

土木建筑 系列英语

中国建筑工程出版社

第三级 供热与通风



English
Series
in Architecture
and Civil Engineering

H319.4/3
6741

土木建筑系列英语

English Series in Architecture and Civil Engineering

第三级 供热与通风

孙 典 主编
石自生 苗玉珍 孙熙福 编

中国建筑工业出版社

土木建筑系列英语
第三级 供热与通风

孙 典 主编

*

中国建筑工业出版社(北京西郊百万庄)
新华书店上海发行所发行 各地新华书店经售
上海市印刷三厂印刷(上海控江路)

*

开本: 850×1168 毫米 1/32 印张: 9% 字数: 353 千字

1987年12月第一版 1987年12月第一次印刷

印数: 1-9,390 册 定价: 2.40 元

ISBN7-112-00047-5/H·4

统一书号: 15040·5358

《土木建筑系列英语》编审委员会

主任委员：杨匡汉

委 员：（以姓氏笔划为序）

王庆昌 史中庸

李伯瑚 李棣萼

孙 典 陈伯初

陈素英 张新国

赵明瑜 贺善镛

顾惠民 薛 戈

《土木建筑系列英语》 第三级 供热与通风

审 稿 者：杨匡汉 贺平（主审）

周保强

责任编辑：张章百

致 读 者

土木建筑行业是我国社会主义经济的重要支柱之一。土木建筑行业职工素质如何,对这个行业发展关系极大。全国土木建筑行业职工约2000万人,其中工程技术人员和管理人员约300万人。随着对外开放的不断扩大,我国同世界各国之间的人员往来、学术交流、信息传播、经济活动以及工程承包等业务日益频繁,土木建筑行业不同领域不同层次的读者,尤其是中青年知识分子,学习和进修英语的要求越来越迫切。奉献在读者面前的《土木建筑系列英语》读本,正是为满足这样的需要而编撰的。

《土木建筑系列英语》是一套结合土木建筑类各专业的英语分级读本,整个系列按文章难度分为四级。第一、二级不分专业,内容为土木建筑方面的浅显易懂的科学普及文章。第三级暂分八个专业,即:建筑学与城市规划、工业与民用建筑、给水与排水、供热与通风、道路与桥梁、工程机械、管理工程、计算机与自动化,每个专业一册,其他专业视情况再行编撰;内容为各有关专业一般性的科学普及或科学技术文章。第四级内容选收专业性较强的科学技术文章;目前暂出版建筑学与城市规划、工业与民用建筑专业各一册,其他专业留待以后考虑。

我们在组织和编撰《土木建筑系列英语》时,力求使这套读本具有自己的特点。

首先,起点低。这套系列读本的起点为1000个单词。凡初中毕业或具有同等英语程度的读者,都可以从第一级开始自修或听课。这就大大地拓宽读者面,使建筑工程和土木工程行业多数人员有参

件有兴趣利用这套读本来学习英语。

其次，便于学习。编撰的四级读本尽量保持一个较为平缓的“坡度”。全部课文均附参考译文，每个练习都有答案。争取使读者在普通英语的“浅基础”上，一步一步地学会阅读专业英语。通过学习第一、二级读本，可以掌握土建类科技英语最常用的2500个单词以及阅读科技英语书刊和有关资料所必需的基本语法知识。继之，通过学习第三级读本，可以累计掌握本专业最常用的3500个单词和比较系统的英语构词法知识，获得阅读本专业英语书刊和有关资料的能力。最后，通过学习第四级读本，可以累计掌握本专业4500个单词和比较全面的英译汉知识；这样，比较流利地阅读和翻译本专业英语书刊和有关资料，就有了比较牢固的语言基础。

这套系列英语读本第一、二级均配有录音磁带，由英、美文教专家朗诵，口音纯正，声质清晰，语调自然，使读者听来亲切、生动。

第三，适应性强。各级英语读本既彼此衔接，又相对独立，可以适应各种不同程度的读者的需要。一般读者如果从第一级学起，循序渐进，持之以恒，每周自修或听课3~4小时，经过一年半左右，便可学完前三级读本，为阅读本专业英语书刊和有关资料创造条件。有意深造的读者，再用半年左右，攻读第四级读本，就可以达到比较流利地阅读和翻译本专业英语书刊和有关资料的目的。对于英语基础较好的读者，如高等院校高年级学生，可把第一、二级读本作为泛读教材，第三、四级读本作为精读教材来学。对于硕士研究生或具有同等英语程度的工程技术人员，则可直接阅读第三、四级读本；在掌握英语构词法和英译汉技巧方面，这两级读本对他们会有所帮助。而广播电视大学、函大、夜大、职大、业大及有关中等专业学校的学生，也可依照自己的水平和需要，选学有关读本。

第四，语言规范可靠。这套系列读本的全部课文，均选自近年来面世的英语国家的出版物。但为了适应系统地学习英语的需要，

编撰者对不少课文作了必要的删改和加工；而在删改和加工之后，均送各校聘请的英、美文教专家审阅，使之保持规范的科普或科技文体的现代英语的特点。全部练习均由编撰者按统一要求编写，目的在于帮助读者更好地运用课文中重要的语言材料。全部参考译文均由有关专业教师一一校阅，术语比较准确，行文比较通达。

《土木建筑系列英语》读本是集集体智慧的结晶。十几所土木建筑高等院校的五十多位英语教师和专业教师参加了编撰、审订工作，其中某些分册还聘请校外的有关专家过目。哈尔滨建筑工程学院、重庆建筑工程学院、北京建筑工程学院、沈阳建筑工程学院、吉林建筑工程学院、南京建筑工程学院、山东建筑工程学院、西北建筑工程学院、苏州城市建设环境保护学院和河北建筑工程学院等，都对编撰、审订工作表示关怀和支持。各学院聘请的十多位英、美文教专家也提出过宝贵的意见。

本书内容是供热通风与空气调节专业的科普文章。在编撰过程中，承蒙王庆昌、李棣萁审阅，有关教师也给予帮助，对此，我们表示深切的谢意。

目前，尚未见到紧密结合本学科、本专业编撰的系列英语分级读本，我们只是做了初步的尝试。万事开头难。尽管编撰、审订人员做了大量的细致的工作，但这套《土木建筑系列英语》读本还不是尽善尽美，毫无瑕疵的。我们期待着读者和同行们的批评和指正。

《土木建筑系列英语》编审委员会

中国建筑工程工业出版社编辑部

1987年3月8日

Contents

Lesson 1	A Brief History of Heating	1
	Reading Material: The History of Fuels	7
Lesson 2	Solar Energy	10
	Reading Material: Air Temperature	15
Lesson 3	Heating, Ventilation and Air Conditioning	18
	Reading Material: The Design Process for an HVAC System	23
Lesson 4	Electric Heating	25
	Reading Material: Heat Pump	32
Lesson 5	Infrared Heating	34
	Reading Material: Space Heating with Gas-Fired Infrared Heaters	39
Lesson 6	Convection and Conduction	41
	Reading Material: Conduction and Convection	46
Lesson 7	Radiation	48
	Reading Material: Energy	53
Lesson 8	Heat Sources	55
	Reading Material: Heat Sources and Combustion	60
Lesson 9	Natural Gases	63
	Reading Material: Natural Gas and Liquefied Petroleum Gas	69
Lesson 10	Combustion	71

Reading Material: Fundamental Principles of Combustion	77
Lesson 11 What Is Humidity?	79
Reading Material: Effects of Humidity	84
Lesson 12 Fluid Mechanics	86
Reading Material: Behavior of Gases	91
Lesson 13 Laminar and Tubulent Flow	93
Reading Material: Pressure	98
Lesson 14 Pump	100
Reading Material: Types of Pump	106
Lesson 15 Fans	109
Reading Material: Axial-flow Fans and Other Types of Fan	114
Lesson 16 Noise Control	117
Reading Material: Production and Transmission of Sound	122
Lesson 17 The Thermal Effect of Building Materials	125
Reading Material: Effect of Thermal Resistance on Indoor Temperatures	131
Lesson 18 Thermal Properties of Glass	134
Reading Material: Thermal Effect of Windows and Efficiency of Shading Devices	140
Lesson 19 Thermal Insulation	142
Reading Material: Prevention of Damage from Condensation	147
Lesson 20 Smell	150
Reading Material: Thermal Comfort Ventilation	156
Lesson 21 The Cleaning of Air	158
Reading Material: Odour	163

Lesson 22	Human Requirements for Comfort	165
	Reading Material: Comfort and Health	170
Lesson 23	Ventilation	172
	Reading Material: Necessity for Ventilation	178
Lesson 24	Industrial Ventilation	180
	Reading Material: Ventilation Functions and Requirements	186
Lesson 25	Vertical Location of Windows	188
	Reading Material: Design Factors Affecting Ventilation	194
Lesson 26	Air-Conditioning	196
	Reading Material: Airconditioning of Laboratories ...	202
Lesson 27	The Cooling Load	204
	Reading Material: Outdoor Design Conditions	209
Lesson 28	Heating and Cooling of Buildings by Natural Energies—An Overview	211
	Reading Material: The Flat Plate Collector	216
Lesson 29	Windows as Solar Collector	218
	Reading Material: Cooling of Buildings by Natural Energies	224
Lesson 30	Role of Specifications in Construction	226
	Reading Material: Types of Specifications	233
Appendix I.	Key to Exercises	235
Appendix II.	Translation for Reference	241
Appendix III.	Vocabulary	272
Appendix IV.	Phrases and Expressions	286

Lesson 1

A Brief History of Heating

The originator of home heating was probably the Stone Age Man. With his primitive ways, the Stone Age Man had no means of producing heat for himself. He had to depend on nature to provide a means of keeping warm or a method of cooking food. This came in the form of lightning which started dried leaves or wood burning^①. Lightning, therefore, is akin to the modern electric ignitors used on modern heating units.

Archeologists have lamps that have been traced back thousands of years. Some of these lamps were made like bowls while^② others were made from human skulls. These crude lamps were used by prehistoric artists in old caves where they made etchings on the cave walls. They produced light to work by^③ and enough heat to warm the artists' hands during the cold season. The fuel for the lamps was animal fat, with wicks made from dried moss, twisted into ropelike strands^④. By slightly stretching the imagination, this could be called the first oil burner.

The first central heating units were put to use by the ancient Romans and Chinese. Not wanting to get their magnificent castles dirty with soot^⑤, the Romans built a furnace pit, beneath the buildings. The heat would penetrate the castles through a 12 or 14 inch floor and thus heat their homes with the first man-made radiant heating systems.

The Chinese approached the matter in a more advanced way. They built ovens with air passages beneath their homes and installed warm air pipes to the rooms to be heated.^⑥ In the bedrooms, the beds were placed directly over the outlets. In

this manner, the Chinese heated their homes with the first central warm air systems.

Chimneys came into being in the twelfth century. With the chimney came the fireplace^⑦ and the fuel was burned within the area to be heated, providing better use of the heat giving source. They were, however, very expensive at first and only a few buildings were equipped with them. The chimney and fireplace removed smoke, smells, and a good deal of heat from the home. When burning, they created such a draft that special furniture was designed to protect the occupants.

Ben Thompson helped to lessen the draft problem by building a restrictor, or throat^⑧, in the chimney. The restriction slowed down the burning and allowed more of the heat to be put into the room. Ben Franklin improved on the restrictor by adding a path for the smoke that made it go through the restrictor, then down behind the fireplace, below the hearth, then out the chimney, thereby making greater use of the fuel.^⑨

The early common fuels for fireplace use were wood, peat, and charcoal. Shepherds burned dried manure and in some cases dried bones. Coal was recognized as a fuel long ago. However, it was not allowed to be used as an ordinary fuel. People were executed in England for burning coal. In the fourteenth century, the forests in England were diminishing so rapidly that Parliament asked the king to change the law governing the burning of coal and allow its use as a fuel. However, it was Queen Elizabeth I who actually passed the act to conserve the forest and allow coal to be put to use.^⑩

New Words

- | | |
|---|--|
| 1. originator [ə'ridʒineɪtə] <i>n.</i> 发起者, 创始人 | 质的 |
| 2. primitive ['prɪmɪtɪv] <i>a.</i> 原始的 | 4. ignitor [ɪg'nəɪtə] <i>n.</i> 点火装置 |
| 3. akin (to) [ə'kɪn] <i>a.</i> 与...同性 | 5. archeologist [ˌɑːki'ələdʒɪst] <i>n.</i> 考古工作者 |

6. trace [treis] *v.* 追踪,追溯
 7. skull [skʌl] *n.* 头盖骨
 8. prehistoric [ˌpri:hi'stɔrik] *a.* 史前的
 9. etching ['etʃɪŋ] *n.* 蚀刻画
 10. wick [wik] *n.* 灯芯
 11. moss [mɒs] *n.* 苔、藓
 12. twist [twɪst] *v.* 拧、搓、捻
 13. strand [strænd] *n.* 条、缕
 14. magnificent [mæg'nɪfɪsənt] *a.* 壮丽的
 15. castle ['kɑ:sl] *n.* 城堡
 16. soot [sut] *n.* 烟灰
 17. pit [pɪt] *n.* 坑
 18. penetrate ['penɪtreɪt] *v.* 穿过
 19. radiant ['reɪdɪənt] *a.* 辐射的
 20. oven ['ʌvn] *n.* 炉子
 21. outlet ['aʊtlet] *n.* 出口,出路
 22. fireplace ['faɪəpleɪs] *n.* 壁炉
 23. draft [dra:ft] *n.* 通风、抽气
 24. occupant ['ɒkjʊpənt] *n.* 居住者
 25. lessen ['lesn] *v.* 减轻
 26. restrictor [rɪs'trɪktɔ] *n.* 节流器
 27. throat [θrəʊt] *n.* 咽喉
 28. hearth [hɑ:θ] *n.* 炉床
 29. thereby ['ðeə'baɪ] *ad.* 藉以
 30. peat [pi:t] *n.* 泥炭
 31. charcoal ['tʃɑ:kəʊl] *n.* 木炭
 32. shepherd ['ʃepəd] *n.* 放牧人
 33. manure [mə'njuə] *n.* 粪
 34. execute ['eksɪkju:t] *v.* 处死
 35. diminish [dɪ'mɪnɪʃ] *v.* 减少
 36. parliament ['pɑ:ləmənt] *n.* 议会,国会
 37. forest ['fɒrɪst] *n.* 森林
- the Stone Age Man 石器时代的人
 Ben Thompson 本·汤普森
 Ben Franklin 本·富兰克林
 Queen Elizabeth I 女王伊利沙白一世

Phrases and Expressions

1. have no means of + ing 无法 (做)
2. start (M) + ing 使(M)开始(做)
3. warm air pipe 热风管道
4. in this manner 照这样
5. come into being 出现,产生
6. a good deal of 大量的
7. improve on (对...加以)改进

Notes

- ① This came in the form of lightning which started dried leaves or wood burning.

This 指代前句中的 means; in the form of lightning (以闪电的形式)在句

中作状语。

② while 并列连词,意为:而

③ by 副词,意为:在旁边。

④ The fuel for the lamps was animal fat, with wicks made from dried moss, twisted into ropelike strands.

“with + n. 分词(等)”是一个常见的短语结构,其中的名词和后面的分词之间存在着逻辑上的主谓关系。意为:灯芯是用干苔藓搓成绳子条做的。

⑤ Not wanting to get their magnificent castles dirty with soot,
现在分词短语作原因状语, to get 意为:使,后面为复合宾语。该短语应译为,
因为不愿使他们富丽堂皇的城堡被烟灰熏黑。

⑥ ... the room to be heated

动词不定式的被动形式作 rooms 的后置定语。意为:需要采暖的房间。

⑦ With the chimney came the fireplace and the fuel was burned within the area to be heated, providing better use of the heat giving source.

came 作谓语, the fireplace 是主语,该句为倒装句。

providing ... 分词短语作结果状语。

the heat giving source = the source which gives heat

⑧ , or throat, or 引导同位语,意为:即

⑨ Ben Franklin improved on the restrictor by adding a path for the smoke that made it go through the restrictor, then down behind the fireplace, below the hearth, then out the chimney, thereby making greater use of the fuel.
down, below, out 前面均省略了动词 go。

⑩ However, it was Queen Elizabeth I who actually passed the act to conserve the forest and allow coal to be put to use.

这是一个强调句型,其结构为:

“it is (was) + 被强调部分 + that (who, which) + 其它部分”

Exercises

I. Comprehension

1. Home heating was first used by

A. Romans.

B. Chinese.

C. the Stone Age Man.

2. In old caves, prehistoric artists used lamps to _____.

A. warm their hands during the cold season

- B. stretch their imagination
 - C. make etchings on the cave walls
3. According to the text,
 - A. chimney and fireplace were good enough: they provided better use of the heat source, moreover, they were cheap.
 - B. chimney and fireplace removed smoke from the room, and at the same time, they also removed some heat from it.
 - C. chimney and fireplace removed not only smoke and smells, but also a good deal of heat from the home.
 4. In early times, fireplaces were often fueled with
 - A. wood.
 - B. coal.
 - C. dried bones.
 5. Coal was recognized as a fuel long ago,
 - A. and it was used as a fuel immediately.
 - B. but burning coal was not allowed at first.
 - C. but only the king could use it as a fuel.

II. Put in the right word

outlets draft radiant prehistoric lessen magnificent fireplace

1. When burning, the chimney and fireplace created such a _____ that special furniture was designed to protect the occupants.
2. These crude lamps were used by _____ artists in old caves where they made etchings on the cave walls.
3. He helped to _____ the draft problem by building a restrictor, or throat, in the chimney.
4. Not wanting to get their _____ castles dirty with soot, the Romans built a furnace pit beneath the buildings.
5. With the chimney came the _____.
6. The heat would penetrate the castles through a 12 or 14 inch floor and thus heat their homes with the first man-made _____ heating systems.
7. In the bedrooms, the beds were placed directly over the _____.

III. Word Building

The prefixes "re-" and "pre-" can be added to many roots or words to alter their meaning. "Re-" means "back" or "again"; "Pre-" means "before in time or order; preceding; prior to; in front of".

Match each word in column A with a definition in column B.

A

1. return
2. prepare
3. refresh
4. prehistoric
5. reunite
6. review
7. refuel
8. prefix
9. present

B

- a. of the time before recorded history
- b. make fresh
- c. send back
- d. get ready
- e. offer
- f. placed in front of a word to add to or change its meaning
- g. supply with, take on, a fresh quantity of fuel
- h. bring or come together again
- i. consider or examine again

Reading Material

The History of Fuels

Gas, the most popular of the modern fuels, was first used in the western world by balloonists. Pilatre de Rozier, the leading balloonist of France at the time, attempted to cross the English Channel in a combination airship that included a hot-air fire balloon connected with a gas balloon. In June 1785, high over the French coast, the airship exploded. All passengers were sent to a fiery death. Because of this incident, gas became known as a mysterious and powerful source of energy. Man did not devise a means for controlling gas until many years later.

Fuel oil began to be recognized about 1860 as a plentiful source of energy for economical heating. In 1861, Werner, a mechanic, developed the first oil burner. In his invention, oil was trickled over preheated plates where it turned into a vapor and could be readily ignited. This method is not too different from modern pot-type oil burners. In 1863, the first pressure-type spray oil burner was introduced by Brydges Adams.

Fuel oil, however, was not advancing alone. Coal was also making great strides in comfort heating. Living room stoves were being moved to the basement. The home was heated with ducts, pipes and radiators. All of these devices, together with the advancements which made it cleaner to use coal, helped to bring about practical central heating in the nineteenth century. The man of the household shook the grate and stoked the furnace in the morning and again in the evening. However, the pipes, ducts, and registers were an eyesore in the decor of the home. Because the design of the ducts was difficult and the home could not be evenly heated, steam boilers and radiators became more popular. However, the noise accompanying these early radiators made