21世纪交通版高等学校教材

专业英语

[土木工程专业（路桥方向）]

English for Highway and Bridge

（第三版）

李　嘉　主　编
俞同华　主　审

人民交通出版社
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内 容 提 要

本教材分五部分：第一部分为土木工程专业基础知识，涉及力学、建筑材料、测量、工程合同、招投标等方面内容；第二部分为现代道路及交通工程专业知识；第三部分为桥梁工程方面内容，所选课文和阅读材料均取自近期英文原版书刊，内容基本覆盖了道路、桥梁与交通工程设计、施工、管理各环节的常用专业词汇及新成就、新技术；第四部分为翻译方法与技巧，通过大量例句，阐述科技英语翻译的基本原则、特点和实用的翻译技巧；第五部分介绍英文摘要和致谢词写作的基本知识。

为了便于学习者使用，每课或每节后均配有一定数量的练习，书后附有疑难语句的注释和参考答案。

本书为道路、桥梁及交通工程专业英语教材，面向高等院校土木工程专业学生，也可供有关专业技术人员学习参考。

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总　序

当今世界，科学技术突飞猛进，全球经济一体化趋势进一步加强，科技对于经济增长的作用日益显著，教育在国家经济与社会发展中所处的地位日益重要。进入新世纪，面对国际国内经济与社会发展所出现的新特点，我国的高等教育迎来了良好的发展机遇，同时也面临着巨大的挑战，高等教育的发展处在一个前所未有的重要时期。其一，加入 WTO，中国经济已融入到世界经济发展的进程之中，国家间的竞争更趋激烈，竞争的焦点已更多地体现在高素质人才的竞争上，因此，高等教育所面临的是全球化条件下的综合竞争。其二，我国正处在由计划经济向社会主义市场经济过渡的重要历史时期，这一时期，我国经济结构调整将进一步深化，对外开放将进一步扩大，改革与实践必将提出许多过去不曾遇到的新问题，高等教育面临加速改革以适应国民经济进一步发展的需要。面对这样的形势与要求，党中央国务院提出扩大高等教育规模，着力提高高等教育的水平与质量。这是为中华民族自立于世界民族之林而采取的极其重大的战略步骤，同时，也是为国家未来的发展提供基础性的保证。

为适应高等教育改革与发展的需要，早在 1998 年 7 月，教育部就对高等学校本科专业目录进行了第四次全面修订。在新的专业目录中，土木工程专业扩大了涵盖面，原先的公路与城市道路工程，桥梁工程，隧道与地下工程等专业均纳入土木工程专业。本科专业目录的调整是为满足培养“宽口径”复合型人才的要求，对原有相关专业本科教学产生了积极的影响。这一调整是着眼于培养 21 世纪社会主义现代化建设人才的需要而进行的，面对新的变化，要求我们对人才的培养规格、培养模式、课程体系和内容都应作出适时调整，以适应要求。

根据形势的变化与高等教育所提出的新的要求，同时，也考虑到近些年来公路交通大发展所引发的需求，人民交通出版社通过对“八五”、“九五”期间的路桥及交通工程专业高校教材体系的分析，提出了组织编写一套 21 世纪的具有鲜明交通特色的高等学校教材的设想。这一设想，得到了原路桥教学指导委员会几乎所有成员学校的广泛响应与支持。2000 年 6 月，由人民交通出版社发起组织全国面向交通办学的 12 所高校的专家学者组成 21 世纪交通版高等学校教材(公路类)编审委员会，并召开第一次会议，会议决定着手组织编写土木工程专业具有交通特色的**道路专业方向、桥梁专业方向以及交通工程专业**教材。会议经过充分研讨，确定了包括**基本知识技能培养层次、知识技能拓宽与提高层次**以及**教学辅助层次**在内的约 130 种教材，范围涵盖**本科与研究生用**教材。会后，人民交通出版社开始了细致的教材编写组织工作，经过自由申报及专家推荐的方式，近 20 所高校的百余名教授承担约 130 种教材的主编工作。2001 年 6 月，教材编委会召开第二次会议，全面审定了各门教材主编院校提交的教学大纲，之后，编写工作全面展开。

21 世纪交通版高等学校教材编写工作是在本科专业目录调整及交通大发展的背景下展开的。教材编写的基本思路是：(1)顺应高等教育改革的形势，专业基础课教学内容实现与土木工程专业打通，同时保留原专业的主干课程，既顺应向土木工程专业过渡的需要，又保持服务公路交通的特色，适应宽口径复合型人才培养的需要。(2)注重学生基本素质、基本能力的

培养，为学生知识、能力、素质的综合协调发展创造条件。基于这样的考虑，将教材区分为二个主层次与一个辅助层次，即基本知识技能培养层次与知识技能拓宽与提高层次，辅助层次为教学参考用书。工作的着力点放在基本知识技能培养层次教材的编写上。(3)目前，中国的经济发展存在地区间的不平衡，各高校之间的发展也不平衡，因此，教材的编写要充分考虑各校人才培养规格及教学需求多样性的要求，尽可能为各校教学的开展提供一个多层次、系统而全面的教材供给平台。(4)教材的编写在总结"八五"、"九五"工作经验的基础上，注意体现原创性内容，把握好技术发展与教学需要的关系，努力体现教育面向现代化、面向世界、面向未来的要求，着力提高学生的创新思维能力，使所编教材达到先进性与实用性兼备。(5)配合现代化教学手段的发展，积极配套相应的教学辅件，便利教学。

教材建设是教学改革的重要环节之一，全面做好教材建设工作，是提高教学质量的重要保证。本套教材是由人民交通出版社组织，由原全国高等学校路桥与交通工程教学指导委员会成员学校相互协作编写的一套具有交通出版社品牌的教材，教材力求反映交通科技发展的先进水平，力求符合高等教育的基本规律。各门教材的主编均通过自由申报与专家推荐相结合的方式确定，他们都是各校相关学科的骨干，在长期的教学与科研实践中积累了丰富的经验。由他们担纲主编，能够充分体现教材的先进性与实用性。本套教材预计在二年内完全出齐，随后，将根据情况的变化而适时更新。相信这批教材的出版，对于土木工程框架下道路工程、桥梁工程专业方向与交通工程专业教材的建设将起到有力的促进作用，同时，也使各校在教材选用方面具有更大的空间。需要指出的是，该批教材中研究生教材占有较大比例，研究生教材多具有较高的理论水平，因此，该套教材不仅对在校学生，同时对于在职学习人员及工程技术人员也具有很好的参考价值。

21世纪初叶，是我国社会经济发展的重要时期，同时也是我国公路交通从紧张和制约状况实现全面改善的关键时期，公路基础设施的建设仍是今后一项重要而艰巨的任务，希望通过各相关院校及所有参编人员的共同努力，尽快使全套21世纪交通版高等学校教材(公路类)尽早面世，为我国交通事业的发展做出贡献。

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高等学校教材(公路类)编审委员会
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前　　言

本教材是按照高等学校路桥与交通工程专业教学指导委员会审定的《专业英语》教材编写大纲的要求编写的。专业英语作为基础英语的后续课程，重点是培养学生阅读和翻译英文专业书刊的能力，提高阅读翻译文献资料的质量和速度。

本教材第一版于1997年出版，第二版于2003年出版。本次修编的第三版进一步精选教材，并随原著的版本更新修改了相关内容，充分吸收了最新的科技成就，更新和增加了专业词汇，内容更充实，编排更趋合理。全书分五大部分：第一部分为土木工程专业基础知识，涉及专业介绍、力学、建筑材料、测量、工程合同、招投标等方面内容；第二部分为现代道路及交通工程专业知识；第三部分为桥梁工程方面内容；第四部分为翻译方法与技巧，阐述科技英语翻译的基本原则、方法和实用的翻译技巧。第五部分介绍英文摘要和致谢词写作的基本知识。

本书课文和阅读材料均取自高水平英文原版书刊，基本上包含了道路、桥梁与交通工程设计、施工、管理各环节的常用专业词汇。取材时考虑难度适中，既注意英语语言的训练，又重视专业领域当代最新知识的传递。

为了便于学习者使用，每课之后附有生词、专业词汇和形式多样的练习，目的在于帮助读者更好地掌握课文中重要的语言材料。书后附有疑难语句注释和练习答案。这些练习和答案是供参考和检查用的，学生应当把主要精力放在课文的学习上。

本书的另一个特点是课文中编排了一些与文章相关的插图和表格，对正确领会课文大有益处。

本教材第一部分、第二部分7~13课由李嘉编写，第二部分14~16课由贺寒辉编写，第三部分由邵旭东、李嘉编写，第四部分、第五部分由鲁力达、李嘉编写。研究生李洪、雷薇、王懿参加了部分修订工作。

本书若有差错和不当之处，敬请读者指正，并将意见寄湖南大学土木工程学院道路桥梁系。

编　　者

2012年1月于岳麓山下

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Part I
General Knowledge

Lesson 1

Careers in Civil Engineering

Engineering is a profession, which means that an engineer must have a specialized university education①. Many government jurisdictions also have licensing procedures which require **engineering graduates** to pass an examination, similar to the bar examinations for a lawyer, before they can actively start on their careers.

In the university, mathematics, physics and chemistry are heavily emphasized throughout the engineering curriculum, but particularly in the first two or three years. Mathematics is very important in all branches of engineering, so it is greatly stressed. Today, mathematics includes courses in statistics, which deals with gathering, classifying and using numerical data, or pieces of information. An important aspect of statistical mathematics is probability, which deals with what may happen when there are different factors or variables, that can change the results of a problem②. Before the construction of a bridge is undertaken, for example, a statistical study is made of the amount of traffic the bridge will be expected to handle③. In the design of the bridge, variables such as water pressure on the foundations, impact, the effects of different **wind forces** and many other factors must be considered.

Because a great deal of calculation is involved in solving these problems, computer programming is now included in almost all engineering curricula. Computers, of course, can solve many problems involving calculations with greater speed and accuracy than a human being can. But computers are useless unless they are given clear and accurate instructions and information—in other words, a good program.

In spite of the heavy emphasis on technical subjects in the engineering curriculum, a current trend is to require students to take courses in the social sciences and the language arts. We have already discussed the relationship between engineering and society; it is sufficient, therefore, to say again that the work performed by an engineer affects society in many different and important ways that he or she should be aware of④. An engineer also needs a sufficient command of language to be able to prepare reports that are clear and in many cases, persuasive. An engineer engaged in research will need to be able to write up his or her findings for **scientific publications**.

The last two years of an engineering program include subjects within the student's field of specialization. For the student who is preparing to become a **civil engineer**, these specialized courses may deal with such subjects as **geodetic surveying**, **soil mechanics** or hydraulics.

Active recruiting for engineers often begins before the student's last year in the university. Many different corporations and government agencies have competed for the services of engineers in recent years. In the science-oriented society of today, people who have technical training are, of course, *in demand*. Young engineers may choose to go into environmental or sanitary engineering, for example, where environmental concerns have created many openings⑤; or they may choose construction firms that specialize in highway work; or they may prefer to work with one of the government agencies that deals with water resources. Indeed, the choice is large and varied.

When the young engineer has finally started actual practice, the theoretical knowledge acquired in the university must be applied. He or she will probably be assigned at the beginning to work with a team of engineers. Thus, **on-the-job** training can be acquired that will demonstrate his or her ability to translate theory into practice to the supervisors⑥.

The civil engineer may work in research, design, construction supervision, maintenance, or even in sales or management. Each of these areas involves different duties, different emphases and different uses of the engineer's knowledge and experience.

Research is one of the most important aspects of scientific and engineering practice. A researcher usually works as a member of a team with other scientists and engineers. He or she is often employed in a laboratory that is financed by government or industry. Areas of research connected with **civil engineering** include soil mechanics, **soil stabilization** techniques and also the development and testing of new **structural materials**.

Civil engineering projects are almost always unique; that is, each has its own problems and design features. Therefore, careful study is given to each project even before design work begins. The study includes a survey both of topographical and subsoil features of the proposed site. It also includes a consideration of possible alternatives, such as a concrete gravity dam or an **earth-fill embankment dam**. The economic factors involved in each of the possible alternatives must also be weighed. Today, a study usually includes a consideration of the environmental impact of the project. Many engineers, usually working as a team that includes surveyors, specialists in soil mechanics, and experts in design and construction, are involved in making these **feasibility studies**⑦.

Many civil engineers, among them the top people in the field, work in design. As we have seen, civil engineers work on many different kinds of structures, so it is normal practice for an engineer to specialize in just one kind. In designing buildings, engineers often work as consultants to architectural or construction firms. Dams, bridges, water supply systems and other large projects ordinarily employ several engineers whose work is coordinated by a systems engineer who is in charge of the entire project. In many cases, engineers from other disciplines are involved. In a dam project, for example, electrical and mechanical engineers work on the design of the powerhouse and its equipment. In other cases, civil engineers are assigned to work on a project in another field; in the space program, for instance, civil engineers were necessary in the design and construction of such structures as **launching pads** and **rocket storage facilities**.

Construction is a complicated process on almost all engineering projects. It involves scheduling the work and utilizing the equipment and the materials so that costs are kept as low as possible. Safety factors must also be taken into account, since construction can be very dangerous. Many civil engineers therefore specialize in the **construction phase**.

Much of the work of civil engineers is carried on outdoors, often in rugged and difficult terrain or under dangerous conditions. Surveying is an outdoor occupation, for example, and dams are often built in wild river valleys or gorges. Bridges, tunnels and skyscrapers under construction can also be dangerous places to work. In addition, the work must also progress under all kinds of weather conditions. The prospective civil engineer should be aware of the physical demands that will be made on him or her⑧.

From: E. J Hall "The Language of Civil Engineering in English", 1984

New Words and Expressions

1. jurisdiction [dʒuəris'dikʃ(ə)n]	*n.* 管辖权，权限
government jurisdiction	政府行政区
2. bar [bɑː]	*n.* 法庭，律师的职业
3. curriculum [kə'rikjuləm]	*n.* ([pl.] curricula) 课程表，课程，学习计划
4. probability [prɔbə'biliti]	*n.* 概率论，可能性
5. impact ['impækt]	*n.* 冲击(力)，影响
6. geodetic [dʒiːəu'detik]	*n.* 大地测量学
7. hydraulics [hai'drɔːliks]	*n.* 水力学
8. recruit [ri'kruːt]	*v.* 招聘
9. orient ['ɔːriənt]	*v.* 定向，定位
science-orient	注重科学的
10. supervision [ˌsjuːpə'viʒən]	*n.* 管理，监控
11. maintenance ['meintinəns]	*n.* 维修，保养
12. construction [kən'strʌkʃ(ə)n]	*n.* 施工，建设
13. topographic(al) [ˌtɔpə'græfikəl]	*a.* 地形学(的)
14. subsoil ['sʌbsɔil]	*n.* 下(亚)层土，地基下层土
15. alternative [ɔːl'təːnətiv]	*n.* 比较方案；*a.* 交替的，比较的
16. consultant [kən'sʌltənt]	*n.* 顾问，咨询者
17. architectural [ɑːki'tektʃər(ə)l]	*a.* 建筑(学)的
18. rugged ['rʌgid]	*a.* 崎岖的，艰难的
19. terrain [te'rein]	*n.* 地域，地带，领域
20. gorge [gɔːdʒ]	*n.* 峡谷
21. engineering graduate	工科毕业生
22. wind force	风力
23. scientific publication	科学刊物
24. civil engineer	土木土程师
25. geodetic surveying	大地测量
26. soil mechanics	土力学
27. *on-the-job*	在现场的，在职的
28. civil engineering(project)	土木工程
29. soil stabilization	土壤稳定

30. structural materials 建筑材料
31. earth-fill embankment dam 填土坝
32. feasibility study 可行性研究
33. launching pads 发射台
34. rocket storage facilities 火箭库
35. construction phase 施工阶段

Exercises

I. Complete each sentence. Write a T before the right ending.

1. Statistics is a branch of mathematics that deals with __________.
   ________ a. what may happen when different factors can change, the results of a problem.
   ________ b. gathering, classifying and using numerical data.
   ________ c. highway engineering, structural engineering and environmental engineering.
2. Computers can't solve complicated problems unless they are given __________.
   ________ a. a good air-condition.
   ________ b. a good program.
   ________ c. a young civil engineer.
3. Besides technical subjects in the engineering curriculum, an engineer needs to take courses in __________.
   ________ a. social sciences and surgery.
   ________ b. law and polities.
   ________ c. language arts and social sciences.
4. A civil engineer may specialize in some of the kinds of work, for example __________.
   ________ a. research, design, construction management and maintenance.
   ________ b. electrical and mechanical equipment.
   ________ c. mathematics, physics and chemistry.
5. Civil engineering projects are almost always __________.
   ________ a. distinctive.
   ________ b. the similar.
   ________ c. alike.
6. The study, which must consider not only structural features, but also economic factors and possible alternatives or other choices, is called __________.
   ________ a. system engineering.
   ________ b. feasibility study.
   ________ c. structural design.

II. Find the words or phrases that fit the meaning in italics.

1. To design a new bridge, a statistical study is made of the amount of traffic the bridge will expect to *carry* (par. 2)

   ____

2. On-the-job training will demonstrate the young engineer's ability to *apply* theory *to* practice. (par. 7)

____

3. In each of the possible alternatives, the economic factors must be *balanced*. (par. 10)

____

4. Many civil engineers specialize in the construction phase because construction is a *complex* process. (par. 12)

____

5. In civil engineering, the *outstanding* people sometimes work in design. (par. 11)

____

III. Discussion

1. Why is computer programming included in engineering courses? Only in what circumstances can a computer do an accurate job?
2. What are some of the areas of research connected with civil engineering? What are some others that are not mentioned in the text?
3. Why don't all civil engineers specialize in the design of all kinds of different structures?
4. What kind of physical demands may be made on a civil engineer?

Reading Material

Specialties in Transportation Engineering

Transportation engineers are typically employed by the agency responsible for building and maintaining a **transportation system**, such as the federal, state, or local government, a railroad, or a transit authority. They also work for consulting firms that carry out the planning and engineering tasks for these organizations. During the past century, transportation engineers have been employed to build the nation's railroads, the interstate highway system and rapid **transit systems** in major cities, airports and turnpikes. Each decade has seen a new national need for improved transportation services.

It can be expected that in the twenty-first century, heavy emphasis will be placed on the rehabilitation of the highway system, including its surface and bridges, as well as on devising a means to ensure improved safety and utilization of the existing system through **traffic control** and systems management①. Highway construction will be required, particularly in suburban areas. Building of roads, highways, airports, and transit systems is likely to accelerate in less-developed countries, and the transportation engineer will be called on to furnish the services necessary to plan, design, build, and operate highway systems throughout the world.

Transportation Planning

Transportation planning deals with the selection of projects for design and construction. The transportation planner begins by defining the problem, gathering and analyzing data and evaluating various alternative solutions. Also involved in the process are forecasts of future traffic, estimates of the impact of the facility on land use, the environment, the community and determination of the benefits and costs that will result if the project is built②. The transportation planner investigates the physical feasibility of a project and makes comparisons between various alternatives to determine which one will accomplish the task at the lowest cost - consistent with other criteria and constraints ③.

A transportation planner must be familiar with engineering economics and other means of evaluating alternative systems, be knowledgeable in statistics and data-gathering techniques, as well as in computer applications for data analysis and travel forecasting, and be able to communicate with the public and the policy makers.

Transportation Infrastructure Design

Transportation infrastructure design involves the specification of all features of the transportation system to ensure that it will function smoothly, efficiently and in accord with physical laws. The design process results in a set of detailed plans that can be used for estimating the facility costs and for carrying out its construction. For a highway, the design process involves the selection of dimensions for all geometrical features, such as the **longitudinal profile**, **vertical curves** and elevations, the highway **cross section**, pavement widths, shoulders, **right-of-way**, drainage ditches and fencing. The design processes also include the pavement and structural requirements for **base courses** and the concrete or asphalt surface material. Highway design also includes bridges and drainage structures as well as provision for **traffic control devices**, roadside rest areas and landscaping. The highway designer must be proficient in civil engineering subjects (such as soil mechanics, hydraulics, **land surveying**, pavement design and structural design), and is concerned primarily with the **geometric layout** of the road, its cross section, paving materials, roadway thickness and traffic-control devices. Special appurtenances (such as highway bridges and drainage structures) are usually designed by specialists in these areas.

The most important aspect of the highway designer's work is to establish the standards that relate the speed of the vehicle to the geometric characteristics of the road. A balanced design is produced in which all elements of the geometry of the highway — its **curve radii**, **sight distance**, superelevation, grade and vertical curvature, are consistent with a chosen design speed such that if a motorist travels at that speed, he or she can proceed safely and comfortably throughout the entire highway system④.

Highway Construction

Highway construction involves all aspects of the building process beginning with clearing of the **native soil**, preparation of the surface, placement of the pavement material and preparation of the final roadway for use by traffic⑤. Highways initially were built with manual labor assisted by horse-drawn equipment for grading and moving materials. Today, modern construction equipment is used for clearing the site, grading the surface, compaction of the pavement base courses, transporting materials and placing the final highway pavement. Advances in **construction equipment** have made the rapid building of large highway sections possible. Nuclear devices test compaction of soil and base courses, Global Positioning Systems (GPS) and Geographic Information Systems (GIS) are used to establish line and grade, and specialized equipment for handling concrete and bridge work