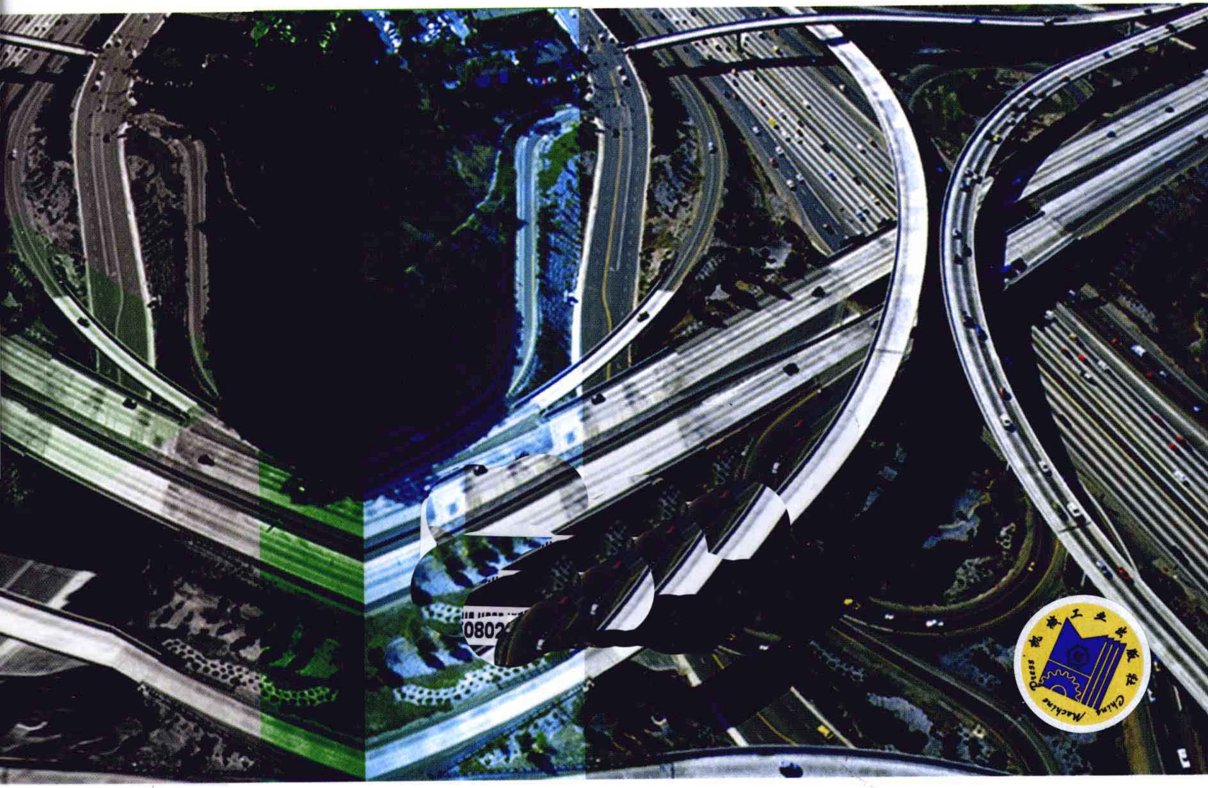
普通高等教育交通运输类专业系列规划教材

交通工程专业英语

邬万江 马丽丽◎主 编



TRAFFIC ENGINEERING ENGLISH

免费电子课件

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本书共7章，涵盖了现代交通工程所涉及的主要内容：交通工程概论、交通组成和特性、交通流特性、交通调查、交通管理与控制、交通规划和智能运输系统，着重介绍交通工程各研究领域的基本概念、原理、方法和应用。为了便于学习，每章正文后均列出了本章中出现的专业词汇释义和与本章内容相关的2～3篇英文原文阅读资料及相应的参考译文。

本书以美国交通工程的情况为背景，参考了原版英文教材、期刊、论文，根据交通工程专业的课程体系安排的内容。本书既可作为高等院校交通工程及相关专业、本科生专业英语教材和交通工程课程双语教材，也可作为交通运输行业的管理人员和科技工作者自学和科研的参考用书。

本书配有电子课件，免费提供给选用本教材的授课教师，需要者请登录机械工业出版社教材服务网下载，网址：www.cmpedu.com。

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前　　言

本书是为了满足高等院校交通运输类相关专业英语课程教学的需要，依照教育部精神，根据高等院校培养目标的要求而编写的，在教材体系和编写方面有如下特点：

1）资料来源上，参考了大量原版英文教材、期刊、论文，可读性强，对提高读者的交通运输类英文文献阅读能力有很大帮助。

2）体系结构上，根据交通工程的课程体系安排内容，强化了各章节内容的连贯性和系统性。

3）编写内容上，涵盖了理论基础、交通调查、交通管理和控制、交通规划和智能运输系统等交通工程主要研究领域。每章正文后均列出了本章中出现的专业词汇释义和与本章内容相关的2～3篇英文原文阅读资料及相应的参考译文，有助于学生充分掌握和灵活运用交通工程专业词汇，达到中英文术语和专业内容的互通、互译。

4）本书主要介绍交通工程各研究领域的基本概念、原理、方法和应用，既可作为交通运输类相关专业的专业英语教材，也可作为交通工程课程的双语教学参考资料。

本书共7章，涵盖了现代交通工程所涉及的主要内容：交通工程概论、交通组成和特性、交通流特性、交通调查、交通管理与控制、交通规划和智能运输系统。具体编写分工如下：第1章由黑龙江工程学院李金库编写，第2章由兰州交通大学傅忠宁、吴艳群编写，第3章由黑龙江八一农垦大学赵亚杰编写，第4章由佳木斯大学郐万江编写，第5章由佳木斯大学马丽丽编写，第6章由佳木斯大学韩平编写，第7章由佳木斯大学姚嘉编写。全书由佳木斯大学郐万江、马丽丽统稿，由吉林大学赵淑芝教授主审。感谢马士武、赵玉芹在本书编写过程中给予的大力支持，同时感谢本教材参考文献的作者。

由于作者水平有限，书中难免有不妥之处，欢迎广大读者批评指正。

编　　者

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Chapter 1 Introduction to Traffic Engineering

1.1 Traffic Engineering Definition, Scope and Functions

1.1.1 Definition

The Institute of Transportation Engineers defines traffic engineering as a subset of transportation engineering as follows:

Transportation engineering is the application of technology and scientific principles to the ***planning***, functional design, operation, and management of facilities for any mode of transportation in order to provide for the safe, rapid, comfortable, convenient, economical, and environmentally compatible movement of people and goods.

Traffic engineering is that phase of transportation engineering which deals with the planning, ***geometric design*** and ***traffic operations*** of roads, streets, and highways, their ***networks***, ***terminals***, ***abutting lands***, and relationships with other modes of transportation.

These definitions represent a broadening of the profession to include ***multimodal transportation systems*** and option, and to include a variety of objectives in addition to the traditional goals of safety and efficiency.

1.1.2 Scope

In wake of growth of urbanization and development of automobile industry, traffic problems have become a major concern facing the urban planners and decisions makers. As transportation facilities have been in place and used by road users so routinely that transportation system has become an important component in people's daily life. Traffic engineering, one of the elements in transportation system, has gradually matured to become an independent discipline being taught at colleges and universities worldwide.

Traditionally, traffic engineering is a branch of civil engineering that uses engineering techniques to achieve the safe and efficient movement of people and goods. The scope or coverage of traffic engineering deals with ***surface*** (land, highway, roadway) ***transportation*** and relationships and connection with other modes of transportation. Therefore, the main task of traffic engineering is intended to study how to move people and goods by highway or roadways and how to connect with other mode of transportation in an efficient way to fulfill transporting people and goods.

Today, as mentioned above, the principal modes that traffic engineers have to deal with include: ***automobile***, ***bus***, ***truck***, ***motorbike***, and ***bicycle***. However, terminals, ***transfer center*** and ***port*** are also the facilities that traffic professionals have to work with. Meanwhile, the discipline of traffic engineering is experiencing a phenomenal growth in the academia and engineering, it has related to social sciences, economics, planning and architecture, system engineering, civil engineering, mechanical engineering, engineering mathematics, physical sciences, cognitive psychology, etc.. So this kind of work should be accomplished through cooperation and coordination due to its comprehensiveness and interest-sharing feature. Though responsibility of traffic engineers has broadened with development and expansion of transportation systems they should keep in mind that their main duty is to plan, design, maintain, and manage highway systems.

1.1.3 Functions

Transportation systems provide the nation's population with both ***mobility*** and ***accessibility***. The two concepts are strongly interrelated but have distinctly different elements. Mobility refers to the ability to travel to many different destinations, while accessibility refers to the ability to gain entry to a particular site or area.

Mobility emphasizes the through movement of people, goods, and vehicles from point A to point B in the system and gives ***travelers*** a wide range of choices as to where to go to satisfy particular needs. Mobility allows shoppers to choose from many competing shopping centers and stores. Similarly, mobility provides the traveler with many choices for all kinds of trip purposes, including recreational trips, medical trips, educational trips, and even the commute to work. The range of available choices is enabled by having an effective transportation network that connects to many alternative trip destinations within a reasonable time, with relative ease, and at reasonable cost.

Accessibility denotes the direct connection to abutting lands or development such as home, stores, schools, office buildings, etc., and is a major factor in the value of land. When land can be accessed by many travelers from many potential origins, it is more desirable for development and, therefore, more valuable. Thus, ***proximity*** of land to major highways and ***public transportation*** facilities is a major factor determining its value.

Mobility and accessibility may also refer to different portions of a typical trip. Mobility focuses on the through portion of trips and is most affected by the effectiveness of through facilities that take a traveler from one general area to another. Accessibility requires the ability to make a transfer from the transportation system to the particular land parcel on which the desired activity is taking place. Accessibility, therefore, relies heavily on transfer facilities, which include parking for vehicles, public transit stops, and loading zones.

A good transportation system must provide for both mobility and accessibility and should be designed to separate the functions from the extent possible to ensure both safety and efficiency. Relationship between mobility and accessibility is shown in Figure 1-1. From the figure, we can see that with an increase of mobility, the ability to access any development decreases, and vise versa.

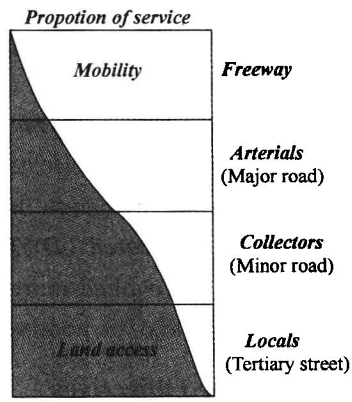

Figure 1-1 Relationship between Mobility and Accessibility

1.2 Research Objectives of Traffic Engineering

The key objectives of the definitions of traffic engineering include safety, speed, comfort, convenience, economy, and environmental compatibility.

1.2.1 Primary Objective—Safety

The principal goal of traffic engineering remains the provision of a safe system for highway traffic. This is no small concern. Traffic safety problems are paid more and more attentions for that it has a direct connection with people's lives and happiness. Traffic accidents are of concern for all modes of transportation, but are perhaps most visible in highways or urban traffic. More Americans have been killed on U. S. highways than in all of the wars in which the nation has participated, including the Civil War.

In general, there has been an improvement in safety for all modes of transportations, especially highway traffic. Improvements in fatality rates reflect a number of trends, many of which traffic engineers have been instrumental in implementing such as improved highway design and maintenance, improved vehicle design, driver education and law enforcement activities. Vehicle design has greatly improved (encouraged by several Acts of Congress requiring certain improvements). Today's vehicles feature padded ***dashboards***, collapsible steering columns, ***seat belts*** with ***shoulder harnesses***, ***air bags*** (some vehicle now have as many as eight), and ***antilock braking systems***. Highway design has been improved through the development and use of advanced barrier systems for ***medians*** and ***roadside*** areas. Traffic control systems communicate better and faster, and ***surveillance systems*** can alert authorities to accidents and breakdowns in the system. Stronger efforts to remove dangerous drivers from the road have yielded significant dividends in safety. ***Driving under the influence*** (***DUI***) and ***driving while intoxicated*** (***DWI***) offenses are more strictly enforced, and licenses are suspended or revoked more easily as a result of DUI/DWI convictions, poor accident record, and/or poor violations record.

1.2.2 Other Objectives

The definitions of transportation and traffic engineering highlight additional objectives:

- Speed.
- Comfort.
- Convenience.
- Economy.
- Environmental compatibility.

Most of these are self-evident desires of the traveler. Most of us want our trips to be fast, comfortable, convenient, cheap, and in harmony with the environment. All of these objectives are also relative and must be balanced against each other and against the primary objective of safety.

While speed of travel is much to be desired, it is limited by transportation technology, human characteristics, and the need to provide safety. Comfort and convenience are generic terms and mean different things to different people. Comfort involves the physical characteristics of vehicles and roadways, and is influenced by our perception of safety. Convenience relates more to the ease with which trips are made and the ability of transport systems to accommodate all of our travel needs at appropriate times. Economy is also relative. There is little in modern transportation systems that can be termed "cheap". Highway and other transportation systems involve massive construction, maintenance, and ***operating expenditures***, most of which are provided through general and user taxes and fees. Nevertheless, every engineer, regardless of discipline, is called upon to provide the best possible systems for the money.

Harmony with the environment is a complex issue that has become more important over time. All transportation systems have some ***negative impacts*** on the environment. All produce air and noise pollution in some forms, and all utilize valuable land resources. In many modern cities, transportation systems utilize as much as 25% of the total land area. "Harmony" is achieved when transportation systems are designed to minimize negative environmental impacts, and where system architecture provides for aesthetically pleasing facilities that "fit in" with their surroundings.

The traffic engineer is tasked with all of these goals and objectives and with making the appropriate tradeoffs to optimize both the transportation system and the use of public funds to build, maintain, and operate them.

1.3 Elements of Traffic Engineering

There are a number of key elements of traffic engineering:

- Traffic studies and characteristics.
- Performance evaluation.
- Facility design.
- Traffic control.
- Traffic operations.
- Transportation systems management.
- Intelligent transportation systems.

Traffic studies and characteristics involve measuring and quantifying various aspect of highway traffic. Studies focus on data collection and analysis that is used to characterize traffic, including (but not limited to) traffic volumes and demands, speed and travel time, delay, accidents, origins and destinations, modal use, and other variables.

Performance evaluation is a means by which traffic engineers can rate the operating characteristics of individual sections of facilities and facilities as a whole in relative terms. Such evaluation relies on measures of performance quality and is often stated in terms of "levels of service". Levels of service are letter grades, from A to F, describing how well a facility is operating using specified performance criteria. Like grades in a course, A is very good, while F connotes failure (on some level). As part of performance evaluation, the capacity of highway facilities must be determined.

Facility design involves traffic engineers in the functional and geometric design of highways and other traffic facilities. Traffic engineers are not involved in the structural design of highway facilities but should have some appreciation for structural characteristics of their facilities.

Traffic control is a central function of traffic engineers and involves the establishment of traffic regulations and their communication to the driver through the use of driver control devices, such as signs, markings, and signals.

Traffic operations involve measures that influence overall operation of traffic facilities, such as one-way street systems, transit operations, curb management, and surveillance and network control systems.

Traffic systems management (***TSM***) involves virtually all aspects of traffic engineering in a focus on optimizing system capacity and operations. Specific aspects of TSM include high-occupancy vehicle priority systems, car-pooling programs, pricing strategies to manage demand, and similar functions.

Intelligent transportation systems (***ITS***) refer to the application of modern telecommunications technology to the operation and control of transportation systems. Such systems include automated highways, automated toll-collection systems, vehicle-tracking systems, in-vehicle GPS and mapping systems, automated enforcement of traffic lights and speed laws, smart control devices, and others. This is a rapidly emerging family of technologies with the potential to radically alter the way we travel as well as the way in which transportation professionals gather information and control facilities. While the technology continues to expand, society will grapple with the substantial "big brother" issues that such systems invariably create.

1.4 Modern Problems for Traffic Engineers

We live in a complex and rapidly developing world. Consequently, the problems that traffic engineers are involved in evolve rapidly.

Urban congestion has been a major issue for many years. Given the ***transportation demand*** cycle, it is not always possible to solve congestion problems through expansion of capacity. Traffic engineers therefore are involved in the development of programs and strategies to manage demand in both time and space and to discourage growth where necessary. A real question is not "how much capacity is needed to handle demand?" but rather, "how many vehicles and/or people can be allowed to enter congested areas within designated time periods?"

Growth management is a major current issue. A number of states have legislation that ties development permits to level-of-service impacts on the highway and transportation system. Where development will cause substantial deterioration in the quality of traffic service, either such development will be disallowed or the developer will be responsible for general highway and traffic improvements that mitigate these negative impacts. Such policies are easily dealt with in good economic times. When the economy is sluggish, the issue will often be a clash between the desire to reduce congestion and desire to encourage development as a means of increasing the tax base.

Reconstruction of existing highway facilities also causes unique problems. The entire Interstate System has been aging, and many of its facilities have required major reconstruction efforts. Part of the problem is that reconstruction of Interstate facilities receives the 90% federal subsidy, while routine maintenance on the same facility is primarily the responsibility of state and local governments. Deferring routine maintenance on these facilities in favor of major reconstruction efforts has resulted from federal funding policies over the years. Major reconstruction efforts have a substantial major burden not involved in the initial construction of these facilities: maintaining traffic. It is easier to build a new facility in a dedicated right-of-way than to rebuild it while continuing to serve 100,000 or more vehicles per day. Thus, issues of long-term and short-term construction detours as well as diversion of traffic to alternate routes require major planning by traffic engineers.

Security of transportation facilities has come to the fore recently. The creation of facilities and processes for random and systematic inspection of trucks and other vehicles at critical locations is a major challenge, as is securing major public transportation systems such as railroads, airports, and rapid transit systems.

The list goes on and on. The point is that traffic engineers cannot expect to practice their profession only in traditional ways on traditional projects. Like any professional, the traffic engineer must be ready to face current problems and to play an important role in any situation that involves transportation and/or traffic systems.

New Words and Expressions

transportation engineering	运输工程
planning	规划
traffic engineering	交通工程
geometric design	几何设计；线形设计
traffic operations	交通运行
network	网络
terminal (airport terminal; truck terminal)	场站；终点；枢纽
abutting lands	毗邻的土地
multimodal transportation system	多式联运系统
surface (land, highway, roadway) transportation	陆路运输
automobile	车辆
bus	公共汽车
truck	卡车；载货汽车
motorbike	摩托车
bicycle	自行车；脚踏车
transfer center	换乘中心；转运中心
port (hub)	港口
mobility	移动；机动性
accessibility	可达性
traveler	出行者
proximity	接近；邻近
public transportation	公共交通
freeway	高速公路

arterial	主干路
collector (minor road)	次干路
locals (tertiary street)	支路
dashboards	仪表板
seat belts	安全带
shoulder harnesses	安全肩带；肩保险带
air bags	安全气囊
antilock braking systems (ABS)	防抱死制动系统
median	中央分隔带
roadside	路侧的；路边的
surveillance system	监控系统
driving under the influence (DUI)	酒后驾驶
driving while intoxicated (DWI)	醉酒驾驶
operating expenditures	运营成本
negative impacts	负面影响
traffic studies and characteristics	交通调查和交通特性
performance evaluation	性能评价
facility design	设施设计
traffic control	交通控制
traffic operations	交通运行；运营
traffic systems management (TSM)	交通系统管理
intelligent transportation systems (ITS)	智能运输系统
urban congestion	城市交通阻塞
transportation demand	运输需求
growth management	增长管理
reconstruction	重建

Exercises

1-1 Define the following terms: traffic engineering, mobility, accessibility, and describe the relationship between mobility and accessibility.

1-2 What are the basic differences between transportation engineering and traffic engineering?

1-3 What is the objective of traffic engineering study?

1-4 What are the basic contents of traffic engineering study?

1-5 Describe modern problems for traffic engineers.

Reading Material

(1)

The Evolution and Impact of Transport

The evolution of transport has been closely linked to the development of humankind throughout the earth's history. Transport's early function was to meet the basic need of hauling food supplies and building materials. But with the formation of tribes, then peoples, and finally nations, the societal and economic functions of transport became more and more complex. At first there was mobility required for individuals, clans, households, and animals to protect them against, and to escape from, the dangers of natural disasters and tribal aggressions, and in the search for the best places to settle. As tribal groups formed and gradually established their geographical identity, transport was increasingly needed to open up regions for development, to provide access to natural resources, to promote intercommunal trade, and to mobilize territorial defense. When the first nations came into being, transport played a major role in establishing national integrity.

After basic societal needs had generally been attended to, local communities could increasingly devote their efforts to enhancing their economic, cultural, and technological development through trade links with other peoples and regions. Again, transport provided the mobility required for such intertribal, international, and finally intercontinental cultural exchange and trade. During all of this gradual development toward an organized human society, represented today through the international family of nations, transport as physical process of moving people and goods, thus promoting such development, continuously underwent technological and organizational changes. Such changes were induced by several factors and circumstances. In fact, today's transport in its various forms and organizational arrangements remains highly subject to changes in response to societal requirements and preferences.

Clearly, the first and foremost criterion to be satisfied by transport was efficiency. For centuries, and particularly during the takeoff stages of local economies, society required reliable, fast, and low-cost transport. The search for appropriate technologies was relatively unconstrained. There were times in human history when the demand for reliable and fast transport was especially pronounced, and quick solutions were required for national self-defense. During such periods of local and international conflict, human