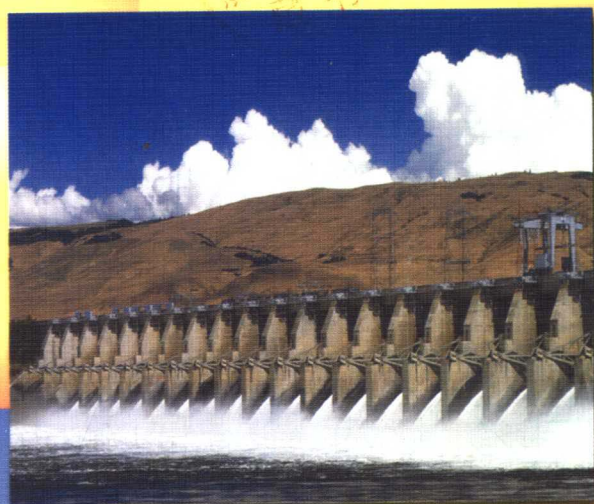


土木工程英语

English for Civil Engineering

●王爱琴 杨道富 编著



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前 言

本教材是为满足教学需要,根据高职高专英语教学基本要求编写的,供高职高专基础英语阶段之后的专业英语及综合练习周使用。其宗旨是培养学生阅读和翻译英文专业资料的能力。本教材曾作为水利系土木工程专业英语内部讲义在黄河水利职业技术学院试用两年,现根据试用反馈意见,对书中内容进行了调整和增删,反复修改,编成此书。

为了适应不同专业的需要,本教材采用模块编排,将全书分为三大部分。第一部分为专业基础知识方面的内容,共5单元,涉及建筑材料、工程合同、招标投标等;第二部分为水利水电工程方面的内容,共11单元,包括水利工程介绍、水文与水资源、灌溉、水电站、大坝施工等;第三部分为道路与桥梁工程方面的内容,共7单元,包括道路与桥梁工程介绍、施工、设计与管理等。各部分的每个单元包含课文及阅读材料各一篇,材料选自最新国内外工程实例及原版书刊,既有丰富的专业词汇,又有一定的可读性。每单元课文后设有生词表、语言点注释和练习题。根据专业英语教学的特点,为了便于专业英语翻译周的教学,书后附有“英汉翻译常识”。该部分中所有译例均选自课文及同类书刊,语言规范,译例与所学专业结合紧密,简明易懂。本书还附有词汇总表,便于学习和查找。

本书由黄河水利职业技术学院英语教师王爱琴、水利系教师杨道富合作编写,充分利用了专业教师的专业优势和英语教师的英语优势。具体分工是:全书由王爱琴编写统稿,杨道富参加第1单元至第23单元的阅读材料部分的编写。

本书由中德意承包商联营体首席翻译、联营体现场代表彭涛审阅。

在本书的编写过程中,我们节选了众多国内外的英文工程文献作为课文,参考了各种专业和英语的工具书及词典,特此说明并表示谢意。本书的编写得到了学院领导及相关人员的大力支持和关怀,在此我们一并表示诚挚的谢意。

书中若有差错和不妥之处,敬请同仁和读者提出宝贵的批评意见。

编 者

2003年1月

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PART ONE GENERAL KNOWLEDGE

Unit One

Text

Aggregates

Aggregate is inert material (chemically inactive) such as sand, slag, pebbles, gravel, broken stone, broken bricks, industrial by-products etc. , which is mixed with cement and water and concrete or mortar is prepared. The aggregate is added to cement paste to increase the bulk. Seventy to seventy-five percent of the volume of the hardened mass of concrete consists of aggregates. The remaining thirty to twenty-five percent consists of hardened cement paste, uncombined water (i. e. , water not involved in the hydration of the cement) and air voids. Aggregate must be clean, dense, hard, durable, structurally sound, capable of developing good bond with cement, weather resistant and unaffected by water. Sand, gravel and broken stone are natural available materials most commonly used as aggregates. Blast furnace slag (air-cooled and crushed) and broken bricks are the artificial and processed aggregates used in concrete. Natural aggregates are generally classified as coarse and fine aggregates. Natural materials having uniform shear strength in all directions are ideal for use as aggregates. Other natural materials having pronounced planes of weakness or cleavage (e. g. , slate, shale, and micaceous materials) are usually undesirable. The aggregates used for concrete should conform to IS: 383-1970 (specifications for coarse and fine aggregate from natural sources for concrete).

Coarse Aggregate

Broken stones, pebbles and gravel retained on IS: 4. 75 mm sieve are called as coarse aggregate. Coarse aggregate is prepared by crushing igneous stone (e. g. , granite, gneiss), sedimentary stone (e. g. , sand stones), and metamorphic stone (e. g. , crystalline lime). Coarse aggregates prepared from very fine-grained granite stone are used for high strength concrete. Coarse aggregates obtained from crushing of hard sand stone are also suitable for use in concrete. Coarse aggregates made from the soft sand stone crack

when there is high degree of shrinkage in concrete, and it should be used with care. Coarse aggregates (if prepared from close-grained crystalline lime stone) are also suitable for use in plain cement concrete. Coarse aggregate made from broken bricks is also used for plain cement concrete only. It makes the concrete weak in strength. In structural concrete, the reinforcement is likely to be rusted when the broken brick aggregates are used. Coarse aggregates are separated in two or three size groups for use in concrete for large and important constructions. Each size group of aggregate is separately weighed according to grade charts and then combined to result in densely packed concrete. For construction of less importance, aggregates brought from the pits or river beds (called as all-in-aggregate) are directly used.

Fine Aggregate

Sand and any other aggregates which pass through IS: 4.75 mm sieve are called fine aggregate. Sand is brought from lakes, pits, rivers and sea-shores. Sand is thoroughly washed so that there remain no clay films over the surface of the aggregate. It prevents adhesion of cement to the aggregate. Clay and silt are fine materials which pass through 75-micron IS: sieve. Clay and silt materials (if present) will increase water content. Dust is also detrimental material to concrete. As such the fine aggregates should be free from dust, organic impurities and silts. Chlorides (present in seashore sand) cause efflorescence and rusting and corrosion of reinforcement in structural concrete.

In order to prepare strong concrete, angular grained sand (having good interlocking property) is used. Round grained particles of sand lack in interlocking property.

In order to prepare the concrete to have good strength, weather resistance and durability, the aggregates are closely packed. For this reason, the gradation of particle sizes of the aggregates is of considerable importance.

Grading of Aggregates

Gradation of particle sizes of the aggregate vary with the nature and course of material and the requirements in this respect depend upon the type of structure. The particle sizes of fine and coarse aggregates are properly graded. Use of well graded aggregates reduces the air voids. The cement fills up the air voids of fine aggregates. The cement and sand both together fill up the air voids of the coarse aggregate. The finishing, workability and uniformity of concrete are considerably affected by the grading of fine aggregates.

New Words

aggregate [ˈægrɪɡɪt] *n.* 骨料; 集料

- inert [i'nɜ:t] *a.* [物]无活动力的;[化]非活性的,惰性的
- slag ['slæg] *n.* 溶渣;矿渣
- by-product ['baɪprɒdʌkt] *n.* 副产品
- cement [si'ment] *n.* 水泥;结合剂
- mortar ['mɔ:tə] *n.* 灰浆,砂浆
- bulk ['bʌlk] *n.* 容积;体积
- hydration [hai'dreɪʃən] *n.* 水化作用
- void ['vɔɪd] *n.* 孔隙;空隙
- coarse [kɔ:s] *a.* 粗糙的;粗粒的
- cleavage ['kli:vɪdʒ] *n.* [地]劈理;解理
- micaceous [maɪ'keɪʃəs] *a.* 含云母的
- sieve [siv] *n.* 筛子,漏勺,过滤器
- igneous ['ɪgnɪəs] *a.* [地]火成的
- gneiss [nais] *n.* 片麻岩
- metamorphic [ˌmetə'mɔ:fɪk] *a.* [地]变质的
- crystalline ['krɪstəlɪn] *a.* 结晶的;水晶的
- detrimental [ˌdetrɪ'mentl] *a.* 有害的,不利的
- chloride ['klɔ:raɪd] *n.* 氯化物;漂白粉
- efflorescence [ˌɛflɔ:'resəns] *n.* 风化;粉化
- gradation [grə'deɪʃən] *n.* 分类;分配
- workability [ˌwɜ:kə'bɪləti] *n.* 工作度;和易性
- uniformity [ˌju:nɪ'fɔ:mɪti] *n.* 均匀性
- prepare [pri'peə] *v.* 配制,调制
- paste [peɪst] *n.* 糊,糨糊
- bond [bɒnd] *n.* 粘合,握裹
- impurity [ɪm'pjʊərɪti] *n.* 污物,杂质
- angular ['æŋɡjʊlə] *a.* 棱角(状)的
- interlock [ˌɪntə'lɒk] *v.* 连锁

Phrases and Expressions

- air void 含气孔(空)隙
- blast furnace slag 高炉矿渣
- natural aggregate 天然骨料
- coarse aggregate 粗骨料
- fine aggregate 细骨料
- artificial aggregate 人工骨料

Notes

1. Aggregate is inert material (chemically inactive) such as sand, slag, pebbles, gravel, broken stone, broken bricks, industrial by-products etc., which is mixed with cement and water and concrete or mortar is prepared. 骨料是(不发生化学变化的)惰性材料,如沙子、矿渣、卵石、砾石、碎石、碎砖及工业副产品等,它与水泥和水拌混制成混凝土或灰浆。

本句是由 and 连接的一个并列复合句, which 引导一非限制性定语从句, 修饰说明第一个分句。

2. As such the fine aggregates should be free from dust, organic impurities and silts. 确切而言, 细骨料应该无灰尘, 无有机杂质和泥沙。

as such 意为“确切而言, 完全地, 照那样的形式或样子”。例如:

He didn't have a nervous breakdown as such. It was more a reaction to overwork. 他不是真得了精神病, 那只是工作过度的反应。

free from 是含有否定意义的短语, 常译为“无、不”。例如:

China is an independant country free from any form or manner of interference by outside powers. 中国是一个独立自主的国家, 不受外来国家任何形式和方式的干涉。

Exercises

I. Comprehension of the text.

Part A Choose the best answer for each of the following.

- Aggregate is _____.
 - used as a binder
 - used as filler for concrete
 - a kind of natural material
 - chemically active
- _____ are artificial aggregates.
 - Slag and broken stone
 - Sand, gravel and broken stone
 - Broken bricks, slag and other industrial by-products
 - Slate, shale and micaceous material
- Which of the following statement is not True?
 - Aggregates are classified as natural and artificial aggregates.
 - Natural aggregates involve coarse and fine aggregates.
 - Natural materials with weakness or cleavage are ideal aggregates.

- d. Coarse aggregates can retain on IS:4.75 mm sieve.
4. “Clay and silt are fine materials. . . .” The word “fine” here means _____.
- | | |
|---------------|-----------------|
| a. very small | b. satisfactory |
| c. very good | d. ideal |
5. To prepare strong concrete, _____ is used.
- | | |
|-------------------------|-------------------------|
| a. round grained sand | b. angular grained sand |
| c. sand with clay films | d. fine sand |

Part B Topics for discussion.

- Talk briefly about the types of aggregates.
- What's the difference between the coarse and fine aggregates?

II. Translate the following phrases.

- | | |
|----------------------------|--------------------------------|
| 1. 惰性材料 | 2. 水泥浆 |
| 3. 沉积岩 | 4. 粗骨料 |
| 5. 结构用混凝土 | 6. 毛骨料 |
| 7. 级配表 | 8. 高炉矿渣 |
| 9. 含气空隙 | 10. 圆粒沙 |
| 11. conform to... | 12. weather resistant |
| 13. uniform shear strength | 14. plain cement concrete |
| 15. natural aggregate | 16. interlocking property |
| 17. vary with | 18. angular grained sand |
| 19. bond with | 20. free from organic impurity |

* * * *

Reading Material

Types of Aggregates

Some unusual and unprocessed aggregates such as blast furnace slag, pumice, calcined clay, diatomaceous silica, asbestos, sawdust, vegetable fibre such as seaweed and others are used for thermal insulating and acoustical concretes.

Slag and crushed overburnt brick or tile aggregates may be found suitable with regard to strength, durability and free from harmful materials and effects and may be used for secondary members. Such aggregates should not contain more than one percent of sulphates and should not absorb more than ten percent of its own mass of water.

The structurally used aggregates are classified as light weight, normal weight and heavy weight aggregates;

Light Weight Aggregates

Expanded shales, clays, slates, slags, pelletized fly ash aggregates are light in weight because of porous and cellular structure of the individual aggregate particle. Such structure is obtained by gas or steam formation in processing the aggregates in rotary kilns at high temperatures (commonly in excess of 1000°C). Light weight aggregate is further distinguished in three classes namely low density (having unit weight 8 kN/m³ and used for insulation), moderate strength aggregates (having unit weight 9–10 kN/m³ and chiefly used as fill) and over light weight (having unit weight 14.40–19.20 kN/m³).

Normal Weight Aggregates

Usual aggregates described in Art. 1.5 are referred as normal weight aggregates. IS: 383-1970 classifies the normal aggregates on the basis of particle shape and surface textures of the aggregates as in Tables 1 (A) and (B).

Heavy Weight Aggregates

For nuclear reactor and similar installations, heavy weight aggregates are essentially needed for shielding against gamma and X-ray radiation. For special purposes (e. g., counter-weights of lift bridges) the heavy weight aggregates are used. Heavy iron ores or barite (barium sulphate) rock crushed to suitable sizes are used as heavy weight aggregates. Steel in the form of scrap, punchings or shots (as fines) are also used. Unit weight of heavy concretes with natural heavy weight aggregates is 32 kN/m³. In case, ores are used as fines only and steel for coarse aggregate, unit weight is 53 kN/m³.

Table 1(A)

CLASSIFICATION OF AGGREGATE Based on particle shape (IS:383-1970)

Classification	Description	Examples
Rounded	Fully waterworn, or completely shaped by attrition.	River or sea shore gravels; desert, sea shore and windblown sands.
Irregular or partially rounded	Naturally irregular or partly shaped by attrition, and having rounded edges.	Pit sands and gravels; land or dug flints; cuboid rock.
Angular	Having well defined edges.	Crushed rocks of all types; talus, scress.
Flaky	Usually angular whose thickness is small relative to width and length.	Laminated rocks.

TABLE 1(B)
CLASSIFICATION OF AGGREGATE
Based on surface texture

Surface Texture	Example
Glassy	Black flint
Smooth	Chert, slate, marble, some rhyolite
Granular	Sand stone, colites
Crystalline	
Fine	Basalt, trachyte, keratophyre
Medium	Delerite, granophyre, granulite, microgranite, some lime stone, many dolomites
Coarse	Gabbro, gneiss, granite, granodiorite, syenite
Honey combed and porous	Scoriae, pumice, trass

New Words

- pumice ['pʌmɪs] *n.* 浮石, 浮岩
 calcine ['kælsain] *v.* 煨烧, 烧成石灰
 diatomaceous [ˌdaɪətə'meɪʃəs] *a.* 硅藻土的
 silica ['sɪlɪkə] *n.* 二氧化硅; 硅氧
 asbestos [æz'bestəs] *n.* 海藻, 海草
 sawdust ['sɔ:dʌst] *n.* 锯屑
 seaweed ['si:wi:d] *n.* 石棉
 thermal ['θɜ:məl] *a.* 热的, 热学的
 acoustical [ə'ku:stɪkəl] *a.* 有声的, 声学的
 sulphate ['sʌlfeɪt] *n.* 硫酸盐
 cellular ['seljʊlə] *a.* 框格状的, 蜂窝状的
 rotary ['rəʊtəri] *a.* 转动的
 kiln [kɪln] *n.* (砖)窑
 attrition [ə'trɪʃən] *n.* 磨损, 损耗
 granular ['grænjʊlə] *a.* 粒状的, 晶粒的
 flint [flɪnt] *n.* 燧石, 坚硬物
 chert [tʃɜ:t] *n.* 燧石
 rhyolite ['raɪələɪt] *n.* 流纹岩
 basalt ['bæso:lt] *n.* 玄武岩
 trachyte ['treɪkəɪt] *n.* 粗面岩

- keratophyre ['kerətəufairi] *n.* 角斑岩
granophyre ['grænəfaɪə] *n.* 花斑岩
granulite ['grænjulait] *n.* 粒变岩, 麻粒岩
dolomite ['dɒləməɪt] *n.* 白云石(岩)
gabbro ['gæbrəʊ] *n.* 辉长岩
granodiorite ['grænəu'daɪərɪt] *n.* 花岗闪长岩
syenite ['saɪnɪt] *n.* 正长岩
scoria ['skɔ:riə] *n.* 火山渣, 熔渣
trass [træs] *n.* 浮石, 凝灰岩

Unit Two

Text

Concrete and Cement

A carefully proportioned mixture of cement (used as binder), fine aggregate (sand) and coarse aggregate (gravel) and water, which hardens to a stone-like mass, is called as concrete. This hardened mass of concrete appears like stone as regards its weight, hardness and strength. A plastic mixture (wet concrete) is formed by mixing these four ingredients. The wet concrete is poured in forms (moulds) of the shape and dimensions of the desired structure or structural component and it is cured to hard mass. All the four ingredients have their separate functions. The coarse aggregates act as main filler. The fine aggregates fill in the voids in the coarse aggregates. The coarse aggregates and fine aggregates increase the volume of material. The cement and water act as binder. The chemical interaction of cement and water binds the aggregate particles into a solid mass. The wet concrete is made workable by using additional water over and above required for the chemical reaction. The wet concrete solidifies and attains useful strength slowly. The completion of chemical reaction of cement and water needs favourable temperature and occurs in three distinct stages of time. The freshly mixed concrete decreases in plasticity and develops marked resistance to flow. This first stage of setting, known as initial set takes thirty minutes to sixty minutes after the original mixing operation. After this, the concrete becomes relatively soft solid without surface hardness. This second stage of setting, called as final set takes five hours to six hours after the original mixing operation. Thereafterwards, the concrete continues to harden and gains strength progressively and indefinitely. The major portion of its potential hardness and strength is gained rapidly, practically within one month after mixing.

The concrete used to be designated since long in terms of volume of cement, fine aggregate and coarse aggregate used in their proportions (e. g. , 1 : 2 : 4, 1 : 1 : 3... etc.). Now proportions are specified by weight (the ingredients are in the same order: cement first, fine aggregate next and coarse aggregate last) and the total water to be used is also mentioned. By appropriate adjustment of the proportions of the ingredients, the concrete in a wide range of strength properties may be obtained. An even wider vari-

ety of strength properties may be obtained by using special cements (such as high early strength cement), special aggregates (such as lightweight or heavyweight aggregates), admixtures (such as plasticizers and air-entraining agents) and special curing methods (such as steam-curing). The process of controlling the conditions of humidity and temperature in which the concrete mix is maintained from the time it is placed in the forms (moulds) until it is fully hardened, known as curing influences the strength property of the concrete.

The high compressive strength of concrete makes the concrete suitable for columns and arches (members primarily subjected to compression). The small tensile strength of concrete as compared with its compressive strength prevents its economical use in structural members that are subjected to tension either entirely (e. g. , tie rods) or over part of their cross-section (e. g. , beams or other flexural members). The steel bars are used to reinforce the concrete. The steel bars completely surrounded by the hardened concrete form integral part of the structural member. The concrete reinforced with the steel bars is known as reinforced concrete.

The combination of steel and concrete permits the almost unlimited uses of reinforced concrete.

Cement is a cementitious material which has the adhesive and cohesive properties necessary to bond inert aggregates into a solid mass of adequate strength and durability. Cement is the most important constituent of concrete. In earlier time, crushed material from natural rocks used to be burnt and ground and used as cement. Such cement is referred as natural cement. Water is needed for the chemical process (hydration) in which the cement powder forms soft paste, which sets and hardens into one solid mass. As such the cements are referred as hydraulic cements. An appropriate type of cements is used for a particular requirement. The different types of cements are commonly made by adjustment in relative proportions of chemical compounds and fineness. The various types of cements may be classified in three categories (viz. , Portland cements, special cements, and other cements).

New Words

- binder ['baɪndə] *n.* 胶结料
 ingredient [ɪn'grɪ:diənt] *n.* 成分, 拼料, 配料
 cure [kjʊə] *v.* 加工处理; (混凝土的) 养护
 filler ['fɪlə] *n.* 填料, 模板填孔料
 volume ['vɒljum] *n.* 体积; 容积
 interaction [ɪntə'ræksjən] *n.* 相互作用
 workable ['wɜ:kəbl] *a.* 易加工的, 可塑的, 易浇筑的

- solidify [sə'lidifai] *v.* 使凝固, 凝结
 favourable ['feivərəbl] *a.* 合适的, 有利的
 freshly ['frefli] *ad.* 新近, 刚才
 plasticity [plæs'tisiti] *n.* 可塑性, 塑性
 set [set] *n.* 凝固
 thereafterwards [ˌðeər'ɑ:ftəwə:dz] *ad.* 其后
 indefinitely [in'definətli] *ad.* 模糊地, 不定地, 无限定地
 progressively [prəu'gresivli] *ad.* 渐进地, 逐渐地
 designate ['deziɡneit] *v.* 标示, 指示
 plasticizer ['plæstisaizə] *n.* 增塑剂, 塑化剂
 admixture [əd'mikstʃə] *n.* 掺合料
 air-entraining ['eəntreiniŋ] *n.* 引气, 加气(作用)
 compression [kəm'preʃən] *n.* 压缩, 压力
 subject [səb'dʒekt] *v.* 使经受, 遭受
 tensile ['tensail] *a.* 张拉的, 拉力的
 tension ['tenʃən] *n.* 拉力, 张力; 紧张状态
 bar [bɑ:] *n.* 杆条; 钢筋
 integral ['intigrəl] *a.* 必要的, 不可缺少的; 整体的
 flexural ['flekʃərəl] *a.* 弯(挠)曲的, 挠性的

Phrases and Expressions

- soft solid 软固体
 initial set 初凝
 final set 终凝
 high early strength concrete 高早强混凝土
 compressive strength 抗压强度
 tensile strength 抗拉强度, 拉力强度
 Portland cement 波特兰水泥

Notes

- The process of controlling the conditions of humidity and temperature in which the concrete mix is maintained from the time it is placed in the forms (moulds) until it is fully hardened, known as curing influences the strength property of the concrete. 混凝土拌合物置于模具中直至完全变硬所需维持的湿度和温度条件的控制过程(称做养护)影响着混凝土的强度性能。

本句中 it is placed in the forms until it is fully hardened 是省略关系副词 when