普通高等学校规划教材

Highway Engineering English

道路工程英语

主　编　王　敏　王　燕
副主编　丁静声　黄健平
主　审　吴国雄

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内 容 提 要

本书全面系统地介绍了道路工程的相关知识。全书共分为四部分:概论、设计、施工、材料和试验33个单元。每一单元简要介绍了道路工程有关的基本原理和方法,并就相关术语和难句做了详细注释,单元末还附有问题讨论,从而使读者对整个道路工程的基本步骤、原理和方法形成较深刻的认识。

本书的适用对象为已完成大学英语学习的土木工程、交通运输工程及相关专业的本科生,涉外工程英语专业的本科生,也可供土木工程技术人员作为进一步提高专业英语阅读、理解和翻译能力的参考读物。

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前　言

为了满足国内国际日益增长的道路交通建设需求，重庆交通大学道路工程英语教材编写组组织编写了《道路工程英语》(*Highway Engineering English*)。本教材适用于已完成大学英语学习的土木工程、交通运输工程专业类的本科生和涉外工程英语专业的本科生，也可供工程技术人员作为进一步提高专业英语阅读、理解和翻译能力的参考读物。

《道路工程英语》(*Highway Engineering English*)全面系统介绍了道路工程的相关知识。全书精选道路工程英语共分四部分：概论、设计、施工、材料和试验，33个单元。概论部分为道路工程项目实施的主要步骤；设计部分包括：平面线形、纵断面线形、平纵组合、视距、横断面、超高和加宽、平面交叉、立体交叉、路基、边坡、挡墙、路面和排水等；施工部分包括：平面图、测量、土石方工程、施工设备、柔性路面施工和刚性路面施工等；材料和试验部分包括：路面材料、材料的性质、土的试验、集料试验、沥青试验和水泥混凝土试验等。

每一单元简要介绍了道路工程有关的基本原理和方法，并就术语和难句做了详细注释，单元末附有问题讨论，书的末尾有专业词汇表，从而使读者对整个道路工程的基本步骤、原理、方法和术语形成较深刻的认识。在使用过程中，教师既可以按照教学需要自行选择上课讲解内容，学生也可以在教师的指导下进行自主学习。

本教材的资料一方面来源于道路工程的学术研究和著作，另一方面来源于国内外网上道路工程施工建设的前沿资料。网址、作者和出版社名均列入参考文献，在此特对文献涉及的作者、网页版权所有人和出版社表示感谢。

本教材的编写和出版得到重庆交通大学外国语学院、土木建筑学院等诸多专家教授的支持和指导：教材提纲由土木建筑学院专家提供，教材具体内容和注释均由土木建筑学院和外国语学院教师们共同商议与审定。由于编写水平和经验有限，书中难免存在不少问题，敬请各位读者批评指正。

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PART Ⅳ MATERIALS AND TESTS

PART I INTRODUCTION

Unit 1 The Steps Involved in a Road Construction Project

There are many steps involved in the road construction process, involving many teams of people and much organization. Road construction broadly encompasses the issues relevant to the process of road construction and maintenance, including the design, contracting, implementation, supervision, and maintenance of roads and related structures, such as bridges and interchanges.[①] For purposes of the knowledge base presented here, the topic covered includes public works[②], private contracting of civil works[③], and labor-based construction techniques. With respect to the process of maintenance, this includes road maintenance in general, as well as the private contracting of maintenance activities. In addition, issues related to the area of construction and the environment are also included, such as construction and maintenance, environmental impacts and mitigation, and construction site safety.

1.1 Planning

The first step to a good construction process is to identify the needs of the transportation in the area and of the road.The planning and designing process can take several years to complete. Then there's the physical construction, which, depending on the size of the road, adds on another few years.

A road project begins with evaluating the transportation system, taking into account nationwide priorities, including the department's mission and vision; and its strategic plans for the transportation system, collecting and maintaining a vast amount of information about our roads, including:

(1) Road and bridge conditions;

(2) Traffic volumes[④];

(3) Crash statistics.

Using this data, transportation planners, engineers, environmentalists, landscape architects, soil scientists and others identify trends that determine what and how to build. Other items to consider:

(1) Is it feasible to build on the property?

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①译文:道路施工主要是指与道路修建和养护有关的步骤,包括道路及其相关结构物如桥梁和立交的设计、招投标、施工、监管和养护。

②public works:公共工程(市政工程,公共建设工程)。

③private contracting of civil works:私人承包土建项目。

④traffic volume:交通量。

(2) What are the environmental issues?

(3) What utilities will be affected by a project?

(4) How will we fund the project?

(5) How can this project be designed to be an asset to the community?

In all, the first stage of road-building is scoping out the area where the road might be located to determine which path would have the least impact environmentally. Planners take into consideration a road's cultural and financial impacts as well. Roads can mean more traffic through a town -- causing cultural changes and financial growth.

1.2 Design

After a plan is defined the design can be constructed. This is when a boundary or land surveyor① may come in, especially in the event of a new road being developed or lanes being added to an existing road. If additional property must be purchased or arranged that would enter into this phase, as would any review of environmental concerns or land in the area that might be impacted by the project.②

Only then, using a process called photogrammetry③, planners determine elevations and topography of the area using photos. Recently, Global Positioning Systems, laser surveys, and other technologies have sped up the process and improved accuracy. Many factors influence design, including:

(1) Location;

(2) Terrain and soil properties;

(3) Drainage capabilities;

(4) Traffic volume;

(5) The ratio of cars to trucks and buses;

(6) Possible future development in the area;

(7) Effects on the environment or nearby residents.

When designers lay out the road plans, they have to determine horizontal and vertical curvature④ and meet design policies according to where the road will be built and the size of the road. Differences in road design come with differences in climate and land formation. For example, if it rains often in a particular area, the road must have an adequate slope⑤, so the water runs off. And, if it's often snowy in an area, bridges will have de-icing equipment built into them. If an area is mountainous, the roads must mold to the hills. If the ground is flat, hills must be made to provide adequate drainage systems.

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①land surveyor:土地测量员。

②译文:在本阶段是否还需要另外征用土地或者是否需要评估本工程对当地环境或土地利用可能造成的影响。

③photogrammetry:摄影测量技术。

④horizontal and vertical curvature:平纵线形。

⑤slope:边坡,斜坡。

1.3 Earthwork[①]

With a contractor on board, earthwork can begin. Earthwork is one of the most important elements in road construction because it establishes a stable foundation. A roadway with a substandard foundation will fail prematurely. That is why the road's base layers are as important as the finished surface.

(1) First, the contractor builds embankments[②] using cuts and fills[③].

(2) Next, a grader or bulldozer levels the screened dirt. Leveling bumps and filling in dips creates a surface that will support a road for decades.[④]

(3) The screened dirt is sprayed with water and compacted to its maximum density.

(4) During this stage, the contactor installs drains and sewers[⑤]. The center of the road must be higher than the edges so water will run off into the storm sewers. Drainage is a critical element because improper drainage will greatly reduce the new pavement's life expectancy.

(5) All of this work must pass strict inspections before the project can continue.

(6) To complete the earthwork, the contractor places gravel in 12in(30.48cm) layers on the road bed. Workers moisten and compact each layer. Layers are added and compacted until the road bed reaches the height called for in the design.

1.4 Paving[⑥]

At last, the road bed is ready for paving. In this analysis, planners and engineers study the cost of maintaining the road, the amount and type of traffic and the cost of paving material to determine whether to use asphalt (bituminous) or concrete pavement.

Asphalt[⑦] uses bitumen, a petroleum product, to glue together sand and crushed rock. This mixture is heated to approximately 300 degrees at the asphalt plant. At the construction site, workers spread and compact the hot mixture onto the roadbed.

Concrete[⑧] uses cement and water as the glue between sand and crushed rock. Workers place concrete into steel molds called forms. A finishing machine vibrates and trims it to the necessary height. To prevent cracks, workers cut joints between the concrete slabs[⑨]. At each joint, wire baskets[⑩] and steel dowels[⑪] connect the slabs. These allow the slabs to expand and contract as the

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①earthwork:土方工程。

②embankment:路堤。

③cuts and fills:挖方和填方。

④译文:接下来,平地机或推土机开始平整场地,把隆起的地方铲掉,把低洼处填起来,这样平整出来的路基足以支承上面修筑起来的路面,使用寿命达几十年。

⑤drains and sewers:排水和排污管道。

⑥paving:路面摊铺。

⑦asphalt:沥青。

⑧concrete:混凝土。

⑨concrete slab:混凝土板。

⑩wire basket:钢筋网。

⑪steel dowel:传力杆,合缝钢条。传力杆是指沿水泥混凝土路面板横缝,每隔一定距离在板厚中央布置的光圆钢筋。其一端固定在一侧板内,另一端可以在邻侧板内滑动,其作用是在两块路面板之间传递行车荷载和防止错台。

temperature changes. The slabs can slide from side to side along the dowels, but not up and down.① Modern paving equipment can insert dowels as the concrete is poured, then immediately tine the concrete②.

1.5 Open to Traffic

With the new surface in place, testers use seismology equipment to measure vibrations of the new pavement. If there is too much vibration, the contractor must grind the pavement to ensure a smooth surface. The final steps are:

(1) Another drainage test;

(2) Grading and landscaping around the pavement (where applicable);

(3) Applying the permanent pavement markings.

Finally, it's time to remove the barriers and return the freeway to the motorists.

1.6 Maintenance

Although the project may be completed, the work is never done. Proper maintenance and observation must be done to ensure that the road stays in proper working order. When a road is traveled on extensively, it can seem that it is always wearing down. Proper analysis must be done to the road to keep it in working order.

Each country may have different rules and regulations regarding the construction process. From start to finish, it is essential that each piece of the construction puzzle is done right. The last thing any contractor wants is the reputation of making drivers upset and creating roads that need to be immediately fixed again. When assembling a team to begin and complete a large scale construction project, it is essential to develop a team that will work well together and will provide excellent service. It's true that the construction process can be difficult to understand from the perspective of an angry driver. All we see are delays and frustration. However, take a moment to consider the immense planning and people involved in the process to making our roadways safe, secure and drivable.

Questions for Discussion

1. What are the major steps involved in a road construction project?

2. What should be done in the planning stage?

3. What are the factors that deserve special consideration in designing a road?

4. What are the important things involved in earthwork?

5. What are the differences between asphalt pavement and concrete pavement?

6. What should be considered in deciding whether to use asphalt pavement or concrete pavement?

7. Why is proper road maintenance necessary?

8. Discussing on the major steps involved in road maintenance.

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①译文:水泥混凝土板会沿传力杆方向移动,但是不会上下错开。

②tine the concrete:混凝土路面拉毛。