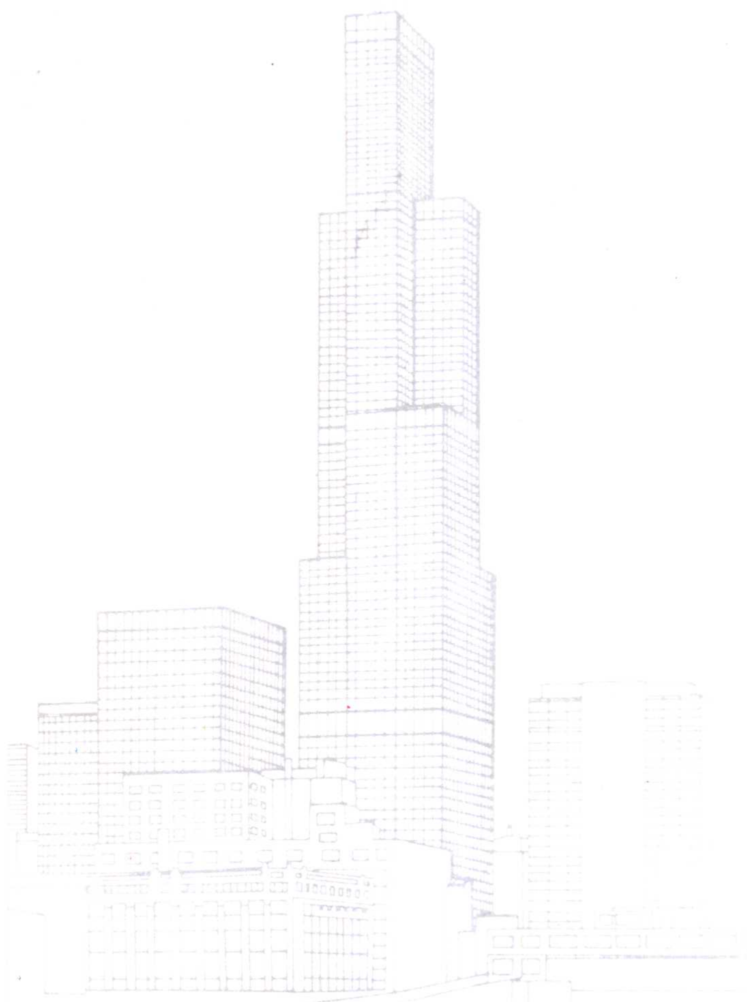
普通高等学校土木工程专业新编系列教材
中国土木工程学会教育工作委员会 审定

土木工程专业英语

T M G C Z Y Y Y

段兵廷 主编



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内容提要

本书是为高等院校土木工程专业类学生选编的专业英语教材。

全书以土木工程为主线，系统地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、水坝、岩土、材料、经济与管理以及计算机的应用等。共编排二十二篇课文作为课堂教学用。

每篇课文后附两篇内容紧密相关的阅读材料，注重介绍世界土木工程界的名人、趣事、重大工程，供教师指导学生阅读，或者根据实际教学学时选作机动教材。

本书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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普通高等学校土木工程专业新编系列教材
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出 版 说 明

1998年7月，教育部颁布了新的普通高等学校本科专业目录，1999年全国高等学校都已按新的专业目录招生。新的土木工程专业专业面大大拓宽，相应的专业业务培养目标、业务培养要求、主干学科、主要课程、主要实践性教学环节等都有了不同程度的变化。原有的教材已经不能适应新专业的培养目标和教学要求，组织一套新的土木工程专业系列教材成为众多院校的翘首之盼。武汉工业大学出版社在中国土木工程学会教育工作委员会的指导和支持下，经过大量的调研，组织国内29所大学的土木工程学科的教授共同编写了这套系列教材。

本套教材的主、参编人员及编委会顾问遵照1998年1月建设部全国土木建筑工程专业教学指导委员会昆明会议和1998年5月上海的全国土木工程专业系主任会议的精神，经过充分研讨，决定首批编写出版29种主干课程的教材，以尽快满足全国众多院校的教学需要，以后再根据专业方向的需要逐步增补。中国土木工程学会教育工作委员会组织专家审查了本套教材的编写大纲，决定将其作为"中国土木工程学会教育工作委员会审定教材"出版。作为一套全新的系列教材，本套教材的"新"体现在以下几点：

体系新——本套教材从"大土木"的专业要求出发，从整体上考虑专业的课程设置和各门课程的内容安排，按照教学改革方向要求的学时统一协调与整合，组成一套完整的、各门课程有机联系的系列。整套教材的编写除正文外，大多增加了本章提要、本章重点、例题详解、思考题、习题等，以使教材既适合教学需要，又便于学生自学。

内容新——本套教材中各门课程教材的主、参编人员特别注意了教材内容的更新和吸收各校教学改革的阶段性成果，以适应21世纪土木工程人才的培育要求。

规范新——本套教材中凡涉及土木工程规范的全部采用国家颁布的最新规范。

本套教材是新专业目录颁布实施后的第一套土木工程专业系列教材，是面向新世纪、适应新专业的一套全新的教材。能为新世纪土木工程专业的教材建设贡献微薄之力，自是我们应尽的责任和义务，我们感到十分欣慰。然而，正因其为第一套教材，尽管我们的编审者、编辑出版者夙兴夜寐、尽心竭力，不敢稍有懈怠，它仍然还会存在缺点和不足。嘤其鸣矣，求其友声，我们诚恳地希望选用本套教材的广大师生在使用过程中给我们多提意见和建议，以便我们不断修改、完善全套教材，共同为教育事业的发展作出贡献。

武汉工业大学出版社

2000.2

前　言

根据大学英语教学大纲的要求，大学英语教学分基础阶段和专业阅读阶段。在完成基础英语的学习后，应在第五至第七学期由专业教师开设专业英语课，每周2学时，为必修课。通过专业英语课学习，使学生能以英语为工具顺利阅读并正确理解有关的专业书籍和文章，阅读速度达每分钟70词，阅读理解的准确率不低于70%，阅读总量不少于250000词。实际教学过程中，由于学时往往不能满足教学大纲的要求，开设专业英语课时学生尚不具备足够的专业知识，要完成教学大纲专业英语阅读阶段的任务，并非一蹴而就的事情。

编者在多年的土木工程专业英语教学实践中，发现学生在学习时普遍存在下列问题：

1. 词汇难。土木工程专业英语的词汇与建筑结构、材料、设备、施工等密切相关，日常基础英语很少涉及这些专业化的词汇，加上学生专业知识有限，因而生词量很大。另一方面，英语单词一词多义，学生习惯于用基础英语中了解的意义来理解专业英语，往往造成误解。

2. 句子难。词汇难是造成理解句子难的一个原因。此外，另一个重要原因是，专业英语采用正式文体，逻辑性强，每个句子包含的信息量大，容量大，句子特别长，语法结构复杂，从而增加了理解的难度。

3. 汉语表达难。由于专业英语词汇的特殊性以及学生是在专业知识还不完备的情况下学习的，教学中汉语的应用有时不可避免，如课堂提问及课后练习以翻译为手段检验学生对专业文章的理解程度是一种有效的方法。实践发现，大多数学生都存在英译汉时汉语表达难的问题。排除生词、语法构成的障碍，文章的大意也可意会，却不能用流畅准确的汉语表达出来。究其原因：一是学生对翻译技巧不太了解，习惯于采用“译电码”那样的机械式翻译，极易写出不达意或者不规范的中文；二是学生本身中文基础薄弱，显得力不从心。

针对专业英语的特点及在学习中存在的问题，编者认为土木工程专业英语的学习应立足于在有限的时间里充分调动学生学习的积极性和主动性，培养学生的学习兴趣，使其能自觉地学习是很重要的。孔子说：“知之者不如好之者，好之者不如乐之者”。只有认识到学中有趣，才能克服畏难心理，自觉、自需地阅读专业书籍和文章，完成教学大纲所要求的专业英语阅读阶段的任务，并为今后工作的需要打下扎实的基础。

本书由编者多年收集的资料整理而成，正是以培养学生的学习兴趣为主导思想，既注重知识结构的完整性，又突出所选材料的趣味性。全书课文以土木工程为主线，系统地介绍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、水坝，岩土、材料、经济与管理以及计算机的应用等。阅读材料以介绍世界土木工程界名人、趣事、重大工程为主，进一步拓展学生的视野，增强本书的可读性。

土木工程专业英语的学习是一个长期的学习过程，真诚地希望本书能起到激发读者对土木工程专业、对阅读英文原版专业书籍和文章兴趣的作用，实现编者编撰此书的初衷。

在此，我要感谢系主任金康宁教授自始至终对本书的关注和支持，感谢我的学生陈世杰、程琦、蔡润良、王端喜、邹丽芳等付出的劳动。我还要特别感谢89岁高龄的土力学前辈Ralph B. Peck先生，他不仅为本书推荐了好几位在世界土木工程界影响深远的名人，将其著作的出版商介绍给我，而且一直关心着本书的进程；特别感谢预应力专家林同炎先生，他从美国给我寄来了生动有趣的资料；特别感谢同济大学侯学渊教授、束昱教授，他们也给我寄来了珍贵的资料并对本书的内容提出了宝贵的建议。书中名人画像应特别感谢唐涛女士，她用自己的幽默和技艺把大师的风采展现出来，使他们不再只是某个公式的符号，而是我们亲近的长者。

编者　段兵廷

2000年5月

CONTENTS

Lesson 1

Text

Civil Engineering

Civil engineering, the oldest of the engineering specialties, is the planning, design, construction, and management of the built environment. This environment includes all structures built according to scientific principles, from irrigation and drainage systems to rocket-launching facilities.

Civil engineers build roads, bridges, tunnels, dams, harbors, power plants, water and sewage systems, hospitals, schools, mass transit, and other public facilities essential to modern society and large population concentrations. They also build privately owned facilities such as airports, railroads, pipelines, skyscrapers, and other large structures designed for industrial, commercial, or residential use. In addition, civil engineers plan, design, and build complete cities and towns, and more recently have been planning and designing space platforms to house self-contained communities.

The word civil derives form the Latin for citizen. In 1782, Englishman John Smeaton used the term to differentiate his nonmilitary engineering work from that of the military engineers who predominated at the time. Since then, the term civil engineering has often been used to refer to engineers who build public facilities, although the field is much broader.

Scope. Because it is so broad, civil engineering is subdivided into a number of technical specialties. Depending on the type of project, the skills of many kinds of civil engineer specialists may be needed. When a project begins, the site is surveyed and mapped by civil engineers who locate utility placement—water, sewer, and power lines. Geotechnical specialists perform soil experiments to determine if the earth can bear the weight of the project. Environmental specialists study the project's impact on the local area: the potential for air and groundwater pollution, the project's impact on local animal and plant life, and how the project can be designed to meet government requirements aimed at protecting the environment. Transportation specialists determine what kind of facilities are needed to ease the burden on local roads and other transportation networks that will result from the completed project. Meanwhile, structural specialists use preliminary data to make detailed designs, plans, and specifications for the project. Supervising and coordinating the work of these civil engineer specialists, from beginning to end of the project, are the construction management specialists. Based on information supplied by the other specialists, construction management civil engineers estimate quantities and costs of materials and labor, schedule all work, order materials and equipment for the job, hire contractors and subcontractors, and perform other supervisory work to ensure the project is completed on time and as specified.

Throughout any given project, civil engineers make extensive use of computers. Computers are used to design the project's various elements (computer-aided design, or CAD) and to manage it. Computers are a necessity for the modern civil engineer because they permit the engineer to efficiently handle the large quantities of data needed in determining the best way to construct a project.

Structural engineering. In this speciality, civil engineers plan and design structures of all types, including bridges, dams, power plants, supports for equipment, special structures for offshore projects, the United States space program, transmission towers, giant astronomical and radio telescopes, and many other kinds of projects. Using computers, structural engineers determine the forces a structure must resist: its own weight, wind and hurricane forces, temperature changes that expand or contract construction materials, and earthquakes. They also determine the combination of appropriate materials: steel, concrete, plastic, stone, asphalt, brick, aluminum, or other construction materials.

Water resources engineering. Civil engineers in this specialty deal with all aspects of the physical control of water. Their projects help prevent floods, supply water for cities and for irrigation, manage and control rivers and water runoff, and maintain beaches and other waterfront facilities. In addition, they design and maintain harbors, canals, and locks, build huge hydroelectric dams and smaller dams and water impoundments of all kinds, help design offshore structures, and determine the location of structures affecting navigation.

Geotechnical engineering. Civil engineers who specialize in this field analyze the properties of soils and rocks that support structures and affect structural behavior. They evaluate and work to minimize the potential settlement of buildings and other structures that stems from the pressure of their weight on the earth. These engineers also evaluate and determine how to strengthen the stability of slopes and fills and how to protect structures against earthquakes and the effects of groundwater.

Environmental engineering. In this branch of engineering, civil engineers design, build, and supervise systems to provide safe drinking water and to prevent and control pollution of water supplies, both on the surface and underground. They also design, build, and supervise projects to control or eliminate pollution of the land and air. These engineers build water and wastewater treatment plants, and design air scrubbers and other devices to minimize or eliminate air pollution caused by industrial processes, incineration, or other smoke-producing activities. They also work to control toxic and hazardous wastes through the construction of special dump sites or the neutralizing of toxic and hazardous substances. In addition, the engineers design and manage sanitary landfills to prevent pollution of surrounding land.

Transportation engineering. Civil engineers working in this specialty build facilities to ensure safe and efficient movement of both people and goods. They specialize in designing and maintaining all types of transportation facilities, highways and streets, mass transit systems, railroads and airfields, ports and harbors. Transportation engineers apply technological knowledge as well as consideration of the economic, political, and social factors in designing each project. They work closely with urban planners, since the quality of the community is directly related to the quality of the transportation system.

Pipeline engineering. In this branch of civil engineering, engineers build pipelines and related facilities which transport liquids, gases, or solids ranging from coal slurries (mixed coal and water) and semiliquid wastes, to water, oil, and various types of highly combustible and noncombustible gases. The engineers determine pipeline design, the economic and environmental impact of a project on regions it must traverse, the type of materials to be used—steel, concrete, plastic, or combinations of various materials—installation techniques, methods for testing pipeline strength, and controls for maintaining proper pressure and rate of flow of materials being transported. When hazardous materials are being carried, safety is a major consideration as well.

Construction engineering. Civil engineers in this field oversee the construction of a project from beginning to end. Sometimes called project engineers, they apply both technical and managerial skills, including knowledge of construction methods, planning, organizing, financing, and operating construction projects. They coordinate the activities of virtually everyone engaged in the work: the surveyors; workers who lay out and construct the temporary roads and ramps, excavate for the foundation, build the forms and pour the concrete; and workers who build the steel framework. These engineers also make regular progress reports to the owners of the structure.

Community and urban planning. Those engaged in this area of civil engineering may plan and develop communities within a city, or entire cities. Such planning involves far more than engineering consideration; environmental, social, and economic factors in the use and development of land and natural resources are also key elements. These civil engineers coordinate planning of public works along with private development. They evaluate the kinds of facilities needed, including streets and highways, public transportation systems, airports, port facilities, water-supply and wastewater-disposal systems, public buildings, parks, and recreational and other facilities to ensure social and economic as well as environmental well-being.

Photogrametry, surveying, and mapping. The civil engineers in this specialty precisely measure the Earth's surface to obtain reliable information for locating and designing engineering projects. This practice often involves high-technology methods such as satellite and aerial surveying, and computer-processing of photographic imagery. Radio signals from satellites, scans by laser and sonic beams, are converted to maps to provide far more accurate measurements for boring tunnels, building highways and dams, plotting flood control and irrigation projects, locating subsurface geologic formations that may affect a construction project, and a host of other building uses.

Other specialties. Two additional civil engineering specialties that are not entirely within the scope of civil engineering but are essential to the discipline are engineering management and engineering teaching.

Engineering management. Many civil engineers choose careers that eventually lead to management. Others are able to start their careers in management positions. The civil engineer-manager combines technical knowledge with an ability to organize and coordinate worker power, materials, machinery, and money. These engineers may work in government—municipal, county, state, or federal; in the U. S. Army Corps of Engineers as military or civilian management engineers; or in semiautonomous regional or city authorities or similar organizations. They may also manage private engineering firms ranging in size from a few employees to hundreds.

Engineering teaching. The civil engineer who chooses a teaching career usually teaches both graduate and undergraduate students in technical specialties. Many teaching civil engineers engage in basic research that eventually leads to technical innovations in construction materials and methods. Many also serve as consultants on engineering projects, or on technical boards and commissions associated with major projects.

NEW WORDS AND PHRASES

1. predominate 居支配地位,统治,(数量上)占优势
2. geotechnical 岩土工程的
3. specification 载明,详述,技术要求,说明书,清单
4. supervise 监督,管理,控制
5. subcontractors 转包合同,转包工作(给第三者),承做(转包的工作)
6. hurricane 飓风,(感情等的)爆发
7. asphalt 沥青, 铺沥青于
8. aluminum [化]铝
9. runoff 雨量,流量,决赛,决定性竞选
10. lock 水闸,闸门
11. fill 充足,饱满,装填物,(一)袋,填土,填方
12. scrubber 洗涤器,涤气器,滤清器,板刷,擦布,擦洗者
13. incineration 烧尽,焚化,火葬
14. toxic 有毒(性)的,中毒的
15. combustible 易燃的,可燃的,易激动的

16. ramp 斜坡，斜面，滑行台
17. excavate 挖掘，发掘，在……上挖掘，挖出，变成空洞
18. precisely 精确的，刻板的，正好，恰恰，确实如此
19. aerial 空气的，大气的，航空的，架空的，生存在空中的
20. sonic 能发出声音的，[物]声音的，音速的，利用音波的
21. plotting 测绘，标图，标航路
22. municipal 市政的，市立的，地方自治的，地方(性)
23. commission 委任，委托(事项)，委员会
24. drainage system 排水系统

NOTES

1. They evaluate and work to minimize the potential settlement of buildings and other structures that stems from the pressure of their weight on the earth.
   他们计算建筑和其他结构由于自重压力可能引起的沉降，并采取措施使之减少到最小。
2. They coordinate the activities of virtually everyone engaged in the work.
   事实上，他们协调工程中每个人的活动。
3. They may also manage private engineering firms ranging in size from a few employees to hundreds.
   他们也可能管理规模为从几个到数百个雇员的私营工程公司。
4. Many teaching civil engineers engage in basic research that eventually leads to technical innovations in construction materials and methods.
   许多从事教学的土木工程师参与会导致建筑材料和施工方法技术革新的基础研究。

Reading Material(1)

On Being Your Own Engineer

The occasion for this short talk was the Civil Engineering students Annual Awards Convocation at the University of Illinois on April 24, 1976. Parents, friends, and wives or husbands of the honor students had been invited to the Convocation. I took the occasion to speak to the wives or husbands as well as to the students who received the honors.

Ralph B. Peck (1983)

Here at this University and in this Department that has trained so many outstanding civil engineers, you have achieved a standard of excellence that results in your recognition at this Honors Day ceremony. It gives me the greatest pleasure to congratulate you on these achievements. Here in your undergraduate career, you have become leaders in the pursuit of engineering knowledge, the first essential step in becoming a civil engineer. Excellence in undergraduate studies correlates highly with a successful engineering career in later years. I sincerely hope that the satisfaction of a successful career continues to be yours and that these honors and recognitions that you so rightfully receive today will be only the first of many satisfactions that will come to you in your practice of civil engineering.

Yet a successful undergraduate career is not always or inevitably followed by leadership in your profession. In a changing world, in a dynamic profession such as civil engineering, how can you be sure today that you will be among the leaders of your profession 20 or 30 years from now? How can you even be sure to pick the branch of civil engineering, the particular kind of work that you will actually like the best or have the most aptitude for? Do you dare leave these matters to chance, do you dare let nature simply take its course? Nobody can predict the future and nobody can guarantee success in the future. But there are, nevertheless, many positive things you can do to shape your own career. I should like to think about some of these with you today.

I believe every engineer, perhaps even while an undergraduate but certainly upon graduation, needs to form and follow his own plan for the development of his professional career. Perhaps it is an unpleasant thought, but I believe it is only realistic that nobody else is quite as interested in your career as you yourself should be. If you don't plan it yourself, it is quite possible that nobody will. On the other hand, there are too many factors, there are too many changes in a dynamic profession to permit laying out a fixed plan. The plan that you follow must be flexible and it must continually be evaluated.

To be sure, every career depends to some extent on chance, on the breaks, good or bad. But if you have followed a sound plan, you will be ready for the good breaks when they come. Those who feel they have never had favorable opportunities usually have not been ready and have not even recognized opportunities when they came.

Civil engineering projects don't exist in the classroom or in the office or in the laboratory. They exist out in the field, in society. They are the highways, the transit systems, the landslides to be corrected, the waste disposal plants to be constructed, the bridges, the airports; they have to be built by men and machines. In my view, nobody can be a good designer, a good researcher, a leader in the civil engineering profession unless he understands the methods and the problems of the builders. This understanding ought to be firsthand, and if you are going to get it, you have to plan for it. Without this experience in the field, your designs may be impractical, your research may be irrelevant, or your teaching may not prepare your students properly for their profession. There are several ways in which you can get construction experience. One is by being an engineer for a builder, for a contractor. Or on the other hand, you might be an inspector for a resident engineer for the designer or owner. It doesn't matter in what capacity you work, and it doesn't take a very long time to get worthwhile experience in the field, but sometime early in your career, you should plan to get it. Since the real projects are out there in the field, you will have to go where they are to get the construction experience, and you may have to put up with a little inconvenience in order to get it.

Real problems of civil engineering design include both concept and detail. In fact, details often make or break a project. A beautifully designed cantilever bridge in Vancouver Harbor collapsed during construction because a few stiffeners were omitted on the webs of some temporary supporting beams. Spectacular failures such as this don't always follow from neglected details, but poor design, poor engineering often do. I believe every civil engineer needs a personal knowledge of the details of his branch of civil engineering. If he's going to be a geotechnical engineer, for example, he needs to know among other things exactly how borings are made and samples taken under a variety of circumstances. If he's going to be a structural engineer, he needs to know how steel structures are actually fabricated and erected. He needs to know, in other words, the state of the commercial art that plays such a large part in his profession. He needs to know how things are customarily done so that he can tell whether, for example, a commercially available sampling tool will do the job at a modest competitive price or whether some unusual tool must be developed for the particular requirements of the job. So it seems to me that you should plan to get this sort of experience also: to spend some time on a drilling rig if you plan to be a geotechnical engineer; to work for a steel fabricator or in a design office if you intend to be a structural engineer.

How can you get this varied experience, these various components of civil engineering that are so dissimilar? I think, for the most part, you have to do it by choosing your jobs carefully and changing your job if and when it seems necessary. You may be lucky in your very first job and go to work for an organization that designs, that supervises construction, that makes its own laboratory tests, that supervises borings, and so on. If this should be true, you would be fortunate, but this is not usually the case. Even such an organization may tend to let you get stuck in one phase of their work, and you may have to persuade them from time to time to let you work in other parts of their activities. More likely you will have to change organizations, possibly even to move to another part of the country or of the world. Unfortunately you can't order the jobs that you want, when you want them, and where you want them. But you can look at every opportunity to see if it fits in your plan and to judge if the time is right to make a change. The breadth of experience so important in a civil engineer's background can't be obtained any other way than by a variety of jobs or a variety of activities within a given job. You owe it to yourself and to your career to see that you get this varied background. On the other hand, while you're getting this background, you ought to avoid being a job-hopper. Each of your employers will have an investment in you. At least for a while, when you start to work for him, he will not be getting his money's worth from you. You owe him a return on his investment, you owe him good work, and you owe staying with him a reasonable minimum time while you're getting that experience.

On my first real job, I had the good fortune to be working under Karl Terzaghi. He had a good many requirements, but one of the most important was that I should keep a notebook in which I should record not just what I had done that day, but what I had seen, what I had observed. When I went down into a tunnel heading, I should come back and sketch how the heading was being executed and how it was being braced. I soon discovered that very often, when I came back, I couldn't remember exactly what had gone on in the heading. I couldn't remember exactly how the bracing fit together. In other words, my eyes had seen what was going on, but my brain didn't really register. My powers of observation were poor. But as I continued to keep this notebook, I discovered that more and more I could remember what I had seen, and more and more my powers of observation developed, I recommend this to you as one way to make your experience more meaningful.

An investment of ten years or so after your degree, including perhaps graduate studies as well, in accordance with a carefully planned but flexible program, will go a long way toward assuring success in your engineering career. But there is another important aspect to be considered. Any worthwhile career is demanding. It makes demands on your time and effort, and also on your family. And there are other demands on your life besides your career. Your wife or your husband will have her or his own goals and even may also have a career in mind. The demands of others in your life and the fulfillment of their goals and careers will require cooperation, adjustment, give and take. Moves from one place to another will require leaving friends, will require that your children change schools. Tensions and conflicts are inevitable and compromise and reason are necessary. You and your partner will need the best possible understanding. Many a marriage has foundered on the career ambitions of one or both partners and, conversely, many a career has foundered on unreasonable or nonunderstanding social or financial demands of the partner. There is seldom a perfect solution to this problem, but there are many good solutions. The important thing is to face up to the problems early and to keep working on them. The best engineers, I think, have achieved a reasonable balance among their goals in life. Often they can truly say that their partner in life has also been their partner in their career.

Your generation has a most exciting prospect. Don't believe for a minute the prophecies that technology has outlived its usefulness. You will have, fortunately, much more to consider than technology. You will need to be true conservationists, true ecologists in the positive sense. You will need to be involved in the social cost-benefit assessments of civil engineering work above and beyond the dollar cost-benefits. Progress in these directions will be the challenge and the great achievement of your generation, and it is an exciting prospect. But to succeed, you must be fully prepared, not poorer, but better grounded technically than your predecessors. In the next ten years, the choices you make and the experiences you get will be crucial. As Honor Students, you have taken the first necessary step with skill and distinction. All of us, your teachers, your parents, your husbands, wives, and friends wish you even greater success in the future. Indeed you must succeed, or this world will be a poorer place rather than a richer place in which to live.

Reading Material (2)

Peck, Ralph Brazelton*

Peck's professional life was directed toward casting the findings of the engineering science of soil mechanics into a form readily useful to practicing engineers, relating the implications of geology to subsurface engineering, carrying out full scale field measurements to assess the validity of forecasts based on theoretical calculations and laboratory tests, and applying soil mechanics and engineering geology to unusual projects, including foundations, earth and rockfill dams, landslides, and tunnels.

Peck turned to soil mechanics in 1938 upon attending Arthur Casagrande's courses at Harvard. In 1939 he was engaged in construction of the Initial System of Chicago Subways where, under the direction of Karl Terzaghi, the father of soil mechanics, he developed techniques for applying soil mechanics to the design and construction of tunnels and braced open excavations in soft clays, and carried out pioneer measurements of earth pressures and ground movements. He maintained a close cooperation with Terzaghi until the latter's death in 1963 and with him wrote the text *Soil Mechanics in Engineering Practice* , which appeared in 1948 and had a strong influence in establishing the role of soil mechanics in civil engineering.

At the University of Illinois from 1942 onward, he maintained an active practice as consultant on geotechnical projects and developed a style of teaching directed toward the cultivation of engineering judgment through a combination of case studies and fundamentals. His early consulting activities were largely devoted to foundations for commercial and industrial structures, ranging from office buildings to steel mills and power plants, under a wide variety of soil conditions in many parts of the United States and Canada. This aspect culminated in publication in 1953 of the text *Foundation Engineering* , coauthored with W. E. Hanson and T. H. Thornburn.

Increasingly Peck's attention turned to earth dams, tunnels, airfields, and landslides in all parts of the world. Among the dams with which he was associated are those for the Churchill Falls and James Bay hydroelectric projects in eastern Canada, the 800-foot (240-meter) Mica Dam on the Columbia River, and the 700-foot (210-meter) W. A. C. Bennett Dam on the Peace River. He also served as a consultant on dams to the Tennessee Valley Authority, the Corps of Engineers, the Bureau of Reclamation, various utility companies and their engineering firms, and foreign governments. He was a member of the Independent Panel appointed in 1976 by the Secretary of the Interior and the Governor of Idaho to determine the cause of failure of Teton Dam. Among tunnels are those of the subways of the San Francisco Bay Area Rapid Transit District; the Washington, DC, Metro; and the New York City, Baltimore, and

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* *American geotechnical engineer*
Born June 23, 1912, Winnipeg, Manitoba, Canada

Buffalo systems. Airfield assignments included the initial subsurface studies at O'Hare (Chicago), foundations for the overwater runway extensions and for the terminal building at LaGuardia (New York), subsurface stabilization measures at Newark, and hangar foundations at J. F. Kennedy (New York). He was a member of an advisory board to investigate the slides triggered by the Good Friday earthquake of 1964 in Alaska, investigated the slides accompanying construction of the Seattle Freeway in 1963, and for many years advised the Association of American Railroads on landslides and other slope stability problems. Measurements of settlements, displacements, and earth and water pressures on many of these projects served as the basis for much of his research and for that of his students.

Beginning with his day-to-day observations of variations in the depositional pattern and of the physical properties of the glacial soils encountered in the Chicago subway excavations, Peck's appreciation of the significance of geological history and structure of the subsoil at construction sites developed into approaches for evaluating and dealing with the inherent variability of the natural deposits within or upon which the civil engineer establishes structures. He formalized an observational procedure, based on approaches initiated by Terzaghi, for achieving safe but economical design under many conditions where geological complexities preclude obtaining all the information needed for final design in advance of construction.

The son of a railroad bridge engineer, Peck received a degree in civil engineering in 1934 and a doctorate in civil engineering in 1937, both from Rensselaer Polytechic Institute. He worked on subway construction until it was interrupted by World War II, and then engaged in defense plant construction for a short period of time. In 1942 he joined the Civil Engineering Department of the University of Illinois in Urbana, where he remained until he retired in 1974.

For his paper on the measurements of earth pressures against the braced excavations of the Chicago subway, Peck was awarded the Norman Medal of the American Society of Civil Engineers in 1943 while still a junior member of that organization. He was its first Karl Terzaghi Lecturer and a recipient of its Karl Terzaghi Award; in 1975, he became an honorary member. He was chosen a member of the National Academy of Engineering in its first general election in 1965. Other distinctions included the Outstanding Civilian Service Medal of the Department of the Army, the Moles Non-Member Award, the National Society of Professional Engineers Award, and the Washington Award. In 1975 he received the National Medal of Science from President Gerald Ford. From 1969 to 1973 he was president of the International Society of Soil Mechanics and Foundation Engineering, and was elected an honorary member of the Southeast Asian, Japanese, and Mexican Societies of Soil Mechanics . He was a member of the U. S National Committee on Tunneling Technology(1974-78) and served as its chairperson (1977).