

江苏科学技术出版社

工业与民用建筑
专业英语

A Technical
English Reader
For Civil Engineering
Students

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专 业 英 语

金芷生 程文淩 张寿庠 编

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前 言

马克思有句名言：“外国语是人生斗争的一种武器。”现在世界上每年发表的科学论文大约有五百万篇，登记的发明专利超过三十万项，平均每天发表科学论文一万三千多篇，其中新发明八百多项。从这里我们不难理解学习、掌握科技外语对四化建设的重要意义。对于工程技术人员及大专院校的学生来说，在掌握了基础英语之后，应进一步提高阅读和翻译英语专业书刊的能力。为此我们选编了这本工业与民用建筑专业英语教材。

本书选材于近年英美科技书刊，题材广泛，内容涉及理论力学、材料力学、结构力学、钢筋混凝土结构、钢结构、工程材料、工程测量、基础、建筑施工和建筑经济等学科，并有数篇科技书籍的序言。全书选编科技文章35篇，每篇附有注释、词汇及参考译文，前25篇可作为课堂教学教材，后10篇作为机动教材或自学材料。另外南京工学院电化教学中心还为本书配有录音磁带。

本书可作为大专院校土木建筑专业的教材或自学阅读材料，也可供从事土建工作的管理干部、工程技术人员作为提高专业英语阅读能力的辅助读物。

本书曾作为教材多次使用，这次出版又进行了反复的修改，但难免挂一漏万。不妥之处，欢迎批评指正。

中国人民解放军工程兵工程学院汪礼彤老师对全书的编写工作给予了很多指导，并进行了审校。南京工学院张娟同

志协助部分工作，在此表示衷心的感谢。

编者

1985年4月于南京工学院土木工程系

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Lesson 1

Loads on Structures

Houses, apartment buildings, factories, theaters, stadiums, warehouses, bridges, and dams are some of a wide variety of structures. What loads act on these structures during their lifetime?

Dead Load

Vertical load due to the weight of a structure itself (such as walls, floors, and roofs) and other bodies permanently attached to it during the entire life of a structure is called the dead load.

We calculate the dead load of a structural element by multiplying its volume by the weight per unit volume, or the unit weight of its material. Let the volume of the element be V and the unit weight of its material γ ; then the dead load W is given by

$$W = V\gamma$$

Volume V is measured in cubic feet (ft^3) or cubic meters (m^3); the units of unit weight are pounds per cubic foot (lb/ft^3) or newtons per cubic meter (N/m^3).

Thus the dimension of W is **lbs** or **newtons**:

$$\text{ft}^3 \times \frac{\text{lb}}{\text{ft}^3} = \text{lb} \qquad (\text{m}^3 \times \frac{\text{N}}{\text{m}^3} = \text{N})$$

Unit weights of some basic construction materials are given in Table A-1 (see Appendix).

Live Load

In addition to their dead load, structures support the loads due to their use and occupancy. These include the weight of furniture and people in houses, apartments, schools, and offices; the weight of goods in warehouses; the weight of vehicles on bridges; water flowing in the aqueduct; and so on. Such load is called the live load. Live loads on buildings according to their use or occupancy are given in building codes. Data found in the Uniform Building Code represent observations, measurements, and experience accumulated through many decades, justified by and checked against theoretical calculations.

Table A-2 shows the distributed and concentrated live loads on structures given by the Uniform Building Code which are to be used in design.^① For example, the weight of furniture and people in a room of a residential building is represented by a continuous load uniformly distributed over the entire area of the room and equal^② to 40 pounds per square foot (40 lb/ft²) or 1.92 kilonewtons per square meter (1.92 kN/m²). This means that whatever the random accumulation of furniture, appliances, and people may be, its effect on the structure need not be larger than that of 40 lb on each square foot of the floor area^③.

Forces of Nature

A third important group of loads on structures are forces of nature, such as snow, wind, and earthquake. For example, the magnitude of the snow load on roofs depends on the geographic location of the building and the pitch and the shape of the roof. The snow load given in the codes is always considered to act on the horizontal projection of the roof surface rather than on the inclined surface itself. For any pitch smaller than 20° , it can be taken as a constant, basic snow load. However, for a pitch larger than 20° , the snow load can be proportionally reduced, since the steeper the slope of the roof is, the harder it is for snow to accumulate on it. For roofs with a pitch larger than 60° , the effect of the snow load on the roof is almost negligible. The basic snow load in the United States varies from 5 lb/ft^2 (0.24 kN/m^2) in some southern states to 80 lb/ft^2 (3.85 kN/m^2) in the northeastern corner of New England. The values of the basic snow load may be found in snow maps. For each degree of pitch over 20° , basic snow loads in excess of 20 lb/ft^2 (0.96 kN/m^2) may be reduced by a value R_s determined by the following formula

$$R_s = \frac{S}{40} - \frac{1}{2}$$

where R_s is the snow load reduction in pounds per square foot per degree of pitch over 20° and S is the basic snow load in pounds per square foot.

Notes

- ① 设计中需要采用的荷载, which 指 loads。
 ② equal 和 distributed 并列, 均修饰 load。
 ③ its effect 指 the random accumulation of furniture, appliances, and people 的 effect; that 指 effect。

New Words and Expressions

vertical	['və:tɪkəl] a.	垂直的
permanently	['pə:mənəntli] ad.	永(持)久地
multiply	['mʌltɪplaɪ] v.	乘
measure	['meɜ:ʒə] n., v.	量度; 测量
cubic	['kju:bɪk] n.	立方
dimension	[d(a)'menʃən] n.	量纲
appendix	[ə'pendɪks] n.	附录
support	[sə'pɔ:t] vt.; n.	支撑; 支座
goods	[gudz] n.	货物; 商品
vehicle	['vi:ɪkl] n.	车辆; 交通工具
aqueduct	[ækwɪdʌkt] n.	渠, 渡槽
Uniform Building Code		统一房屋规范
accumulate	[ə'kju:mjuleɪt] v.	积累
justify	['dʒʌstɪfaɪ] vt.	证明……是正当的, 证明……有道理
distribute	[dɪ'strɪbjʊ:t] vt.	分布
concentrate	['kɒnsentreɪt] v.	集中
residential	[rezi'denʃəl] a.	住宅的, 居住的
random	['rændəm] a.	随机的, 偶然的, 任意的
appliance	[ə'plaɪəns] n.	器具; 装置; 仪表; 器械

earthquake ['ə:θkweɪk] *n.* 地震
 magnitude ['mægnɪtju:d] *n.* 数量; 尺寸; 等级
 geographic [dʒiə'græfɪk] *a.* 地理上的; 地区性的
 pitch [pɪtʃ] *n.* 斜度; 程度; 间距
 horizontal [hɒri'zɒntl] *a.* 水平的; 横的
 projection [prə'dʒekʃən] *n.* 投影
 incline [ɪn'klaɪn] *v.* 倾向于; 使……倾斜
 proportionally [prə'pɔ:ʃnəli] *ad.* 按比例; 相应地
 negligible ['neglɪdʒəbl] *a.* 不计的; 可忽视的

参 考 译 文

作用 于 结 构 上 的 荷 载

住宅、公寓、工厂、剧院、体育馆、仓库、桥梁和坝是各种各样结构物中的一些类型。在使用过程中, 有哪些荷载作用在这些结构物上呢?

静荷载

由于结构物自重(如墙、地板和屋面)和其它在结构物整个使用过程中中长期附建于结构物上的物体所产生的竖向荷载称为静荷载。

结构构件的静荷载是由它的体积乘以单位体积的重量(或材料的单位重量)求得。令构件的体积为 V 、材料的单位重量为 γ , 则静荷载 W 为:

$$W = V\gamma$$

体积 V 的单位是立方英尺(ft^3)或立方米(m^3); 单位重量 γ 的单位是磅/立方英尺(lb/ft^3)或牛顿/立方米(N/m^3)。

因此 W 的单位就是 lbs 或牛顿:

$$\text{ft}^3 \times \frac{\text{lb}}{\text{ft}^3} = \text{lb} \quad \left(\text{m}^3 \times \frac{\text{N}}{\text{m}^3} = \text{N} \right)$$

一些基本建筑材料的单位重量列于表 A-1 (见附录)。

活荷载

除了静荷载以外,结构物还承受着使用荷载,这些荷载包括住宅、公寓、学校和办公室内家具和人员的重量、仓库中货物的重量、桥梁上交通工具的重量以及渡槽中流动的水等等,这些荷载称为活荷载。

根据房屋的使用情况,其活荷载见房屋规范。《统一房屋规范》中的数据代表多年积累的观察、量测结果和经验,并经理论计算校核,证明正确。

表 A-2 给出了设计需用的《统一房屋规范》规定的分布荷载和集中荷载。例如,在居住建筑物的房间中家具和人员的重量是由均布于整个房间的连续的荷载来表示的,等于40磅/平方英尺(或1.92千牛顿/平方米)。这就是说,随便家具、用具和人员怎样安排,作用于结构物上的荷载不大于40磅/平方英尺地板。

自然力

第三种作用于结构物上的重要荷载是自然力,如雪载、风载和地震载。例如,作用于屋面上的雪载取决于结构物的地理位置以及屋面的坡度和形状。规范中所给的雪载总是按作用于屋面的水平投影面上,而不是按作用于屋面的坡面上来考虑的。对于任何斜度小于 20° 的屋面,雪载可取为恒定的基本雪载。当屋面斜度大于 20° 时,雪载可以按比例减少,因为屋面坡度越陡,越难积雪;对于斜度大于 60° 的屋面,雪载的作用几乎可以忽略不计。在美国,基本雪载的变化范围为从南部的 5lb/ft^2 (0.24 KN/m^2) 到新英格兰州东北角的 80 lb/ft^2 (3.85 KN/m^2)。基本雪载值见雪量图。屋面斜度大于 20° 时,每超过 1° ,则大于 20lb/ft^2 (0.96 KN/m^2)的基本雪载可减少 R_s 值。 R_s 由下式确定

$$R_s = \frac{S}{40} - \frac{1}{2}$$

式中 R_s 是超过 20° 的屋面坡度每超过一度的雪载降低量(磅/平方英尺), S 是基本雪载(磅/平方英尺)。

Lesson 2

What is Concrete?

Concrete is a mixture of sand, crushed rock or gravel, and cement. After these ingredients have been thoroughly mixed, water is added in the proper proportion to give a mixture of the correct consistency. When concrete has been placed after mixing, it hardens into a dense rocklike mass of great strength.

The sand and crushed stone or gravel used in concrete are known as aggregates; sand is further classified as fine aggregate and the crushed stone or gravel as coarse aggregate. The fine aggregate is of varying sizes so that the smaller particles tend to fill the spaces (voids) between the larger particles. For the same reason, the coarse aggregate also is composed of varying sizes. When the fine and coarse aggregates are mixed together, the fine aggregate tends to fill the small voids between the smaller pieces of the coarse aggregate. This results in a dense, solid mass.

Water added to a mixture of fine aggregate and cement reacts with the cement to form what is called a cement paste. As it is mixed, either by hand or by machine, the cement paste forms a coating on all particles and pieces of the aggregate. When the mixture has been placed as, for exam-

ple, for a sidewalk or structural part, a chemical reaction takes place in the cement paste which causes it to harden.① This hardening process binds all of the aggregates together, forming a permanent and dense mass which is known as concrete.

Fig. 2-1 shows a piece of concrete which has been sawed in half. As is characteristic of good concrete, the particles and pieces of aggregate are held together by the hardened cement paste.②

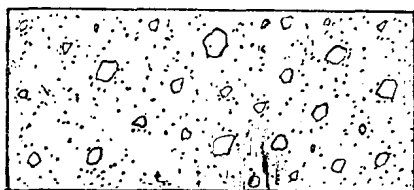


Fig. 2-1 Photograph of a Piece of Concrete Which Has Been Sawed in Two to Show How the Fine and Coarse Aggregates Combine to Form a Solid Mass.

Notes

- ① which 指 chemical reaction; it 指 cement paste.
② As 是关系代词, 代替整个主句, 在定语从句中用作主语。

New Words and Expressions

mix ['miks] *vt.* 混合; 搅拌

mixture ['mɪkstʃə] *n.* 混合物

sand [sænd] *n.* 砂
 crush [kraʃ] *vt.* 挤压; 破碎
 gravel ['grævəl] *n.* 砾石
 ingredient [in'gri:diənt] *n.* 成分; 要素
 consistency [kən'sistənsi] *n.* 稠度; 流动性
 harden ['hɑ:dn] *v.* 硬化
 aggregate ['ægrigeit] *n.* 骨料; 集料
 coarse [kɔ:s] *a.* 粗的
 tend [tend] *vt.* 趋向
 void [void] *n.* 空间; 空位
 cement paste [si'ment peist] 水泥灰浆
 saw [sɔ:] *vt.* 锯
 react [ri:ækt] *v.* 起反应

参 考 译 文

混 凝 土 是 什 么?

混凝土是砂子、碎石或砾石和水泥的混合物。这些配料经充分拌合以后,按比例加入适量的水,使混凝土具有应有的稠度。混凝土在拌合、浇灌后逐渐硬化为一个象石头一样的、有很高强度的密实块体。

混凝土中所用的砂、碎石或砾石通称为集料,砂又进一步被划为细集料,碎石或砾石被划为粗集料。细集料颗粒具有不同尺寸,这样较小的颗粒就可填充较大颗粒之间的空隙。同样,粗集料也由不同尺寸的颗粒组成。当粗、细集料拌合在一起时,细集料就可填充小块粗集料之间的空隙,形成一个密实的块体。

加进细集料和水泥拌合物中的水与水泥起化学反应形成水泥浆。当用手工或机械拌合时,水泥浆包裹了所有集料的大小颗粒。当用这种拌