高等学校试用教材

建筑类专业英语

暖通与燃气 （第三册）

English in Architecture and Construction

周保强 张少凡 主编

中国建筑工业出版社

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本书按国家教委颁发的《大学英语专业阅读阶段教学基本要求》编写的专业阅读教材。本册包括有关供热工程、空气调节、燃气工程、工业通风、锅炉、制冷工程等的设备介绍、系统设置、维护管理及施工安装等内容。全书安排16个单元，每单元除正课文外，还配有两篇阅读材料，均附有必要的注释。正课文还配有词汇表和练习，书后附有总词汇表、参考译文和练习答案。语言难度大于第一、二册，并配有科技英语写作的简要说明与写作练习。

本书供本专业四年级上半学期使用。也可供建筑行业有关人员自学英语参考。

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前　　言

经过几十年的探索，外语教学界许多人认为，工科院校外语教学的主要目的，应该是："使学生能够利用外语这个工具，通过阅读去获取国外的与本专业有关的科技信息。"这既是我们建设有中国特色的社会主义的客观需要，也是在当前条件下工科院校外语教学可能完成的最高目标。事实上，教学大纲规定要使学生具有"较强"的阅读能力，而对其他方面的能力只有"一般"要求，就是这个意思。

大学本科的一、二年级，为外语教学的基础阶段。就英语来说，这个阶段要求掌握的词汇量为2400个（去掉遗忘，平均每个课时10个单词）。加上中学阶段已经学会的1600个单词，基础阶段结束时应掌握的词汇量为4000个。仅仅掌握4000个单词，能否看懂专业英文书刊呢？还不能。据统计，掌握4000个单词，阅读一般的英文科技文献，生词量仍将有6%左右，即平均每百词有六个生词，还不能自由阅读。国外的外语教学专家认为，生词量在3%以下，才能不借助词典，自由阅读。此时可以通过上下文的联系，把不认识的生词猜出来。那么，怎么样才能把6%的生词量降低到3%以下呢？自然，需要让学生增加一部分词汇积累。问题是，要增加多少单词？要增加哪一些单词？统计资料表明，在每一个专业的科技文献中，本专业最常用的科技术语大约只有几百个，而且它们在文献中重复出现的频率很高。因此，在已经掌握4000单词的基础上，在专业阅读阶段中，有针对性地通过大量阅读，扩充大约1000个与本专业密切有关的科技词汇，便可以逐步达到自由阅读本专业科技文献的目的。

早在八十年代中期，建设部系统院校外语教学研究会就组织编写了一套《土木建筑系列英语》，分八个专业，共12册。每个专业可选读其中的三、四册。那套教材在有关院校相应的专业使用多年，学生和任课教师反映良好。但是，根据当时的情况，那套教材定的起点较低（1000词起点），已不适合今天学生的情况。为此，在得到建设部人事教育劳动司的大力支持，并征得五个相关专业指导委员会同意之后，由建设部系统十几所院校一百余名外语教师和专业课教师按照统一的编写规划和要求，编写了这一套《建筑类专业英语》教材。

《建筑类专业英语》是根据国家教委颁发的《大学英语专业阅读阶段教学基本要求》编写的专业阅读教材，按照建筑类院校共同设置的五个较大的专业类别对口编写。五个专业类别为：建筑学与城市规划；建筑工程（即工业与民用建筑）；给水排水与环境保护；暖通、空调与燃气；建筑管理与财务会计。每个专业类别分别编写三册专业英语阅读教材，供该专业类别的学生在修完基础阶段英语后，在第五至第七学期专业阅读阶段使用，每学期一册。

上述五种专业英语教材语言规范，题材广泛，覆盖相关专业各自的主要内容：包括专业基础课，专业主干课及主要专业选修课，语言材料的难易度切合学生的实际水平；词汇

以大学英语“通用词汇表”的4000个单词为起点，每个专业类别的三册书将增加1000～1200个阅读本专业必需掌握的词汇。本教材重视语言技能训练，突出对阅读、翻译和写作能力的培养，以求达到《大学英语专业阅读阶段教学基本要求》所提出的教学目标：“通过指导学生阅读有关专业的英语书刊和文献，使他们进一步提高阅读和翻译科技资料的能力，并能以英语为工具获取专业所需的信息。”

《建筑类专业英语》每册16个单元，每个单元一篇正课文（TEXT），两篇副课文（Reading Material A&B），每个单元平均2000个词，三册48个单元，总共约有十万个词，相当于原版书三百多页。要培养较强的阅读能力，读十万词的文献，是起码的要求。如果专业课教师在第六和第七学期，在学生通过学习本教材已经掌握了数百个专业科技词汇的基础上，配合专业课程的学习，再指定学生看一部分相应的专业英语科技文献，那将会既促进专业课的学习，又提高英语阅读能力，实为两得之举。

本教材不仅适用于在校学生，对于有志提高专业英语阅读能力的建筑行业广大在职工程技术人员，也是一套适用的自学教材。

建设部人事教育劳动司高教处和中国建设教育协会对这套教材的编写自始至终给予关注和支持；中国建筑工业出版社第五编辑室密切配合，参与从制定编写方案到审稿各个阶段的重要会议，给了我们很多帮助；在编写过程中，各参编学校相关专业的许多专家、教授对材料的选取、译文的审定都提出了许多宝贵意见，谨此致谢。

《建筑类专业英语》 是我们编写对口专业阅读教材的又一次尝试，由于编写者水平及经验有限，教材中不妥之处在所难免，敬请广大读者批评指正。

《建筑类专业英语》
编审委员会

Contents

UNIT ONE

Text Heat Transmission and Distribution Systems

[1] Heat is transported from the heat production plant to the heat demand centre, which may be some distance away, in the heat transmission pipeline. ① Transmission system costs are a function of distance and the quantity of heat transmitted, which in turn is determined by the temperature difference and the flow rate of the heat transmission medium. The quality(thickness)of the piping is a function of the water pressure, while the pipe diameter at a given heat load is a function of the flow rate and the temperature difference.

[2] Many large power stations are located remote from the centres of population for reasons of economy, environmental protection, fuel (such as coal) accessibility and storage etc. Thus, while the heat available at large power stations may technically be recovered for district heating and may match the heat demand of a large city, the cost of the transmission line can be prohibitive. At present the maximum economically viable transmission distance is up to 30 km for hot water and 3-5 km for steam, depending on the heat load and fuel prices. Some studies have shown that hot water transmission over distances above 30 km can be economically attractive. Because of the load and demand limitations already referred to, on an economic basis the number of potential applications is limited. In many circumstances it may be more economic to construct new heat production units at short distances from the demand centre than to construct a long transmission line. ②

[3] Depending on the terrain covered by the water transmission line, pumping stations may be required to maintain the pressure drop between the supply and return pipelines. Where possible the piping is constructed above ground to reduce costs.

[4] To date, the most common piping systems have involved steel piping laid inconcrete ducts, although steel pipe-in-pipe systems or steel-in-plastic piping systems have been used in special cases. Pre-fabricated pipes, using polyurethane foam as insulation, can be cost-effective, but must be utilized within certain temperature constraints. Insulation material can be rock, mineral or glass wool, fibre glass, polyurethane foam (sometimes combined with glass wool), or calcium silicate.

[5] Heat is distributed from the main transmission line to the consumer, sometimes directly to the consumer's in-house heat distribution system and sometimes through a heat exchanger to the consumer's in-house distribution system. In some cases the primary distribution grid is interfaced through a heat exchanger with a secondary distribution grid which feeds directly to consumer installations.

[6] The cost of hot water heat distribution, which includes pumping as well ascontrol systems in the local heat network, depends on a number of factors, in cluding; the heat demand density; the supply and return temperatures; the charac teristics of the terrain and

the local infrastructure; and whether the development is new or involves retrofitting. ③

[7] The temperature in the piping system has an important influence on the cost of distribution per unit length. Generally, the lower the temperature range within which the system operates, the lower the cost of piping. This arises simply because less costly piping and insulation materials are required. At the same time cost is heavily dependent on the heat demand density. The greater the heat density the lower the distribution cost.

[8] Lower return temperatures can be achieved by serial connection of space heating and hot water devices, by use of low-temperature heating devices and particularly by using thermostatic valves on the in-house heating devices. The latter control the temperature of hot water leaving the radiator or other heating device. In these cases the in-house heating surface may, however, need to be increased, at some cost.

[9] Increasing supply temperatures and pressures result in thicker gauge pipes, sturdier valves and higher insulation levels and therefore lead to increased costs. Installation costs also tend to be greater. A further factor with an extraction turbine system is that electricity output decreases as the extraction temperature (i.e., the district heating supply temperature) increases, resulting in greater fuel consumption to provide the same energy output. ④ This is an important consideration in determining the overall economic attractiveness of a combined production system.

[10] One of the most important factors is whether the district heating system is being constructed as a new development or as a retrofit development. For the former, costs are much lower and disruption of traffic, pedestrians etc., can be minimized. For a retrofit situation, particularly in older towns and cities, costs can be prohibitive and the degree of disruption can be significant.

New Words and Expressions

accessibility [ækˌsesiˈbiliti]	*n.*	可及性
prohibitive [prəˈhibitiv]	*a.*	过高的而不能
viable [ˈvaiəbl]	*a.*	有生存力的，可行的
terrain [ˈterein]	*n.*	地形
duct [dʌkt]	*n.*	管，沟（波道）
pre-fabricated [priːˈfæbrikeitid]	*a.*	预制的
cost-effective [ˈkɔstəˈfektiv]	*a.*	成本可行的
polyurethane * [ˌpɔliˈjuəriθein]	*n.*	聚氨酯
foam [fəum]	*n.*	泡沫
constraint [kɔnˈstreint]	*n.*	限制范围，约束
calcium * [ˈkælsiəm]	*n.*	钙
silicate [ˈsilikit]	*n.*	硅酸盐
grid [grid]	*n.*	线路网，管网

interface [ˈintə (:) feis] v. 连接
infrastructure [ˈinfrəˌstrʌktʃə] n. 下部（低层）结构
thermostatic [θəːməsˈtætik] a. 恒温的
retrofit * [ˈretrəfit] n. 重建，式样翻新
sturdy * [ˈstəːdi] a. 坚实的
valve [vælv] n. 阀门
extraction [iksˈtrækʃən] n. 抽出
turbine * [ˈtəːbin] n. 涡轮机
minimize [ˈminimaiz] vt. 使…成极小
pedestrian [piˈdestriən] n. 步行者，行人

Notes

①which 引导一个非限制性定语从句，修饰 heat demand centre；本段另一…which…同样引出非限制性定语从句，which 的先行词是 the quantity of heat transmitted。

② In many … a long transmission line. 句中 than 引出比较状语，是 to construct new heat production units at short distances 与 to construct a long transmission line 比较。

③ The cost of …, depends on … retrofitting. 句中 depends on 是谓语动词；the heat demand density; the supply and return temperatures; the characteristics of the terrain and the local infrastructure; 三个短语以及 whether the development is new or involves retrofitting 从句并列作 including 的宾语。

④ with an extraction turbine system 介词短语做定语修饰前面的 factor；that 从句是表语从句；resulting in … 分词短语是结果状语。

Exercises

Reading Comprehension

Ⅰ. Say whether the following statements are true (T) or false (F) according to the text.

1. Many large power stations are located very near to the center of population for many reasons. ( )
2. In many circumstances it may be more expensive to construct new heat production units at short distance from the demand centre than to construct along transmission line. ( )
3. Heat is distributed from the main transmission line directly to the consumer's in-house distribution system or through a heat exchanger to the consumer's in-house distribution system. ( )
4. The greater the heat density the less the cost of heat distribution. ( )

5. For a district heating system retrofitting a development costs less than con-structing a new development in. ( )

Ⅱ. Fill in the table with the information given in the text.

Items	Relations
1. Transmission system costs are	a function of
2. The quality of the piping is	a function of
3. The pipe diameter at a given heat load is	a function of

Ⅲ. Find out the factors that influence the cost of hot water heat distribution.

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________

Vocabulary

Ⅰ. Find words in the text which mean almost the same as the following.

1. the state or quality being able to be reached or got
2. able to exist, capable of living
3. mechanical device for controlling the flow of air, liquid, or gas through a tube or a pipe by opening or closing a passage
4. reduce to smallest possible amount or degree
5. being forbidden or too expensive

Ⅱ. Now use the words you have found to fill in the gaps in the sentences. Change the form if necessary.

1. The inferior products can be ______ if the workers work carefully.
2. They are going to make a survey of the ______ of raw materials for the nearly-built plant.
3. Do you think this small creature is ______ under such a low temperature?
4. A boiler of high pressure usually has a safety ______ on it.
5. Smoking is ______ in most public places.

Ⅲ. Choose one of the four choices that best completes the following definitions.

1. ______ is a kind of engine or motor whose driving-wheel is turning by a cur-rent of water.

   a. Fan　　b. Wind-wheel　　c. Motor-bike　　d. Turbine

2. ______ means hard or firm.

   a. Study　　b. Sturdy　　c. Sticky　　d. Still

3. Calcium silicate is a kind of ______ compound.

a. technical　　b. physical　　c. metal　　d. chemical

4. Retrofit means ______ .

a. renovate　　b. retire　　c. retreat　　d. return

5. Polyurethane foam is called ______ in Chinese.

a. 聚酯皂　　b. 泡沫聚酯　　c. 聚酯泡沫　　d. 聚氨酯泡沫

Writing　　Selecting the Key Words (1)

I. Key words are informative words that can give the information about what a piece of writing is mainly talking about. They are often nouns and verbs, etc. For Example: Read the following text and find out the key worlds:

With the rapid industrialization of the States, air pollution is posing a problem. Fertilizer and steel plants, thermal power plants and paper mills are among the units which cause air pollution.

Automobiles also cause air pollution as they emit smoke which contains hydrocarbon, nitrous oxide and carbon monoxide.

The Air Act was passed in Congress 1982 and came into effect in 1983.

Key words:

Air pollution, Pollutant, Air Act

Directions: Read the text of this Unit and find out three to five key words.

Reading Material A

Infiltration Heat Loss

During the heating season, a portion of heat loss is due to the infiltration of cooler outside air into the interior of the structure through cracks around doors and windows and other openings that are not a part of the ventilating system. ① The amount of air entering the structure by infiltration is important in estimating the requirements of the heating system, but the composition of this air is equally important.

A pound of air is composed of both dry air and moisture particles, which are combined (not mixed) so that each retains its individual characteristics. ② The distinction between these two basic components of air is important because each is involved with a different type of heat: dry air with specific heat, and moisture content with latent heat.

The heating system must be designed with the capability of warming the cooler infiltrated dry air to the temperature of the air inside the structure. The amount of heat required to do this is referred to as the sensible heat loss, and is expressed in Btuh. The two methods used for calculating heat loss by air infiltration are: (1) the crack method and (2) the air-change method.

The Crack Method. The crack method is the most accurate means of calcu lating heat loss by infiltration because it is based on actual air leakage through cracks around windows and doors and takes into consideration the expected wind velocities in the area in which the structure is located. ③ The air-change method (see below) does not consider wind velocities, which makes it a less accurate means of calculation.

Calculating heat loss by air infiltration with the crack method involves the following basic steps:

1. Determine the type of window or door.
2. Determine the wind velocity and find the air leakage.
3. Calculate the lineal feet of crack. ④
4. Determine the design temperature difference.

The data obtained in these four steps are used in the following formula:

$$H = 0.018 \times Q(t_i - t_0) \times L$$

where H = heat loss, or heat required to raise the temperature of air leaking into the structure to the level of the indoor temperature (t_i) expressed in Btu per hour.

Q = volume of air entering the structure expressed in cubic feet per hour (Step 2 above).

t_i = indoor temperature

t_0 = outdoor temperature

0.018 = specific heat of air (0.240) times density of outdoor air (approximately 0.075)

L = lineal feet of crack

Determine the infiltration heat loss per hour through the crack of a 3 ft. × 5 ft. average double-hung, non-weather-stripped, wood window based on a wind velocity of 20 mph. The indoor temperature is 70℉, and the outdoor temperature 20℉.

The air leakage for a window of this type at a wind velocity of 20 mph is 59 cu. ft. per foot of crack per hour. This will be the value of Q in the air infiltration formula.

Air-Change Method. In the air-change method, the amount of air leakage (i.e., infiltration) is calculated on the basis of an assumed number of air changes per hour per room. The number of air changes will depend upon the type of room and the number of walls exposed to the outdoors.

Notes

①在供热季节，部分热损失是由于外部较冷空气通过门窗缝隙以及其他不是通风系统组成部分的孔洞渗入建筑物内部而引起的。

②空气是由干燥空气和潮湿粒子构成，两者是结合（不是混合），这样各自保留自己的特征。
③缝隙法是通过渗透计算热损失的最精确的手段，因为它是以透过门窗周围缝隙的实际空气渗漏为基础的并考虑了建筑物所在区域的预期风速而求解的。
④lineal feet of crack：缝隙的线英尺。

Reading Material B

Cast-iron Radiators

A cast-iron radiator is a heat-emitting unit that transmits a portion of its heat by radiation and the remainder by convection. An exposed radiator (or freestanding radiator) transmits approximately half of its heat by radiation, the exact amount depending on the size and number of the sections. The balance of the emission is by conduction to the air in contact with the heating surface, and the resulting circulation of the air warms by convection.[①]

Cast-iron radiators have been manufactured in column and tubular types, Column and large-tube radiators (with 2.5 -in. spacing per section) have been discontinued. The small-tube radiator with spacings of 7/4-in. per section is now the prevailing type.[②] Ratings for various cast-iron radiators are given in handbook of the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

Wall and window radiators are cast-iron units designed for specific applications. Wall radiators are hung on the wall and are especially useful in installations where the floor must remain clear for cleaning or other purposes. Window radiators are located beneath a window on an exterior wall. The heat waves radiating from the surface of the unit provide a very effective barrier against drafts.[③]

Attempts to improve the appearances of cast-iron radiators by painting them, covering them, or recessing them in walls also succeed in reducing their heating efficiency.[④] An unpainted, uncovered, freestanding radiator is always more efficient.

Radiator Piping Connections

The important thing to remember when connecting a radiator is to allow for movement of the risers and runouts. This movement is caused by the expansion and contraction resulting from temperature changes in the piping.

Radiator Efficiency

Radiator efficiency is important to the operating characteristics of the heating system. The following recommendations are offered as a guide for obtaining higher radiator operating efficiency:

1. A radiator must be level for efficient operation. Check it with a carpenter's level. Use wedges or shims to restore it to a level position.

2. Make sure the radiators have adequate air openings in the enclosure or cover. The openings must cover at least 40 percent of the total surface of the unit.

3. Unpainted radiators give off more heat than painted ones. If the radiator is painted, strip the paint from the front, top, and sides. The radiator will produce10 to 15 percent more heat at a lower cost.

4. Check the radiator air valve, If it is clogged, the amount of heat given off by the radiator will be reduced. Instructions for cleaning air valves are given in "Troubleshooting Radiators".

5. Radiators must be properly vented, This is particularly true of radiators located at the end of long supply mains. Instructions for venting radiators are given in "Vents and Venting".

6. Never block a radiator with furniture or drapes. Nothing should block or impede the flow of heat from the radiator.

7. Placing sheet metal or aluminum foil against the wall behind the radiator will reflect heat into the room.

Notes

①热量散发是通过向与散热表面接触的空气传热以及由此而引起的空气循环而达到的。
②每节有 7/4 英寸间隙的小管散热器是现在盛行的样式。
③来自该装置表面的热波辐射提供了对气流非常有效的障碍。
④试图通过给它们上油漆、加罩来改善铸铁散热器的外观或者把它们放置于墙上凹处确实减少了它们的供热效率。

UNIT TWO

Text　　Exhaust Hoods

[1]　Exhaust hoods are collectors in local extraction systems, usually of pyramidal or conical shape, mounted above or at the side of the source of impurity. ① They are very widely used, much more than they deserve, for it is exceptional to find one that is fully effective in operation.

[2]　With an extract hood there is always an unbounded space between the source of the impurity and the hood itself. ② Hence the surrounding air can flow over the source and in certain conditions deflect the impurity away from the hood. Exhaust hoods therefore have a much greater air consumption than ventilated chambers.

[3]　The various kinds of hood may be classified as simple, active, individual and grouped (glazed frames suspended from the ceiling), Fig. 2-1 shows a simple individual hood (*a*), a hood above the charging port of a furnace (*b*), an active hood with slits around its perimeter (*c*), a hood with a supply of air on both sides of a work table (*d*), and a multiple hood with its glazed casement (*e*) . Other kinds of hood will be mentioned in connection with local exhaust for dust removal. The system of extraction may be natural or mechanical. In either case the hood is brought as close as possible to the source of impurity. Hoods located above the source are usually placed 1.8 to 2 m from floor-level for clear head-room while being yet close to the breathing zone. ③

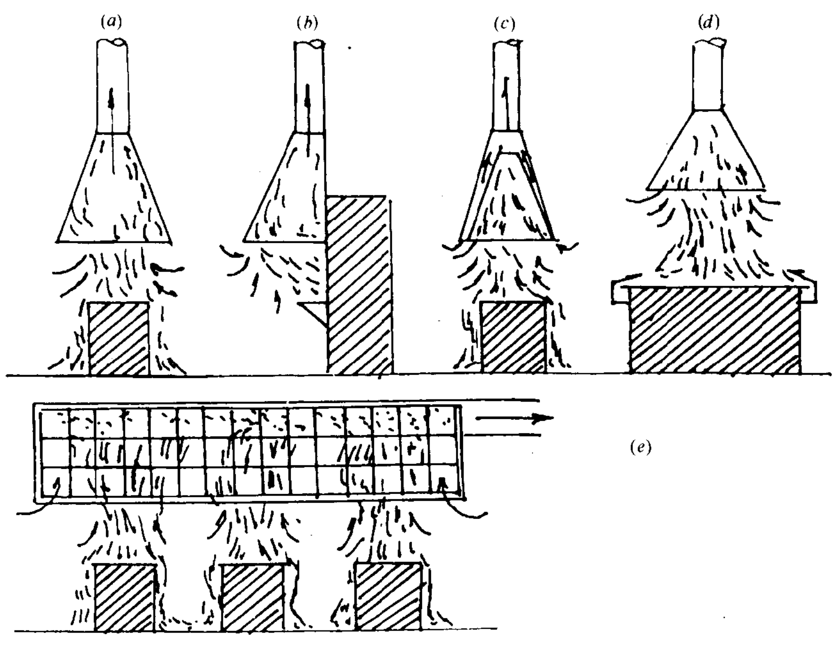

Fig. 2-1

[4] When more contaminated air collects under the hood than can be removed by it, the air flows from under the brim and contaminates the work area. ④ In this case it would be much better if there were no hood at all because if the density of the contaminated air were less than that of the surrounding air, it would rise and when eventually it returns to the work area due to circulation, it would then be more diluted and less contaminated than when it left the over-filled hood. ⑤

[5] Exhaust hoods are effective when the rates of suction into the space between the source and the canopy are sufficient to trap all the impurity beneath the hood. The suction rate must also overcome the cross-currents of indoor air which could deflect the stream of impurity away from the hood. The suction rate should be quite uniform over the entire plane of the hood inlet. The effectiveness of a hood therefore depends essentially on its shape.

[6] In long low hoods it is impossible to achieve uniform suction. It was established in another chapter that for uniformity of suction the angle at the apex of the hood should not exceed 60°.

[7] When an ascending current of contaminated air forms above the source of the impurity it entrains with it a large volume of the surrounding air on its way into the canopy. For effective operation the quantity of air withdrawn should not be less than that of the rising stream of air, otherwise contaminated air must overflow from the hood into the building.

[8] One can illustrate this by the following example, which also shows the real difference between a hood and a chamber. Fig. 2-2 shows a rectangular chamber with a hood inside; a suction fan is connected to pipe 2, and only as much air enters through the opening 1 as is sucked out through 2. ⑥ If the base of the hood is flush with hole 1, all the air entering through 1 also enters the hood and is removed.

[9] Suppose we now move the hood some distance away from the inlet 1. The air entering through the opening is then augmented by some of the surrounding air which it entrains. But since pipe 2 will only remove the initial quantity of air which came in through the inlet, a quantity of air equal to that entrained will flow out of the entry to the hood into the chamber.

[10] Hoods with natural ventilation can be effective only if the general ventilation of the building is suitably arranged. Otherwise it is possible that air will flow into the hood from outside instead of contaminated air blowing out.

[11] The advantage of multiple hoods in the form of glazed casements hanging from the ceiling is that they are more capacious than individual hoods. Owing to their greater size, they are also less affected by cross-currents than individual hoods. They are more pleasing in appearance and they do not darken the building. At the time of maximum pollution, they are often large enough to store the impurities for short periods of time without overspill. This accumulation is eventually removed by a system designed for the average rate of contamination.