate problem except in the consideration of the life cycle cost of a facility. All stages from conceptual planning and feasibility studies to the acceptance of a facility for occupancy may be broadly lumped together and referred to as the Design/Construct process, while the procurement and construction alone are traditionally regarded as the province of the construction industry[10].

Owners must recognize that there is no single best approach in organizing project management throughout a project's life cycle. All organizational approaches have advantages and disadvantages, depending on the knowledge of the owner in construction management as well as the type, size and location of the project. It is important for the owner to be aware of the approach which is most appropriate and beneficial for a particular project. In making choices, owners should be concerned with the life cycle costs of constructed facilities rather than simply the initial construction costs. Saving small amounts of money during construction may not be worthwhile if the result is much larger operating costs or not meeting the functional requirements for the new facility satisfactorily.[11] Thus, owners must be very concerned with the quality of the finished product as well as the cost of construction itself. Since facility operation and maintenance is a part of the project life cycle, the owners' expectation to satisfy investment objectives during the project life cycle will require consideration of the cost of operation and maintenance.[12] Therefore, the facility's operating management should also be considered as early as possible, just as the construction process should be kept in mind at the early stages of planning and programming.

Notes

1. specified by... 是过去分词短语，修饰前面的 constraints。全句可译为：由于该投资的资源投入受市场需求的驱动，所以建筑设施应在其业主和相关规范规定的约束条件内满足特定的目标。
2. in consultant with 意为“与……协商”。全句可译为：除了投机性住宅市场，在那里住宅单元由负责建造的房地产开发商销售之外，大多数的建筑设施都是在与业主协商一致的基础上定制的。
3. 全句可译为：由于业主实质上是以某种形式的合约为保证来获得一项建筑产品的，那么为了保证对完工产品的质量、工期和成本的有力控制，对于任何业主来说，他们应当对项目的全过程有一个清晰和完整的理解。
4. conceptual planning stage 意为：“概念规划阶段”。alternative 指“备选方案”。全句可译为：在项目规划阶段，很多不同的可能方案都可能被考虑，同时每一个备选方案的技术和经济可行性都经过评估和比较，以选出最优方案。
5. 全句可译为：我们还需检验备选方案的财务计划，同时按照项目完工期限和现金流量来安排项目的进度计划。
6. is turned over to... 意为“被移交给……”。conversion 在这里指“转作他用”。全句可译为：最后，设施的管理将移交给业主全权使用和管理，直至其使用期结束，或者拆除，或者转作他用。
7. 全句可译为：某些阶段可以重复，同时也可以和其他阶段平行或搭接进行，这一切取决于项目的特点、规模和紧迫性。
8. 全句可译为：从业主的角度审视项目的全寿命期，我们得以将注意力集中在所有阶段不同活动和参与方的适当角色上，而不用去考虑不同工作类型合约的安排。
9. 全句可译为：业主通常保留规划和设计阶段的直接控制工作，而随着项目复杂程度的不断增加，会将其他工作委托给外部的咨询单位。
10. 全句可译为：尽管只有采购和施工阶段被认为是建筑业的传统领域，但是从项目概念规划和可行性研究直至设施的接受占用都被广义地认为属于设计和建造过程。
11. 全句可译为：如果建筑设施的运营成本很高或者不能满足设施在功能上的需求，在施工阶段省一点就显得不那么值得。
12. facility operation and maintenance 意为“设施的运营与维护”。全句可译为：由于设施的运营与维护是项目全寿命周期的一部分，业主为了满足其项目寿命期内投资目标的期望就需要考虑运营和维护成本。

1.2 Major Types of Construction

Since most owners are generally interested in acquiring only a specific type of constructed facility, they should be aware of the common industrial practices for the type of construction pertinent to them.[1] Likewise, the construction industry is a conglomeration of quite diverse segments and products. Some owners may procure a constructed facility only

once in a long while and tend to look for short term advantages. However, many owners require periodic acquisition of new facilities and/or rehabilitation of existing facilities. It is to their advantage to keep the construction industry healthy and productive. Collectively, the owners have more power to influence the construction industry than they realize because, by their individual actions, they can provide incentives or disincentives for innovation, efficiency and quality in construction.[2] It is to the interest of all parties that the owners take an active interest in the construction and exercise beneficial influence on the performance of the industry.

In planning for various types of construction, the methods of procuring professional services, awarding construction contracts, and financing the constructed facility can be quite different. For the purpose of discussion, the broad spectrum of constructed facilities may be classified into four major categories, each with its own characteristics.

Residential Housing Construction

Residential housing construction includes single-family houses, multi-family dwellings, and high-rise apartments. During the development and construction of such projects, the developers or sponsors who are familiar with the construction industry usually serve as surrogate owners and take charge, making necessary contractual agreements for design and construction, and arranging the financing and sale of the completed structures[3]. Residential housing designs are usually performed by architects and engineers, and the construction executed by builders who hire subcontractors for the structural, mechanical, electrical and other specialty work. An exception to this pattern is for single-family houses as is shown in Figure 1-2, which may be designed by the builders as well.

Figure 1-2 Residential Housing Construction (courtesy of Caterpillar, Inc.)

The residential housing market is heavily affected by general economic conditions, tax laws, and the monetary and fiscal policies of the government. Often, a slight increase in total demand will cause a substantial investment in construction, since many housing projects

can be started at different locations by different individuals and developers at the same time.[4] Because of the relative ease of entry, at least at the lower end of the market, many new builders are attracted to the residential housing construction. Hence, this market is highly competitive, with potentially high risks as well as high rewards.

Institutional and Commercial Building Construction

Institutional and commercial building construction encompasses a great variety of project types and sizes, such as schools and universities, medical clinics and hospitals, recreational facilities and sports stadiums, retail chain stores and large shopping centers, warehouses and light manufacturing plants, and skyscrapers for offices and hotels, as is shown in Figure 1-3. The owners of such buildings may or may not be familiar with construction industry practices, but they usually are able to select competent professional consultants and arrange the financing of the constructed facilities themselves. Specialty architects and engineers are often engaged for designing a specific type of building, while the builders or general contractors undertaking such projects may also be specialized in only that type of building.

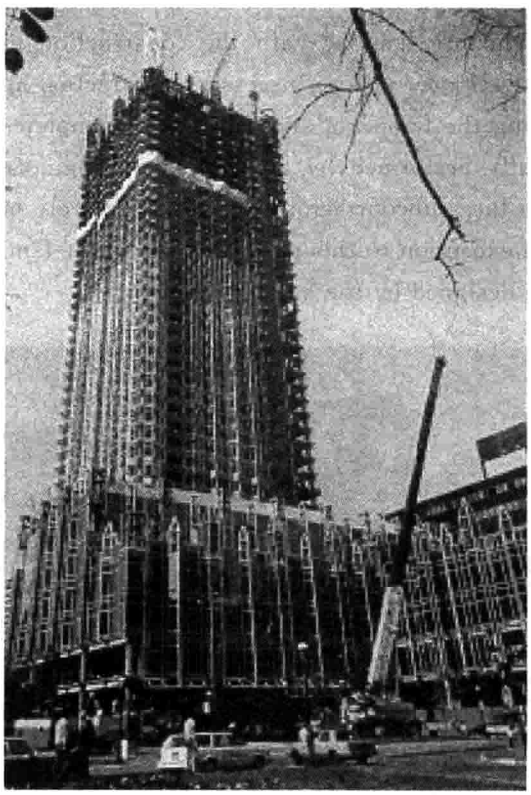

Figure 1-3 Construction of the PPG Building in Pittsburgh, Pennsylvania (courtesy of PPG Industries, Inc.)

Because of the higher costs and greater sophistication of institutional and commercial buildings in comparison with residential housing, this market segment is shared by fewer competitors.[5] Since the construction of some of these buildings is a long process which once started will take some time to proceed until completion, the demand is less sensitive to general economic conditions than that for speculative housing. Consequently, the owners may confront an oligopoly of general contractors who compete in the same market. In an oligopoly situation, only a limited number of competitors exist, and a firm's price for services may be based in part on its competitive strategies in the local market.

Specialized Industrial Construction

Specialized industrial construction usually involves very large scale projects with a high degree of technological complexity, such as oil refineries, steel mills, chemical processing plants and coal-fired or nuclear power plants, as is shown in Figure 1-4. The owners usually are deeply involved in the development of a project, and prefer to work with designers-builders such that the total time for the completion of the project can be shortened. They also want to pick a team of designers and builders with whom the owner has developed good working relations over the years.

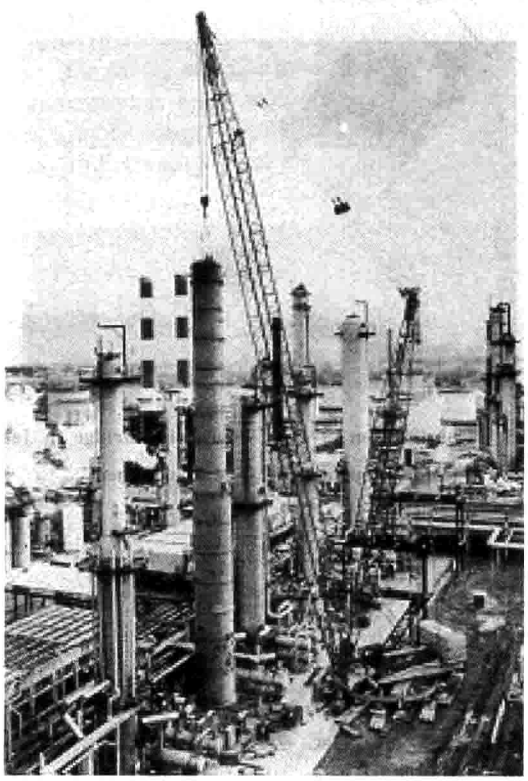

Figure 1-4 Construction of a Benzene Plant in Lima, Ohio (courtesy of Manitowoc Company, Inc.)

Although the initiation of such projects is also affected by the state of the economy, long range demand forecasting is the most important factor since such projects are capital intensive and require considerable amount of planning and construction time[6]. Governmental regulation such as the rulings of the Environmental Protection Agency and the Nuclear Regulatory Commission in the United States can also profoundly influence decisions on these projects.

Infrastructure and Heavy Construction

Infrastructure and heavy construction includes projects such as highways, mass transit systems, tunnels, bridges, pipelines, drainage systems and sewage treatment plants, as is shown in Figure 1-5. Most of these projects are publicly owned and therefore financed either through bonds or taxes. This category of construction is characterized by a high degree of mechanization, which has gradually replaced some labor intensive operations.

The engineers and builders engaged in infrastructure construction are usually highly specialized since each segment of the market requires different types of skills.[7] However, demands for different segments of infrastructure and heavy construction may shift with saturation in some segments. For example, as the available highway construction projects are declining, some heavy construction contractors quickly move their work force and equipment into the field of mining where jobs are available.

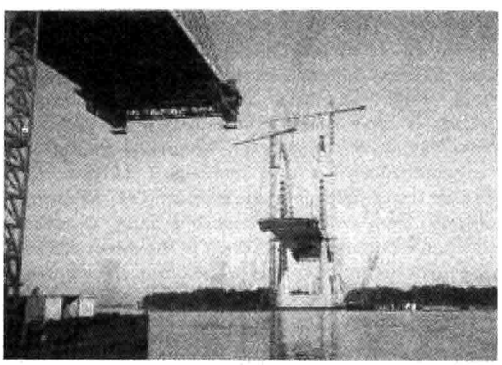

Figure 1-5 Construction of the Dame Point Bridge in Jacksonville, Florida (courtesy of Mary Lou Maher)

Notes

1. 全句可译为：由于大多数业主通常只对获得某种特定类型的建筑物感兴趣，因而他们应当对适合于他们的建设类型的实务有一定的了解。
2. 全句可译为：这些业主有着他们自己也没有意识到的影响建筑业的能力，因为通过其个人行为，他们可以对建筑业的创新、效率以及质量施加积极或消极的影响。
3. 全句可译为：在开发建设这类项目的过程中，了解建筑业的开发商或发起人通常以代理人的身份出现，负责制定设计和施工的合同条款，同时负责融资和完工建筑的销售。