土木类

工程英语

（教程）

Civil Engineering English

(A Coursebook)

周开鑫　主编

人民交通出版社

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内 容 提 要

本书共 34 课，含 102 篇课文，内容涉及道路工程、交通工程、桥梁工程、港航工程和管理工程等专业。全书选文具有权威性，精泛结合，简繁有度，有利于全面培养学生的实践能力和自学能力。

本书为我国高校道路工程、交通工程、桥梁工程、港航工程和管理工程专业的英语教材，亦可供相关专业的工程技术和管理人员使用。

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前　言

摆在你面前的《(土木类)工程英语》是一本供道路工程(Road Engineering)、交通工程(Traffic Engineering)、桥梁工程(Bridge Engineering)、港航工程(Port and Channel Engineering)、管理工程(Management Engineering)等专业大学本科三年级使用的教材,其宗旨是让这类学生在获得专业知识和提高英语能力的结合点上受益,成为适应"大口径"需要的复合型人才。

全书的专业分布是:道路工程 Lessons 1-7, 交通工程 Lessons 8-12,桥梁工程 Lessons 13-22,港航工程 Lessons 23-27,管理工程 Lessons 28-34。

全书 34 课,共 102 篇课文,每课含课文 3 篇:Text A 为精读(Intensive Reading)课文,其后附有"生词表"、"难点注释"以及包括课文理解、词汇运用、翻译实践和口笔头作文等的"综合练习",要求学生在教师的指导下进行课堂操练,全面习得有关的专业知识和英语技能;Text B 为泛读(Extensive Reading)课文,其后附有"生词表"、"难点注释"以及少数"理解练习",要求学生在课堂限定的时间内快速而准确地理解课文的内容,抓住其中的信息,培养阅读理解的能力;Text C 为课外阅读(Home Reading)课文,未经任何加工处理,要求学生借助词典及其他参考书克服语言障碍,读懂课文,旨在培养学生使用工具书自学和独立解决问题的能力。

本书坚持以下的编写原则,因而也具有相应的特点:1. 充分注重基础性、系统性、科学性、适用性、趣味性和可读性。2. 选文具有权威性,难易适度,尽量少收公式和图表,多用叙述和描绘性语言,文字地道,文采突出,以利语言学习。3. 在有限的篇幅内力求全面系统地传授路、桥、水、管等方面的专业基础知识。4. 精泛结合,简繁有度,全面培养学生的实践能力和自学能力。5. 练习针对性强,丰富多彩,力避单调和枯燥。

本书是由重庆交通学院外语系、道路工程系、桥梁及结构工程系、河海建筑工程系、交通及汽车工程系、管理工程系的部分教师合作编写的,充分结合、利用了专业教师的专业优势和英语教师的英语优势。具体分工如下:

周开鑫、陈波、田文玉:Introduction 和 Lessons 1-7

曹顺发、朱顺应: Lessons 8-12

周水兴、罗益民、陈才忆、孙淑红: Lessons 13-22

程昌华、渠时勤、黄健平: Lessons 23-27

邓亚雄、周直、余元玲:Lessons 28-34

周开鑫负责全书的设计、统筹和文字的打磨等。

在本书的编写过程中,我们节选了众多国内外的英文工程文献来作为课文,参考了各种专业和英语的工具书和辞典,还得到重庆交通学院领导的大力支持和关怀,院长龚尚龙教授在百忙中抽出时间审阅书稿,并提出了建设性意见,在此我们一并表示谢忱。

本书是我们利用业余时间编写的。由于时间仓促,加之编者水平有限,书中的疏误在所难免,恳诚希望同行专家及广大读者提出宝贵的批评意见,以利修改。

编者

2001 年 5 月

Contents

A BRIEF INTRODUCTION TO THE ENGINEERING PROFESSION

The engineering is one of the oldest occupations in the history of mankind. Indeed, without the skills that are included in the field of engineering, our present-day civilization could never have evolved. The first toolmakers who chipped arrows and spears from rock were the forerunners of modern mechanical engineers. The craftsmen who discovered metals in the earth and found ways to process and refine them were the ancestors of mining and metallurgical engineers. And the skilled technicians who devised irrigation systems and erected great buildings of the ancient world were the civil engineers of their time. One of the earliest names that has come down to us in history is that of Imhotep, the designer of the stepped pyramid at Sakara in Egypt about 3,000 BC.

Engineering is often defined as the practical application of theoretical sciences, such as physics or chemistry, for the benefit of mankind. Many of the early branches of engineering, however, were not based on science but on empirical information, that is, information that depended on observation and experience rather than theoretical knowledge. Many of the structures that have survived from ancient times, such as the aqueduct of Rome, exist because they were built with greater strength than modern standards require. But at least the Roman engineers were sure that their buildings would last for a long time. Probably the oldest text in the engineering is the work of Roman architect and engineer named Vitruvius Pollio, who wrote a book in the first century BC about the engineering practices of his day. Many of the problems encountered by Vitruvius Pollio were similar to those that modern engineers still must confront.

The term civil engineering originally came into use to distinguish it from military engineering. Civil engineering dealt with permanent structures for civilian use, whereas military engineering dealt with temporary structures for military use. An example of the latter is the bridge built across the Rhine in 55 BC. That is described in Julius Caesar's Commentaries on the Gallic War. A more appropriate definition of civil engineering is that it deals with the design and construction of objects that are intended to be stationary. In practice, this definition includes buildings and houses, dams, tunnels, bridges, canals, station systems, and stationary parts of transportation system—highways, airports, port facilities, and roadbeds for railroad.

Civil engineering offers a particular challenge because almost every structure or system that is designed and built by civil engineers is unique. One structure rarely duplicates another exactly. Even when structures seem to be identical, site requirements or other factors generally result in modifications. Large structures like dams, bridges, or tunnels may differ substantially from previous structures. The civil engineer must therefore always be ready and willing to meet new challenges.

Since the beginning of the modern age in the sixteenth and seventeenth centuries, there has been an explosion of knowledge in every scientific field: physics and chemistry, astronomy and physiology, as well as recently evolved disciplines like nuclear and solid-state physics. One reason for this rapid increase in scientific knowledge was the development of the experimental method to verify quantification , that is , putting the data from the results of the experimentation into precise mathematical terms. It cannot be emphasized too strongly that mathematics is the basic tools of modern engineering.

As scientific knowledge increased, so did the practical applications. The eighteenth century witnessed the beginning of what is usually called the Industrial Revolution, in which machines began to do more and more of the work that previously had been done by human beings or animals. In the nineteenth century and in our own day, both scientific research and the practical applications of its results have progressed rapidly. They have given the civil engineer new and stronger materials, the mathematical formulas which he can use to calculate the stresses that will be encountered in a structure, and machines that make possible the construction of skyscrapers, dams, tunnels, and bridges that could never have been built before.

Another result of the explosion of knowledge was an increase in the number of scientific and engineering specialties. By the end of the nineteenth century, not only were civil, mechanical, mining and metallurgical engineering recognized, but courses were also being offered in the newer specialties of electrical engineering and chemical engineering. This expansion has continued to the present day. We now have, for example, nuclear, petroleum, aerospace, and electronic engineering. Of course, many of these disciplines are subdivisions of earlier specialties.

Within the field of civil engineering itself, there are subdivisions: structural engineering, which deals with permanent structures; hydraulic engineering, which is concerned with systems involving the flow and control of water or other fluids; and sanitary or environmental engineering, which involves the study of the water supply, purification, and sewer systems. Obviously, many of these specialties overlap. A water supply system, for example, may involve dams and other structures as well as the flow and storage of water.

Many different kinds of engineers often work on large projects, such as space exploration or nuclear power development. In the space program, for example, the launching pads and the rocket assembly and the storage building at Cape Canaveral, Florida — the largest such structure in the world — are primarily the work of civil engineers. In a nuclear power plant, civil engineers work with specialists in aerospace, nuclear, and electrical engineering. In projects of this kind, the engineer is a member of a team that is often headed by a system engineer who coordinates the construction of all members of the team. Because teamwork is necessary in so many engineering projects nowadays, an important qualification for engineers is the ability to work successfully with other people.

Still another result of the increase in scientific knowledge is that engineering has grown into a profession. A profession is an occupation that requires specialized, advanced education; indeed, they are often called the "learned professions". Until the nineteenth century, engineers generally were craftsmen or project organizers who learned their skills though apprenticeship, on-the-job training, or trial and error. Nowadays, many engineers spend years studying at universities for advanced degrees. Yet even those engineers who do not study for advanced degrees must be aware of changes in their field and those related to it. A civil engineer who does not know about new materials that have become available cannot compete successfully with one who does.

Engineers must be willing to undergo a continual process of education and be able to work in other disciplines. They must also adapt themselves to the two requirements of all engineering projects. First, the systems that engineers produce must be workable not only from a technical but also from an economic point of view. This means that engineers must cooperate with management and government officials who are very cost-conscious. Therefore, engineers must accommodate their ideas to the financial realities of a project. Second, the public in general has become much more aware, especially in the last ten years or so, of the social and environmental consequences of engineering projects. For much of the nineteenth and twentieth centuries, the attitude of the public could be summed up by the phrase: "science is good". The most visible part of science was the engineering work. No one can avoid seeing the great dams, the bridges, the skyscrapers, and the highways that have created an impressive engineered environment around us.

Nowadays, however, the public is more conscious of the hidden or delayed hazards in new products, processes, and many other aspects of civil engineering systems. For instance, new highways in the United States are no longer approved routinely; instead, highways and other similar projects must now undergo environmental impact studies to assess the project's effect on air pollution and other environmental concerns.

A recent news story which reported that the Egyptian government now permits public criticism of the Aswan High Dam underlines this concern. The Aswan Dam is one of the engineering wonders of modern times, but several undesirable effects have been noted. The dam has, for instance, blocked the flow of silt down the Nile, so that the fertility of the land below the dam has decreased. Nutrients that were once carried down the river have been held back by the dam, and consequently schools of fish that once thrived around the Nile Delta have gone elsewhere. Still another reported effect of the dam has been the increase of the salinity of the soil, which is irrigated by the water behind the dam. These and other problems might have been prevented by more thorough studies before construction was undertaken.

In other words, engineers do not work in a scientific vacuum. They must consider the social consequences of their work. We have, after all, described engineering as a profession that makes practical applications of the findings of theoretical science. Successful engineers must include in their definition of "practical" the idea that the work is also desirable and safe for society.

Discussion

1. What is engineering in your understanding?
2. Give examples to illustrate the great role engineering has played in human history.
3. Talk about civil engineering: its origin and its challenging character.
4. Discuss the cause of the explosion of knowledge in the modern times and the impact of this explosion upon the growth of engineering.
5. What are the subdivisions of civil engineering and how are they inter-related?
6. How did engineering grow into a profession?
7. What are the basic requirements an engineer mustmeet?
8. What have you learned from the public criticisms of the Aswan High Dam?
9. How do you plan to make yourself an excellent civil engineer?
10. What are your expectations from this course, and your suggestions for it?

Lesson 1 General Knowledge of Roads

Text A Development of Roads

When we speed along a modern highway, we rarely stop to think what it is we are riding on[1]. To understand what a road is, we must study the ways in which people have traveled in the past.

The very first roads were really tracks beaten in the ground by wild animals in prehistoric times. People followed these winding trails because they provided an easy and quick way to get through thick forests. In time, people began to improve the paths by filling holes with earth and laying logs across soft, boggy spots. These attempts were crude, but they were the beginning of road construction.

As people began to transport goods over longer distances, they developed new ways of traveling. First they packed their wares on animals. Then they invented various kinds of sleds. Finally, after the invention of the wheel, they built wagons. Each advancement brought a need for better traveling routes.

Later in history, when well-traveled routes were made sturdier with rocks and stones, the path was raised above the surrounding land, it became a "high way".

The great civilizations throughout history were also the great road builders[2]. Roads were necessary to control and extend empires, to permit trade and travel, and to move armies.

Most of these early roads were simply hard-packed dirt, but some were paved with stone blocks or burnt bricks.

The Romans bound their empire together with an extensive system of roads radiating in many directions from Rome. Some of these early roads were of elaborate construction. For example, the Appian Way[3], built southward about 312 B.C., illustrates one of the procedures used cy the Romans. First a trench was excavated to such a depth that the finished surface would be at ground level. The pavement was placed in three courses; a layer of small broken stones, a layer of small stones mixed with mortar and firmly tamped into place, and a wearing course of massive stone blocks, set and bedded in mortar. Some of the Roman roads are still in existence today. And many modern highways follow the ancient Roman routes.

Few roads were built during the early history of the United States since most of the early settlements were connected with the nearest wharf, but the connecting road usually was just a clearing through the forest. Before the Revolutionary War, travel was mainly on foot or horseback, and roads were merely trails cleared to greater width. Development was extremely slow for a time after the war's end in 1783.

Between 1795 and 1830 numerous turnpikes, particularly in the northeastern states, were built by companies organized to gain profits through toll collections. Few of them were financially successful. During this period many stagecoach lines and freight-hauling companies were organized.

The extension of turnpikes in the United States was abruptly halted by the development of the railroads. In 1830 Peter Cooper constructed America's first steam locomotive, the Tom Thumb, which at once demonstrated its superiority over horse-drawn vehicles. Rapid growth of the railroad for transportation over long distances followed. Cross-country turnpike construction practically ceased, and many already completed fell into disuse. Rural roads served mainly as feeders for the railroads; improvements primarily led to the nearest railroad station and were made largely by local authorities and were to low standards. When it rained, the roads were slippery, and in dry weather they were dusty. People using horses and wagons accepted this. But with the beginning of the 20th century a new invention, the automobile, began to take over the road. The first two decades of the twentieth century saw the improvement of the motor vehicle from a "rich man's toy" to a fairly dependable method for transporting persons and goods. There were strong demands not only from farmers but from bicyclists through the League of American Wheelmen④ for rural road improvement, largely for roads a few miles in length connecting outlying farms with towns and railroad stations. This development has been aptly described as "getting the farmer out of the mud."

From 1920 to 1935, highway development was focused primarily on the completion of a network of all-weather rural roads comparable to the street systems undertaken by local governments. By 1935 highway activities in rural areas have been devoted mainly to an attempt to provide facilities of higher standards and with greater capacity and load-carrying ability. During the same period, increasing attention has been focused on urban areas, which have been struck simultaneously by rapidly increasing population, lower population densities resulting from a "flight to the suburbs," and a shift from mass transportation to the private automobile. Indications are that only minor additions to road mileage will be made in the future.

New Words and Expressions

track [træk] *n*. 踪迹，小径
 beat tracks 开辟路径
prehistoric [ˌpriːhis'tɔrik] *adj*. 史前的
trail [treil] *n*. 足迹，小路
boggy ['bɔgi] *adj*. 多沼泽的
crude [kruːd] *adj*. 粗糙的，不精细的
sled [sled] *n*. 雪橇，雪车(以木质或金属长条代轮之交通工具)
advancement [əd'vɑːnsmənt] *n*. 进步
sturdy ['stəːdi] *adj*. 结实的，坚固的
radiate ['reidieit] *vi*. 向各方伸展，辐射
elaborate [i'læbərit] *adj*. 精细的，复杂的
trench [trentʃ] *n*. 沟，沟渠
excavate ['ekskəveit] *vt*. 挖掘
mortar ['mɔːtə] *n*. 砂浆，胶泥
tamp [tæmp] *vt*. 捣固，夯实
settlement ['setlmənt] *n*. 新殖民地，定居点，居民点
bay [bei] *n*. 海湾
wharf [wɔːf] *n*. 码头
clearing ['kliəriŋ] *n*. 开辟出来的空地
turnpike ['təːnpaik] *n*. 收路税的关卡，收税栅；(泛指)公路
stagecoach ['steidʒkəutʃ] *n*. 驿车
freight [freit] *n*. 货物，货运
haul [hɔːl] *v*. 搬运，拖运
locomotive [ˌləukə'məutiv] *n*. 机车，火车头
cross-country ['krɔs'kʌntri] *adj*. 越野的
feeder ['fiːdə] *n*. 支线，进料器
vehicle ['viːikl] *n*. 运载工具，车辆
 motor-vehicle 机动车，汽车
outlying ['autˌlaiiŋ] *adj*. 远离中心的，地处郊区

的

aptly ['æptli] *adv*. 恰当的,巧妙的

simultaneously [ˌsiməl'teinjəsli] *adv*. 同时的,同时发生的

mileage ['mailidʒ] *n*. 里程,英里数

in time 过了一段时间以后

well-travelled routes 经常行走的路线

hard-packed dirt 压紧或夯实的土

wearing course 磨耗(损)层

toll-collections 征收路税,收取过路费

all-weather roads 晴雨通车路,全天(年)候道路

tamp into place 夯实到位

take over 接管,控制

load-carrying ability 运载能力

Notes

① …what it is we are riding on……我们是在什么上面驾车行驶。这是强调句型 it is…that…,句中被强调部分是疑问词 what,关系代词 that 被省去了。例如:You don't know what it is (that) you are doing. It's a mischief!

② 本句不宜直译为"历史上伟大的文明也是伟大的道路建设者",可意译为"历史上伟大的文明时期都是道路的大发展时期"或者"在人类历史上,伟大的文明都带来道路的大发展"。

③ 是最著名的古罗马大道,建于公元前 312 年,全长 350 多公里,其主干部分保留至今。公元 1784 年,罗马教皇庇护六世修建了新的 Appian Way,由罗马通向 Albano,与旧大道平行。

④ the League of American Wheelmen 美国驾车人联合会。

Comprehensive Exercises

I. Answer the following questions on the text.

1. What must we do to get a good understanding of what a road is?
2. How was road construction started in prehistoric times?
3. What did people do to develop new ways of traveling, which in turn necessitated better traveling routes?
4. How did the highway get its name?
5. What contribution did the Romans make to the progress of road construction?
6. Why was the development of road construction very slow in the early history of the United States?
7. What changes took place in the road construction work in the U.S. from 1795 to 1830?
8. What brought about a rapid growth of the railroad?
9. When did the automobile begin to take over the road? How did it spur the rural road improvement?
10. What were the stresses of highway development in the U.S. between 1920 and 1935?

II. Fill in the blanks with the most appropriate words or phrases in the correct forms from all the list below.

in time trail in existence pave beaten tracks superiority

fall into disuse aptly comparable to made to low standards

1. This is the oldest Hebrew manuscript you could find ____________.

2. This theory ____________ the way for the practical use of solar energy.

3. I am fully aware of the ____________ of her talent in music to mine.

4. Can you ____________ define these terms and illustrate them with examples?

5. These machines are well designed, but are ____________.

6. Don't worry! You will learn how to do it ____________.

7. Obsolete words are those that have ____________ in modern English.

8. In doing scientific research, we should never follow the ____________; we must try to develop something new and original.

9. The criminal made his way through the crowds towards the tower, a policeman hot on his ____________.

10. In the past twenty years we have made great achievements ____________ those made by any western country in half a century.

III. Put the following Chinese expressions into English, or vice versa.

运载能力

全年候道路

夯实土

货运公司

要求道路的改善

at ground level

horse-drawn vehicles

a pavement placed in three courses

in the first decade of this century

population densities

IV. Translate the following sentences into English, using the phrases or expressions from the text.

1. 请告诉我你到底要我为你购买什么。(It is…that.…)
2. 他们把崎岖小道拓宽,把它们变成可通行马拉车的路。(clear…to greater width)
3. 解放路座落在长江北岸,全长几公里。(be located)
4. 把井挖掘到一定的深度就能取到清甜的饮水。(excavate)
5. 投机商人往往利用混乱的市场赚大钱。(gain profits)
6. 格林先生退休后,由他儿子接管了他的生意。(take over)
7. 他大半生都致力于癌症的治疗。(devote … to …)
8. 在讲话中,他集中解释了邓小平理论的本质特征和重大意义。(focus…on…)
9. 20 世纪目睹了中国人民的苦难、斗争和崛起。(see)
10. 这场事故应归咎于他的粗心大意。(largely)

V. Write a composition on the topic *Development of Highways in China*.

Text B How Is a Modern Road Built

The first step in building a road is to plan the route. Sometimes the route has been decided by the nature of the land, but today nature① can often be conquered. With powerful modern machinery, whole mountains can be removed and valleys filled in to make the route as direct as possible.

Then the details are planned: the width of the highway, the number of driving lanes, the number and location of entrances and exits, and the essential strength of the road. All these depend on the amount of traffic that is expected. Modern roads are usually planned for the next 20 years' traffic.

The next step is the testing of the earth foundation on which the road is to rest. Engineers carefully study the soil to learn how solid it is, how much moisture it contains, and how well it drains. Then they decide how the soil should be prepared and packed to provide a good, sturdy foundation, or roadbed. They prescribe the thickness of the road layers, the size of the rocks in them, and the other materials that should be used.

While the testing is under way, a group of surveyors begins to measure the land to find out exactly how much work needs to be done and how much it will cost. Then the construction crew can finally move in.

Giant bulldozers clear the path for the roadbed. They knock over trees and tear large rocks out of the ground. Other powerful earth-moving machines, such as loaders and scrapers, follow in their tracks, scoop up earth and rocks, and dump them into low spots. These filling materials are pressed down tightly with power rollers, and gradually the roadbed becomes a long, level band of hard-packed dirt.

Proper drainage is essential in road building, because if the foundation became soggy, the heavy road would sink into it. And if the water were to freeze in the ground, it would expand and crack the road. To protect the highway from such damage, drainpipes called culverts are laid across the roadbed wherever a strong flow of water is expected. The roadbed itself is shaped so that the middle of the finished road will be higher than the sides. Then water and melting snow will easily drain off its surface into the drainpipes or ditches[②]. The roadbed is given a final grading (smoothing) and is now ready to receive the road itself.

Almost all roads are built in two or more layers, or courses, of rocks or stones. The bottom layer is 10 to 20 centimeters thick and usually made up of larger stones. The upper course has smaller stones and is about 8 centimeters thick. In most roads the lower course is wider so that the edges, or shoulders, of the top course do not break off or sink into soft dirt. After each course is laid, it is compacted by heavy power rollers.

The top, or surface, layer of a road must withstand the weight of heavy vehicles. It must also prevent water from seeping into the roadbed and destroying it. Modern highways are therefore surfaced either with concrete or with bituminous materials, such as asphalt, tar, or heavy oils.

New Words and Expressions

conquer ['kɔŋkə] *vt.* 征服

machinery [mə'ʃi:nəri] *n.* [U] 机械,机器(总称)

lane [lein] *n.* 车道

  driving lane 行车道

  inside / outside lane 内(外)车道

entrance ['entrəns] *n.* 入口

exit ['eksit] *n.* 出口

moisture ['mɔistʃə] *n.* [U] 湿度,潮湿

drain [drein] *v.* 排水

  drainpipe 排水管

  drainage system 排水系统

pack [pæk] *vt*. 压紧,夯实;包装

packing course 填层

packing density 夯实密度

prescribe [pris'kraib] *vt*. 规定,指定;开(药方)

surveyor [sə'veiə] *n*. 勘测者,测量员

bulldozer ['buldəuzə] *n*. 压路机

loader ['ləudə] *n*. 搬运机,运土机

scraper ['skreipə] *n*. 刮土机

scoop [sku:p] *vt*. 铲起;舀出

dump [dʌmp] *vt*. 倾倒

roller ['rəulə] *n*. 压路机

power roller 电动压路机(路碾)

soggy ['sɔgi] *adj*. 湿润的,湿透的

crack [kræk] *vt*. 使破裂

culvert ['kʌlvət] *n*. 涵洞

ditch [ditʃ] *n*. 沟渠

grading ['greidiŋ] *n*. 土工修整

edge [edʒ] *n*. 边缘

shoulder ['ʃəuldə] *n*. 路肩

withstand [wið'stænd] *vt*. 抗拒,经得起

seep [si:p] *v*. 渗,漏

concrete ['kɔnkri:t] *n*. 混凝土

bituminous [bi'tju:minəs] *adj*.(含)沥青的

asphalt ['æsfælt] *n*. 地沥青,柏油

tar [tɑ:] *n*. 沥青,柏油

fill in 填满

under way 正在进行

construction crew 施工队

knock over 推倒,弄倒

in one's tracks 随即,立刻

filling materials 填料

sink into 陷入

Notes

① nature 不带冠词时意为"大自然",例如: Nature is at its best in spring.大自然在春天最美。但 the nature 指"天性","本性","性质"等,例如文中的句子: Sometimes the routes has been decided by the nature of the land …有时路线由土地的性质确定了。

② drain(vi.) into…意为"(水之类的液体)排放到……中",本句可译为"然后水和融雪会顺畅地从路面排入排水管或沟渠里"。

Comprehension Exercises

I. Complete the statements or answer the questions with the information from the text.

1. Road building follows such steps as ________________.
2. Road planning includes ______________________________.
3. What should be taken into account in planning the road?
4. Why do the engineers always study the soil very carefully while testing the earth foundation?
5. What does the work "prescribe" in Para. 3 mean?
6. What do the surveyors do when the testing is going on?
7. The jobs for the construction crew to do after they move in are ____________________.
8. Why is proper drainage of vital importance in road building?
9. Proper drainage can be achieved by __________________.
10. Why can modern highways withstand the might of heavy vehicles and prevent water from destroying the roadbed?

Text C　Highways Types

All state highway systems and most of the local highway and street systems encompass several types or classes of highways. At one extreme are high-speed, high-volume facilities carrying through traffic, with no attempt made to serve abutting property or purely local traffic. At the other are local rural roads or streets that carry low volumes, sometimes at low speeds, and with a primary function of land service.

AASHTO Special Committee on Nomenclature gives definitions for various types of highways. Some of these are as follows:

Expressway — Divided arterial highway for through traffic with full or partial control of access and generally with grade separations at major intersections.

Freeway — Expressway with full control of access.

Parkway — Arterial highway for noncommercial traffic, with full or partial control of access, and usually located within a park or a ribbon of parklike developments.

Control of access — Condition where the right of owners or occupants of abutting land or other persons to access, light, or view in connection with a highway is fully or partially controlled by public authority.

Full control of access means that the authority to control access is exercised to give preference to through traffic by providing access connections with selected public roads only and by prohibiting crossings at grade of direct private driveway connections.

Partial control of access means that the authority to control access is exercised to give preference to through traffic to a degree that, in addition to access connections with selected public roads, there may be some crossings at grade and some private driveway connections.

The other highway types lack the feature of access control. They include:

Major street or major highway — Arterial highway with intersections at grade and direct access to abutting property, and on which geometric design and traffic-control measures are used to expedite the safe movement of through traffic.

Through street or through highway — Every highway or portion thereof on which vehicular traffic is given preferential right of way, and at the entrances to which vehicular traffic from intersecting highways is required by law to yield right of way to vehicles on such through highway in obedience to either a stop sign or a yield sign, when such signs are erected.

Local road — Street or road primarily for access to residence, business, or other abutting property.

It should be pointed out here, however, that the freeway, as typified by the Interstate System, represents the highest type of highway facility, these advantages include the following:

Capacity — On freeways the absence of intersections or crossings at grade and the elimination of marginal friction through access control permit unrestricted, full-time use by moving vehicles, rather than restricted, part-time flow.

Reduced travel time — On freeways, time losses from stopping and waiting at intersections are eliminated. In addition, most of the conflicts that contribute to accidents are eliminated, except under unusual circumstances. Drivers normally can and will travel at higher and sustained speeds.

Safer operation — On freeways, elimination of conflicts at intersections and along both margins of the roadway and the barring of pedestrians from the right of way usually bring substantial reductions in accidents.

Permanence — Access control along freeways prevents the growth of businesses or other activities along the roadway margin. Without access control, these activities generate unordered traffic and parking. In a short time, capacity is reduced and accident potential is substantially increased.

Reduced operating cost, fuel consumption, air pollution, and noise — Smoother operations and fewer stops reduce fuel consumption and other operating costs. Reduced fuel consumption in turn reduces air pollution. Smoother operation with fewer stops also greatly reduces noise, particularly that from trucks.

Consult the dictionary and list the new words and expressions you find in the text.