普通高等学校土建类“十二五”应用型规划教材

TUMU GONGCHENG ZHUANYE YINGYU

土木工程专业英语

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内容提要

全书以土木工程为主线，系统介绍了土木工程及其所包括的有关分支学科的基本内容和历史概况，如建筑、桥梁、道路、交通、岩土、材料、经济与管理等，共编排17个单元作为课堂教学用。每篇课文后附与内容紧密相关的阅读材料和科技英语翻译或写作，便于学生掌握所学内容和扩展相关知识。

本书是为高等学校土木工程专业类学生选编的专业英语教材，也可作为从事土木工程的专业人员了解专业知识、提高英语水平的辅助阅读材料。

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前 言

根据大学英语教学的要求，大学英语教学分为基础阶段和专业阅读阶段。专业英语是大学英语的一个重要组成部分，是使学习者完成从纯英语语言学习过渡到实际应用的一个不可缺少的重要环节。专业英语的学习重点在于培养学生在土木工程领域应用英语交流专业知识的能力。

本书的内容采用英美专业书籍和杂志中的文章，以土木工程为主线，系统地介绍土木工程所包含的学科及其相关学科的基本内容，包括建筑学、城市规划、结构工程、桥梁工程、交通工程、岩土工程、建筑材料、建筑施工与管理等，共分 17 个单元。每个单元编有课文和阅读材料。每篇课文后配有生词与短语、注释和习题；前 10 个单元的课文练习之后，编有科技英语翻译或科技英语写作，并配有相应的练习，便于学生掌握所学内容。阅读材料配有词汇和注释，供学生选读；书后还附有总词汇索引。

全书由太原理工大学白晓红担任主编，负责制定编写提纲以及最后统稿、定稿。太原理工大学王梅和韩鹏举担任副主编。具体写作分工如下：太原理工大学白晓红编写科技英语翻译与写作部分，太原理工大学王梅编写第 1、5、7、12、15 单元，太原理工大学韩鹏举编写第 4、6、8、10、11 单元，太原理工大学李立军编写第 9、13、14 单元，天津大学贾凡编写第 2、3 单元，太原理工大学贺武斌编写第 16、17 单元。

本书在编写过程中，参考和引用了国内外许多单位和个人的文献资料，也得到了各方的热心帮助和支持，在此一并表示衷心感谢。特别感谢董彦莉、王林浩、马富丽、刘新华、刘飞姣、冯俊琴等研究生在校稿中付出的辛勤劳动。

由于水平有限，再加上时间仓促，书中难免存在不足之处，敬请读者批评指正。

编 者

2010 年 12 月

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Unit 1 Civil Engineering

Text

Civil Engineering

Introduction

Engineers have probably contributed more to the shaping of civilization than any other professional group. In every society, the role of engineers is to develop the technological application to meet practical needs. For example, the application of an electrical system is to provide power to a city, a water wheel is to run a mill, an artificial heart is to prolong life, etc. The systems that supply our food, water, fuel, power, transportation network, communication and other conveniences are the products of engineering skill. Despite the essential part engineers play in the above progress and in the well-being of humanity, their exact role is imperfectly understood.

Engineering is the art of converting knowledge into useful practical applications. An engineer is a person, who plays the key role in this process of conversion. Since engineering is the profession which serves people, their environment is an important consideration. Often, there have been difficulties in distinguishing engineers from scientists. It is difficult to determine where the work of the scientist ends and that of the engineer begins.

The basic distinction between the linked professions of science and engineering lies in their goals. Scientists aim to invent while engineers strive to use the inventions effectively to cater to the needs of mankind. ① For example, the German physicist Heinrich Hertz discovered radio waves while Guglielmo Marconi developed wireless telegraphy using radio waves, a feat of engineering. And after the scientific principles of nuclear fission were established, the hard work of creating atomic weapons and useful power plants was accomplished by electrical, chemical and mechanical engineers.

Civil Engineering

Civil engineering is that branch of engineering which aims to provide a comfortable and safe living for the people. Shelter, one of the primary needs of mankind, is provided by civil engineers. The efficient planning of water supply and irrigation systems increases the food production in a country. Shelters, apart from just being shelters, have been constructed by civil engineers to provide a peaceful and comfortable life. The engineering marvels of the world, starting from the pyramids to today's thin shell structures, are the results of the development in civil engineering. Communication lines like roads, railways, bridges, etc. without which development is impossible, are fruits of civil engineers' work.

Scope of Civil Engineering

Any discipline of engineering is a vast field with various specializations. The major specializations of civil engineering are listed below:

1. Structural engineering
2. Geotechnical engineering
3. Fluid mechanics, hydraulics and hydraulic machines
4. Transportation engineering
5. Water supply, sanitary and environmental engineering
6. Irrigation engineering
7. Surveying, levelling and remote sensing

Structural Engineering

Structural engineering is the most important specialization in civil engineering. The construction of a structure needs efficient planning, design and method of construction to serve the purpose fully. Generally there are five major steps in any construction project. These include the following:

1. Positioning and arranging the various parts of the structure into a definite form to achieve best utilization. ②
2. Finding out the magnitude, direction and nature of various forces acting on the structure.
3. Analyzing the structure to know the behavior of the various parts of the structure subjected to the above forces.
4. Designing the structure such that its stability under the action of various loads is ensured.
5. Executing the work with selected construction materials and skilled workers.

Geotechnical Engineering

For the efficient functioning of any structure built on earth, the behavior of soil must be known. Geotechnical engineering gives the basic idea about the soil. This branch also deals with the following aspects:

1. The properties and behavior of soil as a material under "soil mechanics".
2. The various types of foundations for a structure, for a machine, etc. and their suitability.

Geotechnical Engineering also deals with the analysis, design and construction of foundation.

Fluid Mechanics, Hydraulics and Hydraulic Machines

Fluid mechanics deals with the properties and behavior of fluids at rest or in motion. The principles of fluid mechanics can be applied to daily life as in the case of the flight of planes, the movement of fish in water, and the circulation of blood in the veins.

The design of hydraulic structures, such as dams and regulators, require the force exerted by water and the behavior of water under pressure.

Machines which utilize the hydraulic energy are called hydraulic machines. For example, turbines use potential energy of water to generate power. Pumps are devices which utilize mechanical energy to lift water. The efficient working of the above machines depends upon the fluid behavior which is dealt with in this discipline.

Transportation Engineering

The development of a nation mainly depends on the communication facilities available. A nation's wealth is measured in terms of the road and railway facilities available. There are three modes of transportation viz., land, water and air. This specialization deals with the design, construction and execution of the communication routes.

The different branches of transportation engineering include the following: highway engineering deals with the planning and designing of roads, railway engineering deals with the railway tracks, harbor engineering deals with the harbors and airport engineering deals with the airports.

Water Supply, Sanitary and Environmental Engineering

Without food man can survive for days but not without water. The responsibility of providing potable (drinking) water to the public and disposing the waste water safely is that of a civil engineer. The sources of water are precipitation and underground water.

Water supply engineering deals with the location, collection of water, its treatment methods, tests for standard limits and efficient supply of water.

Used water, solid wastes, toxic wastes, etc. cannot be disposed directly since these affect the environment. Hence these have to be treated and tested for the standard limits and then disposed. Sanitary engineering deals with the collection of used water, their treatment methods and effective disposal which safeguards the whole world. The natural and artificial wastes generated and released into the atmosphere have upset the natural equilibrium. Anthropogenic or human-induced pollutants have overloaded the system.

The role of an environmental engineer is to build a bridge between biology and technology by applying all the techniques to the job of cleaning the debris. Environmental engineering deals with the methods of protecting the environment from the deleterious effects of human activity which would result in the improvement of environmental quality for the well being of mankind. ③

Irrigation Engineering

Irrigation may be defined as the process of supplying water by man-made methods for the purpose of land cultivation. Irrigation engineering includes the study and design of works related to the control of river water and the drainage of waterlogged areas. Thus, irrigation engineering deals with the controlling and harnessing of various resources of water, by constructing dams, reservoirs, canals, head works and distribution channels to the cultivable land.

Surveying, Levelling and Remote Sensing

Before starting any important civil engineering project, such as the construction of railways, highways, dams and buildings, it becomes necessary to have a detailed survey map showing accurate boundary of the project area. Surveying is defined as an art of collecting data for mapping the relative positions of points on the surface of the earth. Levelling is the process of determining the relative heights of the points on the surface of earth in a vertical plane. ④

The main purpose of the survey work is to prepare the plan of the object to be surveyed. Various instruments are used to measure and collect the necessary information to draw the plan. Remote sensing uses the technique of obtaining the data about an area by taking aerial photographs. The intelligent interpretation gives a clear picture of the terrain.

Functions of Civil Engineer

Civil engineering incorporates activities such as construction of structures like buildings, dams, bridges, roads, railways, hydraulic structures, water supply and sanitary engineering.

Various Functions of a civil engineer are listed below.

1. **Investigation** The first function of a civil engineer is to collect the necessary data that is required before planning a project.

2. **Surveying** The objectives of surveying is to prepare maps and plans to locate the various structures of a project on the surface of earth.

3. **Planning** Depending on the results obtained from investigation and surveying, a civil engineer should prepare the necessary drawing for the project with respect to capacity, size and location of its various components. On the basis of this drawing, a preliminary estimate should be worked out.

4. **Design** After planning, the safe dimension of the components required is worked out. With this dimension a detailed drawing is prepared for various components and also for the whole structure and a detailed estimate is also calculated.

5. **Execution** This function deals with the preparation of schedules for construction activities, floating of tenders, finalization of contracts, supervision of construction work, preparation of bills and maintenance.

6. **Research and Development** In addition to the above works, a civil engineer has to engage himself in research and development to achieve economy and to improve the efficiency to meet the present and future needs.

NOTES

1. The basic distinction between the linked professions of science and engineering lies in their goals. Scientists aim to invent while engineers strive to use the inventions effectively to

cater to the needs of mankind.

译:工程(学)与其相近专业科学之间最根本的区别在于它们的目标不同。科学家致力于发明创新,而工程师则致力于有效地利用这些发明创新去为人类服务。

2. Positioning and arranging the various parts of the structure into a definite form to achieve best utilization.

译:安排布置结构的各个部分到特定位置,以达到最佳的使用效果。

3. Environmental engineering deals with the methods of protecting the environment from the deleterious effects of human activity which would result in the improvement of environmental quality for the well being of mankind.

译:环境工程涉及保护环境不受人类活动有害影响的方法,其目的是改善环境质量,以满足人类健康生活的要求。

4. Surveying is defined as an art of collecting data for mapping the relative positions of points on the surface of the earth. Levelling is the process of determining the relative heights of the points on the surface of earth in a vertical plane.

译:测量可以定义为一项收集数据以确定地球表面各点相对位置的技术。水准测量是确定地球表面各点在一个垂直平面上的相对高度的过程。

NEW WORDS AND PHRASES

1. irrigation　灌溉,冲洗
2. specialization　专业化
3. geotechnical engineering　岩土工程
4. fluid mechanics　流体力学
5. hydraulics　水力学
6. transportation engineering　交通工程
7. environmental engineering　环境工程
8. surveying　勘察,测量
9. levelling　水平测量,水准测量
10. potential energy　势能
11. discipline　学科
12. precipitation　(雨等)降落,某地区降雨等的量
13. toxic　有毒的
14. equilibrium　平衡,均衡
15. anthropogenic　人为的
16. debris　残渣,垃圾,废弃物;泥石流
17. deleterious　有害的
18. drainage　排水,排水系统
19. waterlogged　水浸的,水涝的
20. interpretation　解释,翻译
21. tender　投标,提出
22. supervision　监督,管理

QUESTIONS

1. How to distinguish engineers from scientists?
2. What are the major specializations of civil engineering?
3. What does geotechnical engineering deal with?
4. As a civil engineer, what should he do during construction?

Reading

What is Design?

The word 'design' means different things to different people. To some, a designed object will be a slick and smart-looking object—it has aesthetic appeal. To others it will be a thing that performs everything it is called upon to do —it has functional efficiency. To yet others it may be something that represents good value for money. In truth, all the above statements are valid. A long and rigorous process has to be gone through to achieve the desired end results and that process is design. Let us illustrate this through two examples.

Imagine a town with a river flowing through it, cutting it into two. Let us further assume that the only mode of crossing the river currently available is by boat, which is highly restrictive and inconvenient to the communities. If you are asked to improve the situation, how will you go about it? You will first think of speedier alternatives to boat crossing, e. g. a bridge or a tunnel. Locating the new crossing or crossings (in design you should not close off options too early) will need many considerations—e. g. the existing network of roads on both sides, the ground conditions, the resulting length of crossing (cost implications), and so on. You might analyse the total impact of two or three alternatives.

Having chosen an ideal location, preliminary surveys (topographical, soil, traffic and so on) will be commissioned. Preliminary details will then be prepared, together with a budget. With such major construction, obtaining planning consent could be a fraught process. The scheme could affect some people adversely or will be perceived to do so by some sections of the community. The planning process provides for hearing all objections. You will, therefore, have the task of presenting the case for the scheme, highlighting such issues as economic, environmental and employment benefits. You will also need to counter the technical arguments of the objectors. After successfully negotiating the planning process, you must prepare detailed proposals for constructing the crossing. At every stage a number of options will need to be considered, e. g. materials to be used (steel, concrete, etc.) and their form (number of spans, suspension, cable stayed, beam and slab).① When the design is optimised, detailed drawings are prepared to enable tenders to be invited. When a contractor is appointed, you will need to supply detailed drawings and specifications so that the product you had in mind is actually constructed. This whole process of delivering to a client a product that had its genesis in the form of vague requirements is design. The details will vary from project to project.

Take another example: that of building a hospital for a Health Authority which has decided on the type (general or specialist) of the hospital and the number of patients to be catered for. Here the designer will need to consider the best location, taking into account the centers of population the hospital seeks to serve and infrastructure facilities such as road access, public transport, utilities, waste disposal, etc. Space requirements for the various departments will need to be addressed, as well as the relationship of the various spaces. Hospitals are heavily serviced and consideration must be given to heating and ventilation of spaces, supply of medical gases, emergency alarms, call bells, operating theatre requirements and so on. There will also be issues such as boiler plant location, safe storage of medical gases, disposal of medical wastes, central laundry, patient lifts, fire, and security precautions, communications within and without the hospital. Externally, vehicle circulation will need careful planning with allowance for ambulances, cars, public transport, and pedestrian traffic. The buildings and surroundings will need to be as pleasant as possible.

As in the previous example, at every stage a number of alternatives will need to be considered and choices will need to be made. The load-carrying skeleton of the building, i. e. the structure, will have to be designed taking note of the constraints imposed by other requirements for the efficient functioning of the hospital. These will include the location of column supports and the effect of the circulation of services, which may need holes through the structure. As before, detailed drawings will need to be supplied for tender and then for construction. The contractor who works to the drawings will expect them to have been coordinated between the various disciplines, bearing in mind the particular aspects of the brief so that everything fits. That is the mark of a good design.

From these examples it can be seen that the genesis of the design process lies in some basic and simple requirement of a client, such as a river crossing or a hospital. The final form of the facility is the result of design. The impact of design does not end with construction. Ease or otherwise of operability, inspectability and maintainability are all inherent in the chosen design and these have huge implications for the client and users. ②

Another feature of design that should have come across in these examples is that most design is multifaceted, requiring the skills of many disciplines, such as civil/structural engineering, services engineering and architecture. Designers thus work in teams. The lead role in the team is usually dictated by the nature of the scheme, e. g. a civil engineer for the river crossing example and an architect for the hospital.

We can summarise some attributes of a good design:

- fulfilment of all client's requirements
- functional efficiency
- value for money
- sensible balance between capital and maintenance costs
- buildability, maintainability and operability
- aesthetically pleasing.

Practical design is usually a compromise between all of these. Every client will attach different weighting to the above-noted features.

From the above, we can provide a possible definition for design.

Design is an optimisation process of all aspects of a client's brief. It requires the integration of all the requirements to produce a whole that is efficient, economic and aesthetically acceptable. ③

Optimisation implies an iterative approach. Integration of various requirements demands collaborative work. Emphasis on the 'whole' requires awareness beyond one's own specialism. Being efficient, economic and aesthetically pleasing, all at once, implies compromises and a trade-off between different requirements.

The examples would also have illustrated the steps in any project, which can be summarised as follows:

- briefing
- project investigations
- sketch designs
- planning consent
- detailed design
- working drawings
- tender
- construction/commission.

So how does one become a good designer? Here are a few tips:

- good education and training in the chosen discipline
- general awareness of the workings of other allied disciplines
- keeping up to date by following technical journals, books and participating in the activities of professional institutions and other learned bodies, generally maintaining technical curiosity throughout your life
- developing communication skills, including oral, written, drawn and electronic.

It can thus be seen that design is not all to do with the calculation of stresses and strains, nor does it have precise, fixed outcomes. It is a much more holistic, creative and satisfying pursuit. ④

NOTES

1. At every stage a number of options will need to be considered, e. g. materials to be used (steel, concrete, etc.) and their form (number of spans, suspension, cable stayed, beam and slab).

译:每个阶段都有一些项目需要考虑,例如使用的材料(钢筋、混凝土等)以及它们的形式(桥的跨数,悬索式,斜拉式,梁式和板式)。

2. The impact of design does not end with construction. Ease or otherwise of operability, inspectability and maintainability are all inherent in the chosen design and these have huge

implications for the client and users.

译:设计的作用并不会随着施工的结束而终止。使用、检查和维护的方便与否均由所选设计的特性决定,而这些将会对委托人和业主产生巨大的影响。

3. Design is an optimisation process of all aspects of a client's brief. It requires the integration of all the requirements to produce a whole that is efficient, economic and aesthetically acceptable.

译:设计是对委托人的要求要点的全部方面加以优化的一个过程。它需要结合所有的需求设计出一个高效的、经济的并能为审美所接受的一个结构。

4. It can thus be seen that design is not all to do with the calculation of stresses and strains, nor does it have precise, fixed outcomes. It is a much more holistic, creative and satisfying pursuit.

译:所以设计不能仅仅被看成应力应变的计算,也不只是为了得到精确的、特定的结果。它所追求的是得到更加全面的、富有创造性的、令人满意的结果。

NEW WORDS AND PHRASES

1. aesthetic 美学的,审美的
2. topographical 地形的,地学的
3. commission 委托,授权
4. infrastructure 基础设施,基础结构,基础建设
5. ventilation 通风,通风设备
6. load-carrying 承载的,负荷的
7. skeleton (建筑物等的)骨架,框架
8. constraint 约束,约束条件
9. column 柱
10. contractor 承包商,承包人,承包单位
11. operability 可操作性
12. inspectability 可检验性
13. maintainability 可维护性
14. multifaceted 多方面的
15. optimization 优化
16. trade-off 权衡,交换,协定
17. stress 应力
18. strain 应变

科技英语翻译(一)——翻译的基本概念

一、翻译的定义

美国著名语言学家、翻译理论家 Roman Jacobson (1896 ~ 1982)认为,翻译是“用另一种语言符号来解释一种语言符号”。(Translation is an interpretation of verbal signs by means of other signs.)也就是说翻译即阐释。

翻译是一种活动,是用一种语言阐释另一种语言的活动,表现在三个方面:

(1)翻译是一种思维活动和语言活动;

(2)该活动的主体就是阐释者即译者;

(3)活动过程是以原文为起点,经过阐释,再用另一种语言表达出来的过程。

二、翻译的原理

翻译活动是一个由表及里，再从里及表的工作过程。这里的“里”代表思想，原著的思想，“表”代表两种语言，原文使用的语言和译文使用的语言。因此，翻译就是一种语言表述的思想通过另一种语言进行表述的过程。

三、翻译的原则

翻译应遵循的原则，众所周知就是“信、达、雅”。“信”就是忠实原著，它给出了译者与原作之间的关系。原文是作者思想之所在，是译者要传达的信息的唯一来源，所以翻译必须忠实于原著。但是这里的忠实是相对的忠实，而非绝对的忠实。“达”就是表达的准确和清晰，给出了译作与读者之间的关系，译作要使读者读懂、接受。语言流畅是“达”的一个方面，还包含有使读者理解原文的内涵和思想。所以，“达”就是通过翻译的技巧和翻译的方法，达到译文的顺畅和易懂。“雅”就是译文质量的美学要求，这一点对科技文献翻译可能不是很突出的要求。

“信、达、雅”代表了三个不同的范畴，共同构成了一个不可分割的整体。因此，好的译文不是原文的复制品，而是“信、达、雅”的再创作。

四、翻译的分类

翻译的分类从不同的角度出发，就有不同的分类。这里按照翻译对象的内容进行分类，可把翻译分为三类，即科技翻译、社科翻译和文学翻译。因此，根据翻译的对象来看，翻译不仅仅涉及语言，原文的语言——英语和译文的语言——汉语，还要涉及原文要表达的专业知识和专业水平，一个好的翻译不仅有良好的语言基础，还必须对译文所表述的内容和题材熟悉掌握。特别是对于科技翻译其更多的涉及专业语言。专业语言是指某一特殊学科领域使用的语言，不同的学科、行业的专业语言是不同的，专业语言从词语到句子结构都有其自身特点，作为科技英语的译者除了有必备的英语基础外，必须对所翻译对象的专业语言熟悉掌握，这样才能翻译出好的科技作品。本书后边讲到的翻译的一些技巧和方法将主要针对科技英语翻译。

问　题

1. 你认为翻译的定义表达了怎样的内涵？
2. 你认为“原作、译作、读者”三者之间的关系应是怎样？
3. 简述“信、达、雅”三者之间的关系。

Unit 2 Urban Design

Text

Is Urban Design a Discipline?

For me, urban design lacks a penumbra of scholarship, theory and principles, a set of generally recognized working methods, an institutional setting, and a mass of practitioners. These constitute a 'discipline'. Lacking them, urban designers tend to borrow precepts, methods, and concepts from architecture, but late in the game. They borrow theoretical hand-me-downs—architecture's old clothes—"the most recent from Post Modernism, before that from the Athens Charter. They also borrow models from the European city. In any case, the ethos of the American city, with its strengths and its weakness, is seldom the basis for the promulgating of public sector urban design recommendations."

I do not read much planning these days, but when I scan the urban design coverage in planning journals, it seems to be limited to the New Urbanism—what would Gans say?

The urban research and design Venturi and I have done seems of interest today to young architects and students from schools of architecture in the United States and Europe, including some from Harvard. They study our urban ideas, particularly those on Las Vegas. And architecture students and academics involved in urban communication and urban mapping turn to our work and thought on symbolism and on urban systems as patterns. But we do not hear *from urban designers*.

In my opinion, few great philosophical formulations on urban design, as I define it, have been made by urban designers since the writings of Crane, and to the extent urban design theory has been developed; it has been from a base in architecture. An example is Rem Koolhaas's work, including some at Harvard, that follows in the footsteps of our Las Vegas research, documenting the Strip twenty-five years later but also applying similar research methods to African urbanism—from Las Vegas to Lagos.

When it comes to discipline building, there could be a new construction team available to urban design—architecture's new scholars. Architectural education in the past twenty years has seen the enormous growth of Ph. D., as academic streams have been introduced to parallel the traditional professional programs. In my experience, they have added depth to the field—build the discipline—enormously. How many will turn their attention to urban design? There