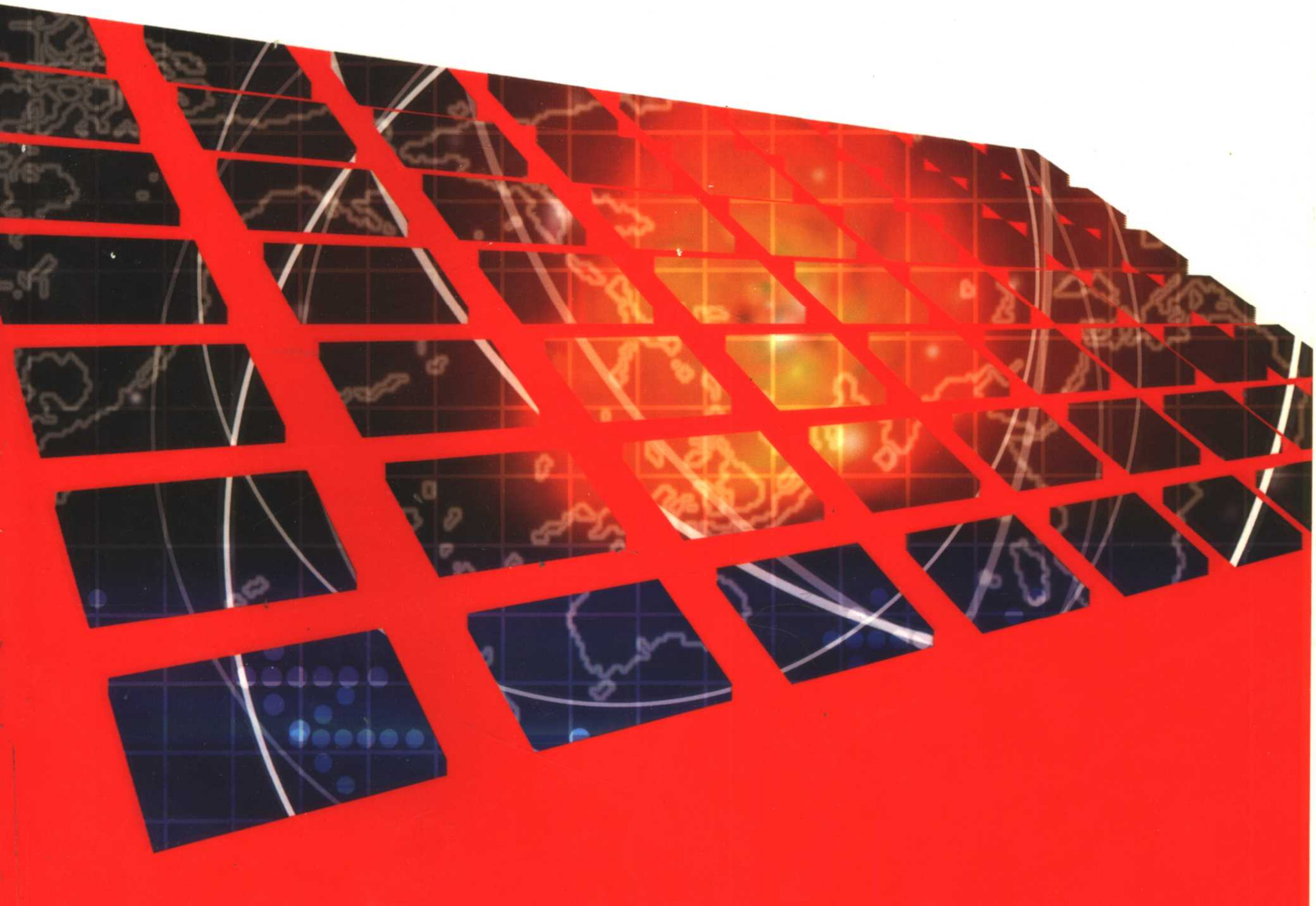
A TEXTBOOK FOR SCIENTIFIC ENGLISH

科技英语教程

魏汝尧 董益坤 主编



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前 言

2004年初，教育部印发了《大学英语课程教学要求(试行)》，提出了"大学英语的教学目标是培养学生的英语综合应用能力，特别是听说能力，使他们在今后工作和社会交往中能用英语有效地进行口头和书面的信息交流，同时增强其自主学习能力，提高综合文化素养，以适应我国社会发展和国际交流的需要。"

大学英语基础阶段的教学主要侧重于传授语言基础知识和培养基本的语言技能，能否使学生的语言知识转化成较强的专业应用能力，则在很大程度上取决于英语后续课程的教学是否成功。

在教学课程的设置方面，《大学英语课程教学要求(试行)》中也专门提出："各高等学校应当根据实际情况，按照《课程要求》确定本校的大学英语教学目标，设计各自的大学英语课程体系，将综合英语类、语言技能类、语言应用类、语言文化类和专业英语类等必修课程和选修课程有机结合，以确保不同层次的学生在英语应用能力方面得到充分的训练和提高。"

在实际教学中，我们发现：大学英语基础阶段结束后，直接过渡到专业英语教学有较大的难度，原因在于基础阶段向专业阶段过渡台阶过大过高，基础英语与专业英语难以直接"对接"，需要在两者之间建立起有一定坡度能逐步过渡的"引桥"。基于《课程要求》中"培养学生的英语综合应用能力"以及课程设置的精神，我们认为：在基础英语向专业英语过渡的这一阶段，目前高校学生，特别是理工科大学生缺乏一套能够承上启下的教材。承上，即连接基础阶段英语教学；启下，即与专业阶段英语教学对接。基于此状况，我们特地编写了这本《科技英语教程》。

此书旨在于，在基础阶段英语教学结束的基础上，进一步提高学生获取英语知识和技能的能力，培养和拓展学生实际应用英语的能力和空间，以达到顺利过渡到专业英语教学阶段之目的。

本书选材新颖，编写具有特色，每个单元各有侧重，又相互关联，既重视了系统性、连贯性，又不忽视各章的特殊性和专业性。

由于时间仓促，编写中难免有不当之处，敬请批评指正。

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UNIT ONE

Text	Reading Materials	Access to Scientific English	Usages and Expressions
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TEXT

Civil Engineering

Civil engineering the profession of designing and executing structural works that serve the general public. The term was first used in the 18th century to distinguish the newly recognized profession from military engineering, until then preeminent. From earliest times, however, engineers have engaged in peaceful activities, and many of the civil engineering works of ancient and medieval times—such as the Roman public baths, roads, bridges, and aqueducts; the Flemish canals; the Dutch sea defenses; the French Gothic cathedrals; and many other monuments—reveal a history of inventive genius and persistent experimentation.

The beginnings of civil engineering as a separate discipline may be seen in the foundation in France in 1716 of the Bridge and Highway Corps, out of which in 1747 grew the cole Nationale des Ponts et Chaussées ("National School of Bridges and Highways"). Its teachers wrote books that became standard works on the mechanics of materials, machines, and hydraulics, and leading British engineers learned French to read them. As design and calculation replaced rule of thumb and empirical formulas, and as expert knowledge was codified and formulated, the nonmilitary engineer moved to the front of the stage. Talented, if often self-taught, craftsmen, stonemasons, millwrights, toolmakers, and instrument makers became civil engineers. In Britain, James Brindley began as a millwright and became the foremost canal builder of the century; John Rennie was a millwright's apprentice who eventually built the new London Bridge; Thomas Telford, a stonemason, became Britain's leading road builder.

preeminent *adj.* 卓越的，杰出的
aqueduct *n.* 输水道，渡槽，沟渠
Flemish *n.* 佛兰德人(语)
adj. 佛兰德的，佛兰德人(语)的
canal *n.* 运河；小道；导管，槽，沟渠
persistent *adj.* 持久稳固的
discipline *n.* 学派；学科
hydraulics *n.* 水力学
leading *adj.* 重要的，有影响的
empirical *adj.* 完全根据经验的，经验主义的
formula *n.* 公式；规则；客套语
codify *v.* 编成法典，使法律成文化
stonemason *n.* 石工，石匠
millwright *n.* 造水车木匠，技工
foremost *adj.* 位于最前面的，首位的

John Smeaton, the first man to call himself a civil engineer, began as an instrument maker. His design of Eddystone Lighthouse (1756-1759), with its interlocking masonry, was based on a craftsman's experience. Smeaton's work was backed by thorough research, and his services were much in demand. In 1771 he founded the Society of Civil Engineers (now known as the Smeatonian Society). Its object was to bring together experienced engineers, entrepreneurs, and lawyers to promote the building of large public works, such as canals (and later railways), and to secure the parliamentary powers necessary to execute their schemes. Their meetings were held during parliamentary sessions; the society follows this custom to this day.

The cole Polytechnique was founded in Paris in 1794, and the Bauakademie was started in Berlin in 1799, but no such schools existed in Great Britain for another two decades. It was this lack of opportunity for scientific study and for the exchange of experiences that led a group of young men in 1818 to found the Institution of Civil Engineers. The founders were keen to learn from one another and from their elders, and in 1820 they invited Thomas Telford, by then the dean of British civil engineers, to be their first president. There were similar developments elsewhere. By the mid-19th century there were civil engineering societies in many European countries and the United States, and the following century produced similar institutions in almost every country in the world.

Formal education in engineering science became widely available as other countries followed the lead of France and Germany. In Great Britain the universities, traditionally seats of classical learning, were reluctant to embrace the new disciplines. University College, London, founded in 1826, provided a broad range of academic studies and offered a course in mechanical philosophy. King's College, London, first taught civil engineering in 1838, and in 1840 Queen Victoria founded the first chair of civil engineering and mechanics at the University of Glasgow, Scot. Rensselaer Polytechnic Institute, founded in 1824, offered the first courses in civil engineering in the United States. The number of universities throughout the world with engineering faculties, including civil engineering, increased rapidly in the 19th and early 20th centuries. Civil engineering today is taught in universities on every continent.

Civil engineering is a form of human activity that has been pursued as long as human beings have sought to change the natural environment for their own benefit. It is well described by the definition given in 1828 by Thomas Tredgold when the British Institution of Civil Engineers was applying for its charter: That species of knowledge which constitutes the profession of a Civil Engineer; being the art of directing the great sources of power in Nature for the use and convenience of man, as the means of production and of traffic in States both for external and internal trade, as applied in the construction of roads, bridges, aqueducts, canals, river navigation and docks, for internal intercourse and

interlock *v.* 联锁；连结

masonry *n.* 石工术，石匠职业

entrepreneur *n.* <法>企业家，主办人

embrace *v.* 着手做……

faculty *n.* 学院(大学)里的教学部门；一种行业的所有成员

pursue *v.* 从事；追赶，追踪，追击

charter *n.* 特许，特权

dock *n.* <美>码头，船坞

intercourse *n.* 交往，交流

exchange; and in the construction of ports, harbors, moles, breakwaters and lighthouses, and in the art of navigation by artificial power for the purposes of commerce; and in the construction and adaptation of machinery; and in the drainage of cities and towns.

Of course, added to this are the particular forms of construction that serve modern needs, such as airports, highways, dams, tunnels, and power stations of various types, but these are minor refinements on the general theme of the civil engineer as the creator of the physical infrastructure on which any level of civilization depends.

Although essentially a practical profession, civil engineering is founded on applied science, and training is based on the appropriate courses in engineering as well as in ecology and public health. To this theoretical knowledge are added several years of practical training and experience under the direction of a practicing civil engineer. The total period of education and training required for the attainment of full professional status varies among countries but commonly is in the range of 8 to 10 years.

The profession of civil engineering can be divided into three broad categories, which may be described as consulting, contracting, and municipal engineering. The consulting civil engineer is the technical adviser to the client, who may be an individual, a commercial firm, or a government department. The consulting engineer is the designer of projects, and the duties generally include the outline preparation of a project and an estimate of cost; surveys and site investigation; the detailed design of the project, including drawings, specifications, schedules of quantities, and forms of contracts; advice to the client on which construction bid to accept; and administration of contracts and supervision of the execution of the work. In the execution of contracts the consulting engineer may be required to act in a quasi-judicial capacity to decide on various questions that may arise between the client and the contractor. Consulting engineers usually work in partnership with a small number of other engineers, and it is usual for such partnerships to specialize in a particular branch of engineering, such as transport, water supply, dams, large buildings, and so on.

The task of actually building the project is the responsibility of a firm of contractors, and firms that handle many government projects employ professional civil engineers capable of interpreting the design and of devising methods for carrying out the work. It is they who organize and control both labor and machines. The duties of the contracting civil engineer are to make detailed surveys of site conditions, to obtain information about the supply of materials, to plan in detail how the work shall be carried out, and

mole *n.* 防波堤，筑有防波堤的海港
breakwater *n.* 防浪堤，挡浪板，挡水板
lighthouse *n.* 灯塔
drainage *n.* 排水，排泄；排水装置，排水区域，排出物；消耗
tunnel *n.* 隧道，隧洞，烟道
infrastructure *n.* 下部构造，基础下部组织
ecology *n.* 生态学
bid *n.* 招标，投标
supervision *n.* 监督，管理
quasi- 前缀，表示“类似，准，半”之义
contractor *n.* 订契约人；交易的一方（一般指供应人工和材料并按规定的说明书和图纸负责完成施工任务的一方）
partnership *n.* 合伙关系

determine what kind and quantity of both machines and manpower will be required.

The municipal engineer serves local or state government directly in planning and supervising the construction and management of water-supply and sewage-disposal systems, roads and bridges, public-transport systems, public buildings, and many other significant features of modern life. In addition to a variety of engineering work, the municipal engineer is also to a large extent responsible for the welfare, health, and safety of the community that is served.

municipal	*adj.*	市政的，市立的；地方性的，地方自治的
sewage	*n.*	下水道；污水
	v.	用污水灌溉，装下水道于……
welfare	*n.*	过得好的状态；福利

Exercises

I. Answer the following questions according to the text

1. When was the term "civil engineering" first used?
2. What were the main works of civil engineering in ancient and medieval times?
3. When and where was civil engineering founded as a separate discipline?
4. Who was the first man to call himself a civil engineer? And what did he found?
5. What's the object of the Society of Civil Engineers?
6. When and where was the first institution of civil engineers founded?
7. When and where was civil engineering first taught?
8. When did civil engineering begin to develop rapidly?
9. What aspects of development could civil engineering be applied to?
10. Into how many categories can the profession of civil engineering be divided?
11. And what character and responsibility does every category have?

II. Cloze

For large civil-engineering works, the heavy work of moving earth continued to depend throughout this period __(1)__ human labour organized __(2)__ building contractors. But the use of gunpowder, dynamite, and steam diggers helped to reduce this dependence toward the end of the 19th century, and the introduction of compressed air and hydraulic tools also contributed __(3)__ the lightening of drudgery. The __(4)__ two inventions were important in other respects, such as in mining engineering and in the operation of lifts, lock gates, and cranes. The use of a tunneling shield, to allow a tunnel to be driven through soft or uncertain rock strata, was pioneered __(5)__ the French émigré engineer Marc Brunel in the construction of the first tunnel __(6)__ the Thames River in London (1825-1842), and the technique was adopted elsewhere. The iron bell or caisson was introduced for working __(7)__ water level __(8)__ lay foundations for bridges or other structures, and bridge building made great advances with the perfecting of the suspension bridge—by the British engineers Thomas Telford and Isambard Kingdom Brunel and the German-American engineer John Roebling—and the development of the truss bridge, first in timber, then ___(9)___ iron. Wrought iron gradually replaced cast iron ___(10)___ a bridge-building material, although several distinguished cast-iron bridges survive, such as that erected at Ironbridge in Shropshire ___(11)___ 1777 and 1779, which has been fittingly described ___(12)___ the "Stonehenge of the Industrial Revolution." The sections were cast at the Coalbrookdale furnace nearby and assembled by mortising and wedging on the model of a timber construction, without the use of bolts or rivets. The design was quickly superseded in other cast-iron bridges, but the bridge still stands as the first important structural use of cast iron. Cast iron became very important ___(13)___ the framing of large buildings, the elegant Crystal Palace of 1851 being an outstanding example. This was designed ___(14)___ the ingenious gardener-turned-architect Sir Joseph Paxton on the model of a greenhouse that he had built on the Chatsworth estate of the Duke of Devonshire. Its cast-iron beams were manufactured by three different firms and tested for size and strength ___(15)___ the site. By the end of the 19th century, however, steel was beginning ___(16)___ replace cast iron as well as wrought iron, and reinforced concrete was being introduced. In water-supply and sewage-disposal works, civil engineering achieved some monumental successes, especially in the design of dams, ___(17)___ improved considerably in the period, and in long-distance piping and pumping.

READING MATERIALS

Passage A

Types of Bridges

Bridge designs differ in the way they support loads. These loads include the weight of the bridges themselves, the weight of the material used to build the bridges, and the weight and stresses of the vehicles crossing them. There are basically eight common bridge designs: beam, cantilever, arch, truss, suspension, cable-stayed, movable, and floating bridges. Combination bridges may incorporate two or more of the above designs into

beam *n.* 梁,横梁
cantilever *n.* [建]悬臂
stay *n.* 撑条,支柱,拉条
v. 支撑,支持
incorporate *v.* 结合(包括,插入)
adj. 合为一体的(组成的,掺合的)

a bridge. Each design differs in appearance, construction methods and materials used, and overall expense. Some designs are better for long spans. Beam bridges typically span the shortest distances, while suspension and cable-stayed bridges span the greatest distances.

Beam bridges represent the simplest of all bridge designs. A beam bridge consists of a rigid horizontal member called a beam that is supported at both ends, either by a natural land structure, such as the banks of a river, or by vertical posts called piers. Beam bridges are the most commonly used bridges in highway construction. Single-piece, rolled-steel beams can support spans of 15 to 30 m (50 to 100 ft). Heavier, reinforced beams and girders are used for longer spans.

Cantilever bridges are a more complex version of the beam-bridge design. In a cantilever design, a tower is built on each side of the obstacle to be crossed, and the bridge is built outward, or cantilevered, from each tower. The towers support the entire load of the cantilevered arms. The arms are spaced so that a small suspended span can be inserted between them. The cantilevered arms support the suspended span, and the downward force of the span is absorbed by the towers.

Cantilever bridges are self-supporting during construction. They are often used in situations in which the use of scaffolding or other temporary supports would be difficult. The Forth Bridge, a railway bridge across the Firth of Forth in Queensferry, Scotland, has two main spans of 521 m (1,710 ft) each. The Haora (Howrah) Bridge in Calcutta (now Kolkata), India, was opened in 1943, with a main span of 457 m (1,500 ft). The Québec Bridge across the St. Lawrence River in Canada has a span of 549 m (1,800 ft).

Arch bridges are characterized by their stability. In an arch, the force of the load is carried outward from the top to the ends of the arch, where abutments keep the arch ends from spreading apart. Arch bridges have been constructed of stone, brick, timber, cast iron, steel, and reinforced concrete.

Steel and concrete arches are particularly well suited for bridging ravines or chasms with steep, solid walls. The New River Gorge Bridge in West Virginia is the longest arch bridge, spanning a gap of 518 m (1,700 ft). Other long arch bridges include the Bayonne Bridge between New York and New Jersey, and the Sydney Harbour Bridge in Australia, with main spans of 504 m (1,652 ft) and 503 m (1,650 ft), respectively.

Truss bridges utilize strong, rigid frameworks that support these bridges over a span. Trusses are created by fastening beams together in a

span *n.* 跨距，跨度；间隔跨索，张索，中索(仪表)量程间距
rigid *adj.* 刚性的，硬质的，坚固
horizontal *adj.* 水平的
n. 水平面(物)，水平方向
vertical *adj.* 垂直的，直立的；顶点的
n. 垂直线，垂直面
pier *n.* 闸墩，桥墩
obstacle *n.* 障碍，障碍物
scaffolding *n.* 脚手架，搭脚手架
chasm *n.* 断口，裂口，断层，分裂；峡谷，坑
Bayonne 巴约讷
New Jersey 新泽西州（美国太平洋沿岸）
truss bridge [建]桁架桥

triangular configuration. The truss framework distributes the load of the bridge so that each beam shares a portion of the load. Beam, cantilever, and arch bridges may be constructed of trusses. Truss bridges can carry heavy loads and are relatively lightweight. They are also inexpensive to build. The Astoria Bridge over the Columbia River in Oregon has a span of 376 m (1,232 ft).

Suspension bridges consist of two large, or main, cables that are hung (suspended) from towers. The main cables of a suspension bridge drape over two towers, with the cable ends buried in enormous concrete blocks known as anchorages. The roadway is suspended from smaller vertical cables that hang down from the main cables. In some cases, diagonal cables run from the towers to the roadway and add rigidity to the structure. The main cables support the weight of the bridge and transfer the load to the anchorages and the towers.

Suspension bridges are used for the longest spans. The Brooklyn Bridge, which was the world's longest suspension bridge at the time of its completion in 1883, crosses the East River in New York City and has a main span of 486 m 31 cm (1,595 ft 6 in). The Akashi Kaikyo Bridge between Honshū and Awaji Island in Japan was completed in 1998, with a span of 1,991 m (6,532 ft). While suspension bridges can span long distances, this design has a serious drawback: It is very flexible, and traffic loading may cause large deflections, or bending, in the bridge roadway. Suspension design is rarely used for railroad bridges, because trains are heavier and can travel faster than highway traffic.

Cable-stayed bridges represent a variation of the suspension bridge. Cable-stayed bridges have tall towers like suspension bridges, but in a cable-stayed bridge, the roadway is attached directly to the towers by a series of diagonal cables. A cable-stayed bridge is constructed in much the same way as a suspension bridge is, but without the main cables.

Cable-stayed designs are used for intermediate-length spans. Advantages a cable-stayed bridge has over a standard suspension bridge include speed of construction and lower cost, since anchorages are not necessary. There are no massive cables, as with suspension bridges, making cable repair or replacement simpler. The Pont de Normandie (Normandy Bridge) over the Seine River near La Havre in France opened in 1995, with a span length of 856 m (2,808 ft).

Movable bridges make up a class of bridge in which a portion of the bridge moves up or swings out to provide additional clearance beneath the bridge. Movable bridges are usually found over heavily traveled waterways. The three most common types of movable bridge are the bascule (drawbridge), vertical-lift, and swing bridges. Modern bascule bridges usually have two movable

triangular *adj.* 三角的,三脚的,三者间的

Astoria 阿斯托里亚(美国俄勒冈州西北部一城市)

suspension bridge [建]悬桥,吊桥

anchorage *n.* [建]锚,拉桩,支撑物

swing *v.* 摇摆,摆动;回转,旋转
n. 秋千,摇摆,摆动

clearance *n.* 清除,间隙,有害空间,[建]净空

bascule *n.* 开放桥的平衡装置,竖旋桥的双翼,开放桥的活动桁架

drawbridge *n.* 吊桥(一端或两端可绞起的)

spans that rise upward, opening in the middle. A vertical-lift bridge consists of a rigid deck frame held between two tall towers. The bridge opens by hoisting the entire bridge roadway upward between the towers in an elevator-like fashion. Swing bridges are mounted on a central pier and open by swinging to one side, allowing ships to pass.

Movable bridges are generally constructed over waterways where it is either impractical or too costly to build bridges with high enough clearances for water traffic to pass underneath. Bascule bridges are used for short spans. A bascule bridge over the Black River in Lorain, Ohio, has a length of 102 m (333 ft). Vertical-lift bridges are useful for longer spans, but they must be built so they can be lifted high enough for tall ships to pass underneath. The vertical-lift bridge over Arthur Kill between Staten Island in New York City and New Jersey has a span of 170 m (558 ft) and can be raised 41 m (135 ft) above the water. Swing bridges have the advantage of not limiting the height of passing vessels, but they do restrict the horizontal clearance, or width, of passing ships. The longest swing-bridge span is that of a railroad and highway bridge crossing the Mississippi River at Fort Madison, Iowa. This bridge has a span of 166 m (545 ft).

Floating bridges are formed by fastening together sealed, floating containers called pontoons and placing a roadbed on top of them. A pontoon typically contains many compartments so that if a leak occurs in one compartment, the pontoon will not sink. Some floating bridges are constructed using boats or other floating devices rather than pontoons.

Floating bridges were originally developed and are most widely used as temporary structures for military operations. For everyday use, floating bridges are popular when deep water, bad riverbed conditions, or other conditions make it difficult to construct traditional bridge piers and foundations. A concrete-pontoon bridge carries a highway across Lake Washington, near Seattle, Washington. It consists of 25 floating sections bolted together and anchored in place and a span that can be opened to permit the passage of large ships. The floating section of the bridge is 2.3 km (1.4 mi) long.

Combination bridges include crossings consisting of several types of bridges or both bridges and tunnels. For example, the Chesapeake Bay Bridge-Tunnel in Virginia includes two tunnels that are each 1.6 km (1.0 mi) long along its 28 km (17 mi) length from shore to shore. The Triborough Bridge in New York City is actually a network of bridges connecting the boroughs of Queens, Manhattan, and the Bronx. These bridges meet over Randall's Island. Seven truss spans stretch over Bronx Kills, and three truss spans and a vertical lift extend over the Harlem River. A viaduct and a suspension bridge also make up part of the Triborough Bridge.

elevator *n.* 升降机，电梯
impractical *adj.* 不实用的，不切实际的，不能实行的
Iowa 艾奥瓦（旧译衣阿华，美国的州名）
pontoon *n.* 浮桥，浮筒，二十一点，潜水箱
roadbed *n.* 路基表面（行车道）
military *adj.* 军事的（陆军的）
n. 军队
Seattle 西雅图
borough *n.* 自治城市；市行政区
viaduct *n.* 栈桥，高架桥