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АВТОМАГИСТРАЛИ И МОСТЫ

Методические материалы
по дисциплине «Иностранный язык»
для обучающихся направления подготовки
08.03.01 Строительство

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ОГЛАВЛЕНИЕ

Предисловие

Методические указания «по английскому языку «Автомагистрали и мосты» предназначены для студентов направления подготовки 08.03.01 Строительство.

Целью данных методических указаний является формирование у студентов иноязычной коммуникативной компетенции, позволяющей использовать знание языка для информационной работы с оригинальной иностранной литературой в рамках предложенной тематики.

Методические указания состоят из 4 блоков и включают материал по темам «История строительства дорог», «Выдающиеся инженеры и ученые в области дорожного строительства», «Современные дороги», «Мосты». Методические указания направлены на развитие разных видов речевой деятельности: чтения, устной коммуникации и письменной речи.

Каждый блок включает тексты для ознакомительного, изучающего и просмотрового чтения, лексические упражнения, способствующие отработке специальной и научной лексики и овладению ею на уровне словосочетания, а также устные и письменные упражнения. Послетекстовые задания основаны на информации прочитанных текстов. Предусмотрены задания для групповой, парной и индивидуальной работы.

UNIT 1. HISTORY OF ROAD BUILDING

I. Vocabulary.

path	дорожка, тропа
to pave streets	мостить дороги
gutter	сточная канава
mortar	строительный раствор
slab	плита (a row of slabs – ряд плит)
track	проселочная дорога
terminus (мн.ч. termini)	конечная станция, вокзал
pavement	дорожное покрытие, мостовая, тротуар
rut	колея, выбоина
masonry	каменная кладка
surveying	съемка
trench	траншея
embankment	насыпь
bedding	слой
course	горизонтальный ряд кладки, слой
to crown	придавать выпуклость
curb	обочина, край тротуара
lane	узкая дорога, переулок
to grout	заливать цементом, известью
crevice	щель, тещина
ditch	траншея, котлован
foot (мн.ч. feet)	фут (30,5 см)
inch	дюйм (2,54 см)

II. Translate the following word-combinations and memorize them.

stone-paved streets, timber roads, to make possible, at the same time, demand for roads, necessity of drain age, along sections, clay gypsum mortar, row of basalt slabs, foot traffic, long-distance road, to come into use, burned bricks, to take place, little evidence, limestone blocks, military road, to build in a straight line, to raise the foundation, above ground level, cleared ground, to cover the embankment with a bedding of sand, 2 inches in size.

III. Give definitions.

1. slab	1. a way from one place to another which is well known to people
2. to pave a road	2. to drive ground by causing water to gradually flow out of it
3. a foundation	3. a large station where several routes begin and end
4. a route	4. a thick flat piece of material which is usually square or rectangular in shape
5. mortar	5. layers of bricks, concrete, etc. below the ground on which something can be built so that it is solidly supported
6. a terminus	6. to cover a road with blocks of stone, bricks, concrete, etc. so that it is suitable for walking or traveling on
7. to drain ground	7. a mixture of sand, water, and cement or lime which is put between stones or bricks to make them stay firmly

IV. The text «Roads of Antiquity» contains the information about the roads constructed many centuries BC. Scan the text and say in what parts of the world the first roads were built.

V. Find international words in the text, read and translate them into Russian.

VI. Read the text and find out how road building developed in ancient times.

Roads of Antiquity

Ancient roads of the Mediterranean and Middle East

The first roads were paths made by animals and later adapted by humans. The first indications of constructed roads date from about 4000 BC and consist of stone-paved streets at Ur in modern-day Iraq and timber roads preserved in a swamp (болото) in Glastonbury,

England. During the Bronze Age, the availability of metal tools made the construction of stone paving possible; at the same time, demand for paved roads rose with the use of wheeled vehicles, which were well established by 2000 BC.

Cretan stone roads

At about this time people on the island of Crete built a 30-mile (50 kilometers) road on the southcoast over the mountains at an elevation of about 4,300 feet (1,300 meters). Constructed of layers of stone, the roadway took account of the necessity of drainage by gutters along certain sections. The pavement, which was about 12 feet (360 centimeters) wide, consisted of sandstone bound by a clay-gypsum mortar. The surface of the central portion consisted of two rows of basalt slabs 2 inches (50 millimeters) thick. The center of the roadway seems to have been used for foot traffic and the edges for animals and carts. It is the oldest existing paved road.

Roads of Persia and Babylon

The earliest long-distance road was a 1,500-mile route between the Persian Gulf and the Mediterranean Sea. It came into some use about 3500 BC, but it was operated in an organized way only from about 1200 BC by the Assyrians. More a track than a constructed road, the route was made longer between 550 and 486 BC by the great Persian kings Cyrus II and Darius I in their famous Royal Road. The Persian Royal Road began at Susa and proceeded westward to Harran, a major road junction and caravan center. The main road then continued to two termini at Smyrna and Ephesus. The Greek historian Herodotus, writing in about 475 BC, put the time for the journey from Susa to Ephesus at 93 days, although royal riders passed the route in 20 days.

In Babylon about 650 BC the city’s temples were connected with the royal places with a major Processional Way, a road in which burned bricks and carefully shaped stones were laid in bituminous mortar.

Egypt

The Egyptians built their first roads to provide a solid track upon which to move the immense limestone blocks used in the pyramids, and archaeological evidence indicates that such road-building took place southwest of Cairo between 2600 and 2200 BC. The wheel arrived in Egypt at about 1600 BC. There is little evidence

of street surfacing in ancient Egyptian towns, though there is evidence of the use of paved processional roads leading to the temples. The ancient travel routes of Egypt ran from Thebes and Coptos on the central Nile east to the Red Sea and from Cairo across the land.

Greece

The early Greeks depended primarily on sea travel. There is evidence of the building of special roads for religious purposes and transport about 800 BC, but there is little evidence of substantial road building for travel and transport prior to the Roman system. The Greeks did build a few ceremonial roads, paved with shaped stone and containing wheel ruts about 55 inches (140 centimeters) apart.

From *Encyclopedia Britannica, 2005*

VII. Say in construction of what roads and in what century the following materials were used.

stone
timber
burned bricks
bituminous mortar
sandstone
clay gypsum mortar

VIII. Work in pairs. Discuss the topic «Ancient Roads».

1. For what purposes were ancient paved roads built?
2. When did the demand for paved roads rise?
3. What layers did constructed roads consist of?
4. Where was the oldest existing paved road?
5. How wide was it?
6. What was the surface of this road made of?
7. Where was the earliest long-distance road?
8. How long was it?
9. How much time did it take to pass the Persian Royal Road?

IX. Read the text «The Roman Roads» and say in Russian:

– how Romans built their roads;
– how their roads looked like.

The Roman Roads

The greatest systematic road builders of the ancient world were the Romans, who knew the military, economic, and administrative advantages of a good road system. The Romans learned mainly from the Etruscans (этруски) – particularly in cement technology and street paving – though they probably also learned skills from the Greeks (masonry), Cretans (pavement structure), Phoenicians (финикияне) and Egyptians (surveying). Concrete made from cement was a major development that permitted many of Rome's construction advances.

The Romans began their road-making task in 334 BC and by the peak of the empire had built nearly 53,000 miles of roads connecting their capital with the frontiers of their empire. Twenty-nine great military roads radiated from Rome. The most famous of these was the Appian Way. Begun in 312 BC, this road followed the Mediterranean coast south to Capua and then turned eastward to Beneventum, where it divided into two branches a total of 410 miles from Rome.

The typical Roman road was advanced in conception and construction. Where possible, it was built in a straight line from one sighting point to the next, regardless of obstacles, and was carried over marshes (болота), lakes, and mountains. In its highest stage of development, it was constructed by excavating parallel trenches about 40 feet apart to provide longitudinal (продольный) drainage – a typical feature of Roman road engineering. The foundation was then raised about three feet above ground level, using material taken from the drains and from the adjacent cleared ground.

As the importance of the road increased, this embankment was progressively covered with a light bedding of sand mortar on which four main courses were constructed: (1) the layer 10 to 24 inches (250 to 600 millimeters) thick, composed of stones at least 2 inches in size, (2) a 9-inch-thick layer of concrete made from stones under 2 inches in size, (3) the nucleus layer, about 12 inches thick, using concrete made from small gravel and coarse sand, and, for very important roads, (4) a wearing surface of large stone slabs at least 6 inches deep. The total thickness thus varied from 3 to 6 feet. The width of the Appian Way in its ultimate development was 35 feet. The two-way, heavily crowned central carriage way was 15 feet

wide. On each side there were curbs 2 feet wide and 18 inches high and paralleled by one-way side lanes 7 feet wide. This massive Roman road section, adopted about 300 BC, set the standard of practice for the next 2,000 years.

The public transport of the Roman Empire was divided into two classes: (1) the express service, and (2) the freight service. In addition, there was an enormous amount of travel by private individuals. The most widely used vehicles were the two-wheeled chariot (колесница) drawn by two or four horses and the cart (повозка) used in rural areas. Fast freight vehicles were drawn by 8 horses in summer and 10 in winter and, by law, could not carry more than 750 pounds, or 330 kilograms. Speed of travel ranged from a low of about 15 miles per day for freight vehicles to 75 miles per day by speedy post drivers.

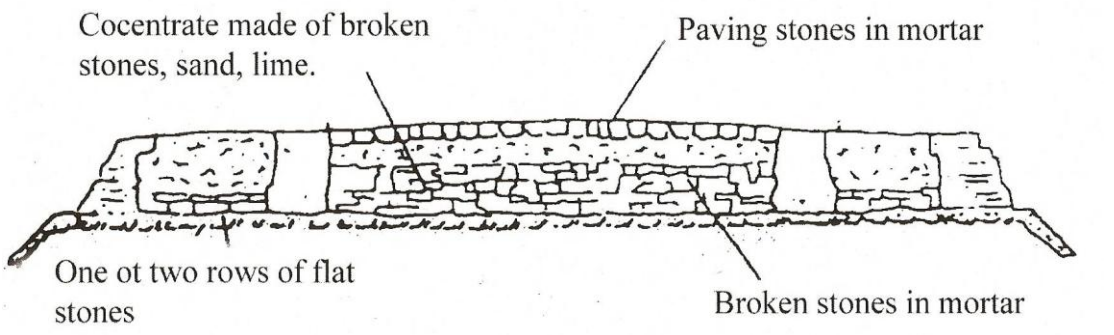
From *Encyclopedia Britannica*

X. Complete the sentences.

1. The Romans understood the importance of a good …
2. They began road-making in …
3. They built 53,000 …
4. The Roman roads connected their capital with …
5. 29 military roads went from Rome to various …
6. They built roads in a straight line regardless of …
7. Concrete made from cement let Romans achieve good results in …
8. A typical feature of Roman road-engineering was longitudinal …
9. The foundation was raised three feet above …
10. The embankment was covered with beddings of sand and …
11. The total thickness of a road was about …
12. The two-way road was about 15 feet …
13. The massive Roman road section was adopted about 300 …
14. The Romans gave the world the standard of road building for the next …
15. Practice of … in the Roman Empire was of a high standard.

XI. Examine the figure and speak about a typical Roman road. Make use of the following:

To built in a straight line, to use parallel trenches, to be about 40 feet apart, longitudinal drainage, to raise the foundation about 3 feet above ground level, to cover the embankment with a light bedding of mortar.



Typical Roman Road

XII. There is saying: «All the roads lead to Rome». Prove it.

XIII. Read the text and fill the blanks with the words from the list below.

Indian Ancient Roads

The Indus civilization probably flourished (процветать) on the ___1___ 3250–2750 BC. Excavations indicate that the cities of this civilization ___2___ their major streets with burned bricks cemented with bitumen. Great attention was devoted to drainage.

Evidence from archaeological and historical sources indicates that by AD 75 several ___3___ of road construction were known in India. These included the brick pavement, the stone slab pavement, a kind of concrete as a foundation course or as an actual road surface, and the principles of filling crevices (трещина) with gypsum, lime, or bituminous mortar. Street pavement seems to have been ___4___ in the towns in India at the beginning of the Common Era, and the principles of drainage were well known. The crowning of the roadway and the use of ditches and gutters was common in the towns. Northern and western India on the period 300 to 150 BC had a network of well-built roads. The rulers of the Mauryan empire (4th century BC) generally recognized that the unity of a great empire

depended on the ___5___ of its roads. The Great Royal Road of the Mauryans began at the Himalayan border and ran to the Granges River. A «Ministry of Public Works» was responsible for construction, marking, and maintenance of the roads.

From *Encyclopedia Britannica*

1. period, section, days
2. linked, improved, paved
3. development, methods, existence
4. interesting, common, great
5. quality, width, ways

XIV. Study specifications of Indian roads and speak about them. Make use of the given word-combinations.

1. Several methods of road-construction, to be known, in India.
2. The brick pavement, the stone slabs, to be used.
3. A kind of concrete, to be in use, as a road surface, as a foundation course.
4. Crevices, to be filled with, bituminous mortar.
5. The principles of drainage, to be well known.
6. Ditches, gutters, to be common, in Indian towns.
7. The unity of a great empire, to depend, on quality of its roads.

UNIT 2. FAMOUS ROAD BUILDERS

I. Vocabulary.

broken stone	щебень
advance	прогресс, успех
highway engineering	дорожное дело
walnut-sized	размером с грецкий орех
to top	покрывать сверху
gradient	наклон, скат, уклон, градиент
surveyor	топограф, съемщик
turnpike	застава, где взимается дорожный сбор
angular pieces	неровные куски
to compact	уплотнять, сжимать
void	пустота

maintenance	уход, содержание в исправности
reliance	опора на что-либо
shift	сдвиг, изменение
macadam road	дорога со щебеночной одеждой

II. Translate the following expressions and memorize them.

to create a demand, to meet demands, article on a pavement system, a marked advance, to develop a new type of road surface, standard cross-section, broken stone, to place emphasis on, to carry the heaviest loads, middle layer, top layer, well drained natural formation, masonry construction, to elevate the pavement.

III. Match the expressions.

1 relatively light road surface	1. выдерживать груз
2. underlying natural formation	2. каменная поверхность
3. to support the load	3. относительно легкое дорожное покрытие
4. eight-inch thick course	4. укладывать вручную
5. excavated trench	5. ниже лежащее природное образование
6. stone surface	6. 8-дюймовый ряд
7. good-quality foundation stone	7. вырытая траншея
8. to place by hand	8. заполнять пустоты
9. to fill voids	9. изменение в истории дорожных покрытий
10. a shift in the history of road pavements	10. качественный камень для фундамента

IV. Give definitions.

1. a pavement	1. something which is being carried somewhere
2. a layer	2. the outside or top part of a solid (твердый) object
3. a surface	3. progress in understanding some field, subject, industry or in developing new ideas and techniques

4. an advance	4. the surface of a road
5. a load	5. a quantity of a material or substance that covers something

V. Read the text and find out what progress was made in technique of road-building in Europe in the 17th and 18th centuries.

European Master Road Builders

In Europe, gradual technological improvements in the 17th and 18th centuries saw increased commercial travel and improved vehicles. These factors created a demand for better roads. Supply and invention both rose to meet that demand. In 1585 the Italian engineer Guido Toglietta wrote a thoughtful article on a pavement system using broken stone that made a marked advance on the heavy Roman style. In 1607 Thomas Procter published the first English-language book on roads. The first highway engineering school in Europe, the School of Bridges and Highways, was founded in Paris in 1747. In the last half of the 17th century the fathers of modern road-building and road maintenance appeared in France and Britain.

Tresaguet

In France in 1764, Pierre-Marie-Jerome Tresaguet, an engineer from an engineering family, became engineer of bridges and roads at Limoges and, in 1775, inspector general of roads and bridges for France. In that year he developed an entirely new type of relatively light road surface, based on the theory that the underlying natural formation, rather than the pavement, should support the load. His standard cross section, 18 feet wide, consisted of an eight-inch-thick course of uniform foundation stones laid on the natural formation and covered by a two-inch layer of walnut-sized broken stone. This second layer was topped with a one-inch layer of smaller gravel or broken stone. In order to maintain surface levels, Tresaguet's pavement was placed in an excavated trench – a technique that made drainage a difficult problem.

Telford

Thomas Telford, born of poor parents in Scotland, in 1757. Intelligent and ambitious, he progressed to designing bridges and building roads. Telford placed great emphasis on two features: (1)

maintaining a level roadway with a maximum gradient of 1 in 30 and (2) building a stone surface capable of carrying the heaviest loads. His roadways were 18 feet wide and built in three courses: (1) a lower layer, seven inches thick, consisting of good-quality foundation stone carefully placed by hand (this was known as the Telford base), (2) a middle layer, also seven inches thick, consisting of broken stone of two-inch maximum size, and (3) a top layer of gravel or broken stone up to one inch thick.

McAdam

The greatest advance came from John Loudon McAdam, born in 1756 in Scotland. McAdam began his road-building career in 1787 but reached major heights after 1804, when he was appointed general surveyor for Bristol, then the most important port city in England. The roads leading to Bristol were in poor condition, and in 1816 McAdam took control of the Bristol Turnpike. There he showed that traffic could be supported by a relatively thin layer of small, single-sized, angular pieces of broken stone placed and compacted on a well-drained natural formation and covered by a surface of smaller stones. He had no use for the masonry constructions of his predecessors and contemporaries.

Drainage was essential to the success of McAdam's method, and he required the pavement to be elevated above the surrounding surface. The structural layer of broken stone was eight inches thick and used stone of two to three inches maximum size laid in layers and compacted by traffic – a process adequate for the traffic of the time. The top layer was two inches thick, using three-quarter- to one-inch stone to fill surface voids between the large stones. Continuing maintenance was essential.

Although McAdam made use of the successes and failures of others, his total structural reliance on broken stone represented the largest paradigm shift in the history of road pavements. The principles of the «macadam» road are still used today. McAdam's success was also due to his efficient administration and his strong view that road managers needed skill and motivation.

Mitchell

The first modern concrete roads were produced by Joseph Mitchell, a follower of Telford, who conducted three successful trials in England and Scotland in 1865–1866. Like asphalt technology,

concrete road building was largely developed by the turn of the 20th century and was restricted more by the available machinery than by the material. Fir the following century the two materials remained in competition, both offering a similar product at a similar cost, and there was little evidence that one would move far ahead of the other as they continued on their ways of gradual improvement.

From *Encyclopedia Britannica*

VI. Make a list of improvements introduced into road-building by different engineers. Fill in the table.

name	date	country	improvements
Thomas Telford	The end of the 18th century	Great Britain, Scotland	1. maintain a level road with a gradient of 1 in 30; 2. build a stone surface; 3. roads 18 feet wide, consisting of 3 layers

VII. Speak about the advances in road-building made by Tresaguet, Telford, McAdam, Joseph Mitchell. Make use of exercises II, III, V.

VIII. Read the text and entitle it.

In Russia there has always been a demand for better roads. «Roads guide of the Russian Empire» first published in 1801 was in widespread use by specialists and road users. The first Russian book on road maintenance, their regular checking and doing necessary repairs was «Instructions to Road Builders» which was published in 1817. The map of roads of European Russia was published in St-Petersburg in 1859. The first highway engineering higher school was founded in St-Petersburg in 1809.

Russia has 1.000.000 km rural highway system that consists primarily of two-lane roadways. The cities have adequate street systems with very wide paved sections. Most highways radiate from the major cities and while some intercity routes are planned most are formed when two city systems intersect. In order to overcome this problem Russia is now planning and building several intercity

highways, some four-lane divided and some with controlled access. Nowadays as motor vehicle numbers increase, strong demand for more road building develops.

Many Russian engineers and scientists worked in highway engineering, among them M. Lyahnitsky, A. Gelfert, B. Stechkin, N. Briling, N. Ivanov, P. Shilov and others. One of the leading scientists was O.V. Andreev (1911–1990). O.V. Andreev is known as a brilliant scientist and a road and a bridge builder. He was a doctor of technical sciences, a professor and an academic.

He graduated from Moscow motorway Institute in 1933. He became a lecturer in 1935. He gave lectures on road design, bridge design, highway engineering. He was interested in road-bridge hydraulics. He was the first to create a theory and methods for predicting (предсказывать) river-bed (русло) deformation under bridges. He took part in designing bridges over the Vyatka river and the Volga.

He published over 100 scientific works and some text-books. Many of his books were translated into Chinese and Czech. He carried out research and helped post-graduates (аспиранты) in their research work. Over 100 post-graduates wrote their candidate theses under his supervision (руководство) and defended them. He took part in scientific conferences both in this country and abroad.

IX. Speak about:

– historic aspect of road engineering in Russia;
– Russian system of roads;
– Scientific and practical activity of O.V. Andreev.

X. Render the text into English. Make use of the given words and expressions.

В. Ф. Бабков
(1909–1995 гг.)

Валерий Федорович Бабков – доктор технических наук, профессор, академик, выдающийся ученый-дорожник России. Он окончил Московский автодорожный институт (МАДИ), защитил кандидатскую и докторскую диссертации. Он

исследовал проблемы грунтовых дорог, взлетов и посадки самолетов на грунтовые аэродромы.

В.Ф. Бабков возглавлял российскую научную школу по проектированию и реконструкции автомобильных дорог. Он подготовил 70 кандидатов наук, 5 докторов наук. Им опубликовано более 400 научных работ, несколько учебников по проектированию автомобильных дорог, аэродромов, безопасности дорожного движения. Ряд его книг был переведен на английский и испанский языки. Они изданы в Китае, Чехословакии, Польше, Бразилии. Он принимал участие в международных научных конгрессах, был почетным доктором Будапештского технического университета. Многие годы он являлся членом редакционной коллегии международного журнала «Accident Prevention and Analysis».

Дороги России XXI века, 2005, №3

_____

to defend a candidate, doctoral thesis, to investigate, take-off, landing, earth roads (airports), to head, traffic safety, a number of his books, to take part in, honorary, editorial staff.

XI. Work in pairs. Think of some questions to the following answers.

1. In Paris in 1747.
2. A new type of light road surface.
3. 18 feet wide.
4. Joseph Mitchell.
5. In 1801.
6. In 1809 in St-Petersburg.
7. Over 100 post-graduates.

UNIT 3. THE MODERN ROAD

I. Vocabulary.

through traffic	прямой, беспересадочный транспорт
legislation	законодательство
set of laws	пакет законов
freeway	магистраль, скоростная трасса
parkway	аллея, бульвар

lane	1. полоса дороги; 2. узкая дорога; 3. переулок
carriage way	проезжая часть дороги
band	полоса
conflict	столкновение
in excess of	сверх, больше чем
bypass	1. объездная дорога; 2. построить объездную дорогу; 3. объехать
toll road	платная дорога
median	срединный
grade	уклон
interchange	узловой пункт

II. Translate the following expressions and memorize them.

coordinated system of roads, to be of great significance, to introduce the concept of highway systems, a network of roads, to improve highways, a road service bureau, through traffic system, four-lane road, single carriageway, roads to be maintained by the government, to improve highways, to increase cost, broad bands of parkland, limited access, conflicting traffic movement, successful experience, integrated freeway network, large traffic volumes, cross traffic.

III. Give definitions.

1. parkway	1. one of the two sides of a motorway where traffic travels in one direction only.
2. freeway	2. a wide road with grass and trees on either side.
3. lane	3. a main road for any form of transport.
4. through traffic	4. a road which has several lanes and controlled places where vehicles join it, so that people can travel quickly
5. highway	5. a part of a main road that is marked by the edge of the road and a painted line, or two rows of painted lines

	which tell drivers where to drive
6. carriageway	6. traffic that goes directly to a particular place, so that people who want to go there do not need to change vehicles.

IV. Translate the sentences. Pay attention to the underlined words.

1. He was on the wrong lane.
2. Many parkways were built in the USA and Europe in the 20th century.
3. He changed lanes to make a left turning.
4. Main roads usually have bys lanes.
5. They were driving in a California freeway,
6. The first parkway was introduces in New York City as the work of the landscape architects.
7. On a grade I found myself behind a gigantic truck.
8. He went into the line of rush-hour traffic.
9. We should be able to bypass Oxford.

10 million pounds is to be spend on bypassing Holywell.

11. The construction of a new bypass around the ancient town of Sandwich will be completed in some months.

V. Match the synonyms.

total	road movement
to complete	convenience
pavement	to satisfy the demands
to replace	to give
to grow	to increase
to provide	to take the place of
to meet the demands	influence
comfort	needs
road travel	entire
requirements	to finish
impact	surface

VI. Read the text and find out special characteristics of national highway systems in different countries.

National Highway Systems

France

The Romans had realized that a coordinated system of roadways connecting the major areas of the empire would be of great significance for both commercial and military purposes. In the modern era, the nations of Europe first introduced the concept of highway systems. In France, for example, the State Department of Roads and Bridges was organized in 1716, and by the middle of the 18th century the country was covered by an extensive network of roads built and maintained primarily by the national government.

In 1797 the road system was divided into three classes of descending importance: (1) roads leading from Paris to the frontiers, (2) roads leading from frontier to frontier but not passing through Paris, and (3) roads connecting towns. By the early 1920s the road system was divided into four classes: (1) national highways, improved and maintained by the national government, (2) regional highways, improved and maintained by the department under a road service bureau appointed by the Department Commission, (3) main local roads, connecting smaller cities and villages, built and maintained from funds of the communes and by grants from the department, and (4) township roads, built and maintained by the communities alone.

The United Kingdom

While the British recognized the necessity for national support of highways and national system as early as 1878, it was the Ministry of Transport Act of 1919 that first classified the roadway system into 23, 230 miles of Class I roads and 14,737 miles of Class II roads. Fifty percent of the cost of Class I roads and 25 percent of the cost of Class II roads were to be maintained by the national government. In the mid-1930s the need for a national through-traffic system was recognized, and the Trunk Roads Act of 1939, followed by the Trunk Roads Act of 1944, created a system of roadways for through traffic. The Highways Act of 1959 liquidated all previous highway legislation in England and Wales and replaced it with a comprehensive set of new laws.

The Unites States

The U.S. Interstate Highway System (formally, the National System of Interstate and Defense Highways) developed in response to strong public pressures in the 1950s for a better road system.

The Federal Aid Highway Act and the Highway Revenue Act of 1956 provided funding for an accelerated program of construction. A federal gasoline tax was established, the funds from which, with other highway-user payments, were placed in a Highway Trust Fund. The federal state ratio for funding construction of the Interstate System was changed to 90 percent federal and 10 percent state. It was expected that the system would be completed no later than 1971, but cost increases and planning delays extended this time by some 25 years. The system grew to a total length of more than 45,000 miles, connecting nearly all major cities in the United states and carrying more than 20 percent of the nation's traffic on slightly more than 1 percent of the total road and street system.

Canada

The Canadian Highway Act of 1919 provided for a system of 40,000 kilometers (13,000 miles) of highways and provided for a federal support for construction not to exceed 40 percent of the cost. By the end of the century, more than 134,000 kilometers (83,000 miles) of highway had been built, of which about 16,000 kilometers (9,900 miles) were freeway.

From *Encyclopedia Britannica*

VII. Work in pairs. Discuss national highway systems.

1. In what country was a national highway system first introduced?
2. What classes was the road system in France divided into in 1797?
3. What roads were the most important?
4. What classes was the road system in France divided into in 1920s?
5. What is the difference between these two classifications?
6. When did the British understand the necessity for national support of highways?

7. What was the first Act of the British Ministry of Transport?

8. What is the government support of Class I roads and Class II roads in Great Britain?

9. When was the need for a national through-traffic system recognized in Britain?

10. What is the official name of the U.S. highway system?

11. When did it develop?

12. What is the federal-state ratio for funding road construction in the United States?

13. What is the total length of the U.S. roads?

14. What is a federal support for road construction in Canada?

VIII. Read the text «New Highways» and answer the questions.

1. What is a parkway?
2. When and where was the first parkway built?
3. What is the world's first freeway?
4. What freeway was first built in the U.S.?

New Highways

The parkway

A system of national roads in the automobile age required a new form of road. This grew from the parkway, which was introduced in its modern form in 1858 with the work of the landscape architects Frederick Law Olmsted and Calvert Vaux for Central Park in New York City. The 15-mile, four-lane single carriageway known as the Bronx River Parkway was built between 1916 and 1925. Protected on both sides by broad bands of parkland that limited access, the highway was located and designed so as to cause minimum disturbance to the landscape. Its use was restricted to passenger cars. The success of the concept led to the creation of the Westchester County parkway system and the Long Island State Park Commission. More parkways were built in the New York area, including the Merritt Parkway (1934–1940), which continued the Westchester Parkway System across Connecticut as a toll road providing divided roadways and limited access.

The freeway

The success of the parkway system led to the introduction of the freeway, which is a divided highway with no conflicting traffic movements and no access from adjoining properties. In Germany between 1913 and 1921 a group called AVUS had built 10 kilometers (6 miles) of parkway through the Grunewald park in Berlin. Their successful experience led to the world's first full freeway being built from Cologne to Bonn between 1929 and 1932. In 1933 Adolf Hitler began construction of an integrated freeway network known as the Reichsautobahnen, or «national motor roads», beginning with the Frankfurt-Darmstadt-Mannheim-Heidelberg Autobahn. One purpose of the program was to stop unemployment, but the roads also pleased German nationalism and had a strong militaristic intent. The entire system included three north-south routes and three east-west routes. The highway provided separate 7.5-metre (25-foot) carriage ways divided by a median strip of 5 meters (16 feet). The roads were designed for large traffic volumes and speeds in excess of 150 kilometers per hour, bypassing cities and providing limited access. About 1,000 kilometers (600 miles) were completed by 1936, and 6,500 kilometers (4,000 miles) were in use when construction stopped in 1942.

The importance of the freeway concept in the United States was demonstrated by the Pennsylvania Turnpike. The Pennsylvania Turnpike Commission was established in 1937 to raise funds and build a toll road across the Appalachian Mountains. The Turnpike provided two 24-foot carriageways and a 10-foot median with no cross traffic at grade and with complete control of access at eleven traffic interchanges. It was designed for high volumes of high-speed traffic and its pavement was to accommodate the heaviest trucks. The favourable public reaction to this new type of highway provided the stimulus for the post-World War II toll-road boom in the United States, advanced the start of a major interstate highway program, and influenced highway developments elsewhere. The Pennsylvania Turnpike, originally running from Harrisburg to Pittsburgh, was later extended 100 miles east to Philadelphia and 67 miles west to the Ohio border, making it 327 miles long. An original feature of the Turnpike, later widely copied, was the provision of restaurant and fueling facilities.

IX. Complete the sentences.

1. A parkway was introduced in 1858 for Central Park in …
2. The parkway was worked out by landscape…
3. The 15-mile, 4-lane carriage way was built in …
4. The highway was protected by broad bands of …, thus providing limited excess to it.
5. It was mainly used by passenger …
6. The concept of a parkway was a success and more parkways were built in …
7. The success of a parkway system led to the introduction of the …
8. A freeway is a … which has some lanes, along each of them traffic goes in one direction.
9. The world's first freeway network was constructed … in …
10. The integrated freeway network included three north-west routes and three …
11. The roads were designed for large traffic volumes and speed of 150 …
12. The total length of the freeway network in Germany was …
13. In the USA a freeway was built in Pennsylvania across the Appalachian …
14. The freeway provided two 240foot carriageways and a 10-foot …
15. After World War II a major interstate highway program began to develop …

X. Speak about:

a) the parkway;
b) the freeway;
Make use of exercises II, III, IV, IX.

XI. Read the text and 1. choose the title to it: a) Roads in the age of the automobile; b) Road engineering; c) Modern road system. 2. Fill the blanks with the words from the list below.

Beginning in the 1840s, the rapid development of railroads brought the construction of lightweight Tresaguet-McAdam roads to an end. For the next 60 years, road ___1___ were limited to city streets. Rural roads became impassable in wet weather.

The initial stimulus for renewal of road building came not from the automobile, whose impact was not felt before 1900, but from the bicycle, for whose benefit (на благо) road improvement began in many countries during the 1880s and ‘90s. Nevertheless, while the requirements of the lightweight, low-speed bicycle were satisfied by the old «macadamized» (мостить щебнем) ___2___, as the world entered the 20th century the automobile began to raise its own ___3___.

Since the beginning of the 20th century, vehicle ownership per head of population had increased. Road needs have been strongly influenced by this popularity and also by the mass movement of people to cities and to suburbs – a trend that has led to ___4___ travel needs. Often the building of new roads requires controls over land use, and the proper pricing of road travel. Road managers must be concerned not merely with lines on maps but also with the number, type, speed, and loading of individual vehicles, the safety, comfort, and convenience of the traveling public, and the health and welfare of people and adjoining property owners.

Ideally, the development of a major road system is an orderly, ___5___ process. The process follows several steps: assessing (оценка) road needs and transport options; planning a system to meet those needs; designing an economically, socially, and environmentally acceptable set of roads; obtaining the required approval and financing; building, operating, and maintaining the system; and providing for future extensions and reconstruction.

1. transport, improvements, achievement.
2. surfaces, slabs, stones.
3. movement, development, demands.
4. increasing, measuring, loosing.
5. ecological, continuous, short.

XII. Speak about tendencies in road building in the 19th and 20th centuries. Make use of the given expressions.

1. The first stimulus, for road building, to come, from the bicycle, in the 19th century.

2. Road improvements, in many countries, to begin, for the benefit, at the end of the 19 century, of a bicycle.

3. In the 20th century, to begin, the automobile, to make its own demands.

4. Per head of population, vehicle ownership, to increase, at the beginning of the 20th century.

5. To begin, mass movement of people, to cities and suburbs.

6. Increasing travel needs, to lead to, this, and, building road systems.

XIII. Say what stages the development of a road system includes.

UNIT 4. BRIDGES

I. Vocabulary.

span	1. соединять берега, охватывать; 2. пролет моста
performance	работа, эксплутационные качества
overpass bridge	переходный мост
pier	мостовой бык
beam	мостовая балка
bed of a river	дно реки
permanence	прочность
cofferdam	перемычка
enclosure	ограждение
pile	свая, столб
sheath	обшивка, кожух
to seal	замазывать, уплотнять раствором
masonry bridge	мост каменной кладки
joint	соединение
tier	ряд, ярус
reinforced concrete	железобетон
prestressed concrete	предварительно напряженный бетон
suspension bridge	висячий (подвесной) мост
caisson	кессон
cantilever span	консольный пролет
braced arch	жесткая арка
bar	балка
sweeping	пологая кривая

tension	натяжение, растягивающая сила
plate	плита
tie	распорка, растянутый элемент, затяжка

II. Translate the following expressions and memorize them.

to overcome engineering problems, in simple form, be strong enough, bridge design, to serve the public interests, a scientific principle, to reduce the cost of maintenance, to make efficient use of materials, to have possible choices, industrially produced iron, to exchange building ideas, wooden piles, to use the circular arch form, long spans, strong piers, to weigh eight tons, the top tier, to rise 45 meters above the river, to understand the possibilities.

III. Match the expressions.

1. threefold goal	1. уменьшить расход материала
2. put value on	2. сохранять эффективность
3. to reduce materials	3. компетенция инженера
4. to preserve efficiency	4. временное ограждение
5. personal expression	5. эстетические идеи
6. province of an engineer	6. признать факт
7. aesthetic ideas	7. вообще говоря
8. to recognize the fact	8. выражение личности
9. temporary enclosure	9. тройная цель
10. generally speaking	10. ценить
11. to overcome problems	11. как можно короче
12. as short as possible	12. преодолеть проблемы

IV. Give definitions.

1. a bridge	1. a building material which is made by mixing together cement, sand, small stones and water, and which hardens when it dries
2. a span	2. a new idea or method that is introduced in the way that something is done
3. concrete	3. a structure that has two pillars on

	either side of a space which form part of a bridge or support a curved roof
4. an innovation	4. a structure that is built over a river, railway, road, etc. so that people, vehicles can cross it from one side to the other
5. masonry	5. part of a bridge that stretches right across a river or between two pillars
6. an arch	6. bricks or pieces of stone which have been stuck together with cement as part of a wall or a bridge

V. Read the text «The Main Principles of Bridge Design» and name these principles.

The Main Principles of Bridge Design

A bridge is a structure that spans horizontally between supports, whose function is to carry vertical loads. The prototypical bridge is quite simple – two supports holding up a beam – yet the engineering problems that must be overcome even in this simple form are natural in every bridge: the supports must be strong enough to hold the structure up, and the span between supports must be strong enough to carry the loads. Spans are generally made as short as possible; long spans are made where good foundations are limited – for example, over estuaries (эстуарий, широкое устье реки) with deep water.

All major bridges are built with the public's money. Therefore, bridge design that best serves the public interest has a threefold goal: to be as efficient, as economical, and as elegant as is possible. Efficiency is a scientific principle that puts a value on reducing materials while increasing performance. Economy is a social principle that puts value on reducing the costs of construction and maintenance while preserving efficiency. Finally, elegance is a symbolic or usual principle that puts value on the personal expression of the designer without compromising performance or economy. There is little disagreement over what is efficiency and economy, but the definition of elegance has always been controversial (противоречивый).

Modern designers have written about elegance or aesthetics since the early 19th century, beginning with the Scottish engineer Thomas Telford. Bridges ultimately belong to the general public, which is the final arbiter, but in general there are three positions taken by professionals. The first principle holds that the structure of a bridge is the province of the engineer and that beauty is fully achieved only by the addition of architecture. The second idea, arguing from the viewpoint of pure engineering, insists that bridges making the most efficient possible use of materials are by definition beautiful. The third principle holds that architecture is not needed but that engineers must think about how to make the structure beautiful. This last principle recognizes the fact that engineers have many possible choices of equal efficiency and economy and can therefore express their own aesthetic ideas without adding significantly to materials or cost.

Generally speaking, bridges can be divided into two categories: standard overpass bridges or unique design bridges.

From *Encyclopedia Britannica*

VI. Work in pairs. Discuss the principles of bridge design with your partner.

1. What is the function of a bridge?
2. What was the first bridge model?
3. What engineering problems must be overcome when designing a bridge?
4. What threefold goal should an engineer achieve?
5. What is a scientific principle?
6. What does economy put value on?
7. Is elegance important in bridge design?
8. Whose interests must a bridge design serve?
9. What's your idea of these three principles? Do you think it is necessary to make a bridge structure beautiful?

VII. Write a summary of the text «The Main Principles of Bridge Design».

VIII. Read the text «Roman Arch Bridges», and say in Russian:

– bridges of what type the Romans built;

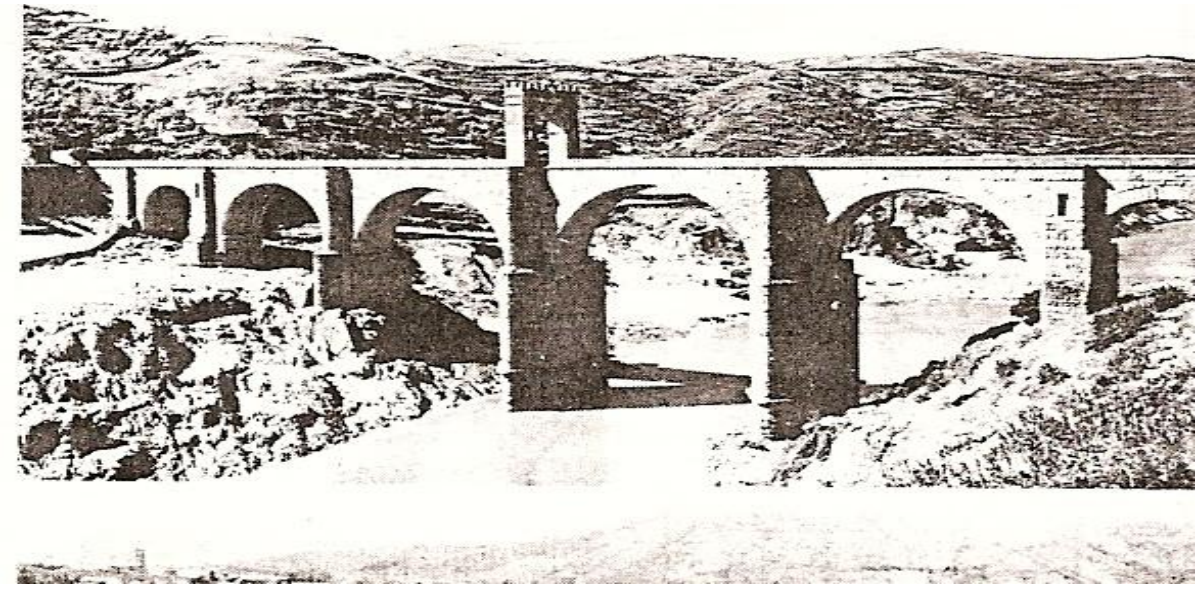
– what materials were used.

Roman Arch Bridges

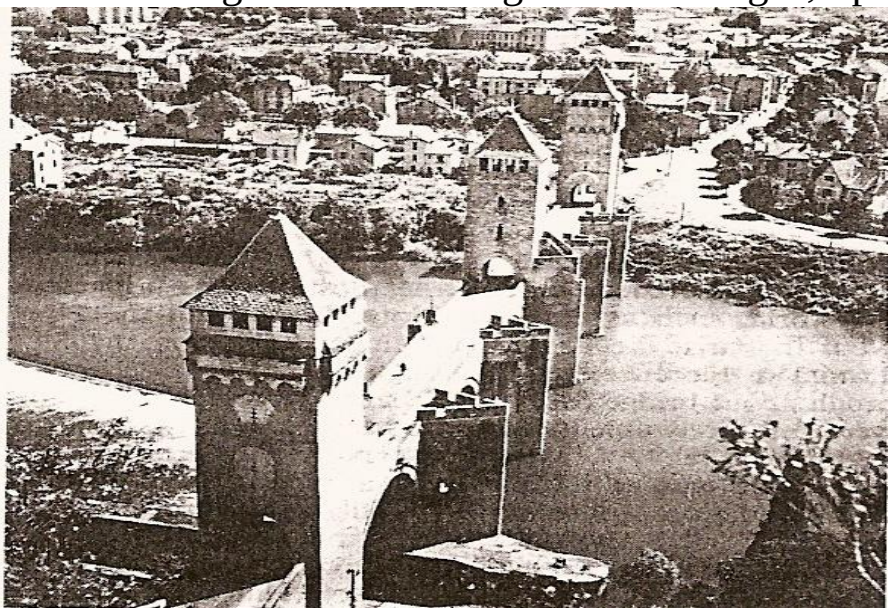
The Romans began organized bridge building to help their military campaigns. Engineers and skilled workmen formed guilds that worked throughout the empire, and these guilds spread and exchanged building ideas and principles. The Romans also discovered a natural cement, called pozzolana, which they used for piers in rivers.

Roman bridges are famous for using the circular arch form, which allowed for spans much longer than stone beams and for bridges of more permanence than wood. Where several arches were necessary for longer bridges, the building of strong piers was difficult. This was a problem when the piers could not be built on rock, as in a wide river with a soft bed. To solve this dilemma, the Romans developed the cofferdam, a temporary enclosure made from wooden piles driven into the river bed to make a sheath, which was often sealed with clay. Concrete was then put into the water within the ring of piles. Although most surviving Roman bridges were built on rock, the Sant'Anglo Bridge in Rome stands on cofferdam foundations built in the Tiber River more than 1,800 years ago.

The Romans built many wooden bridges, but none has survived, and their reputation rests on their masonry bridges. One beautiful example is the bridge over the Tagus River, in Spain. The arches, each spanning 29 meters (98 feet), show huge arch stones weighing up to eight tons each. Typical of the best stone bridges, the stones in Spain were so accurately shaped that no mortar was needed in the joints. This bridge has remained standing for nearly 2,000 years. Another surviving monument is the Pont du Gard aqueduct in southern France, completed in AD 14. This structure, almost 270 meters (900 feet) long, has three tiers of semicircular arches, with the top tier rising more than 45 meters (150 feet) above the river.



Stone arch bridges. Roman bridge over the Tagus, Spain



Pont Valentre, France, a medieval fortified bridge

IX. Complete the sentences.

1. Construction of bridges helped the Romans in their military …

2. Engineers and skilled workers worked throughout the empire and exchanged building …

3. The Romans used the circular arch … .

4. For longer bridges where several arches were …, the Romans … the cofferdam.

5. The Sant'Anglo Bridge in Rome stands on cofferdam foundation. It was built more than …

6. The Romans are famous for their masonry …

7. A beautiful example of a stone bridge built by the Romans is in …

8. Another surviving monument is the Pont du Gard aqueduct in …

X. Give the main idea of Roman arch bridges (in 5–8 sentences).

XI. Read the text «The History of Bridge Design», and say in Russian:

– what influenced the development of bridge design;

– what changes in designing bridges were made;

– what countries took the lead in introducing new materials and new forms in their bridges.

The History of Bridge Design

Modern bridges began with the introduction of industrially produced iron. They have developed over the past 200 years as engineers have come to understand better the new possibilities of cast iron, then structural steel, and finally reinforced and prestressed concrete. These materials have led to bridge designs that have broken completely with the designs in wood or stone that characterized bridges before the Industrial revolution.

Industrial strength has been an important factor in the evolution of bridges. Great Britain, the leading industrialized country of the early 19th century, built the most significant bridges of that time. Likewise, innovations arose in the United States from the late 19th century through the mid- 20th century and in Japan and Germany. Switzerland, with its highly industrialized society, has also been a good ground for advances in bridge building.

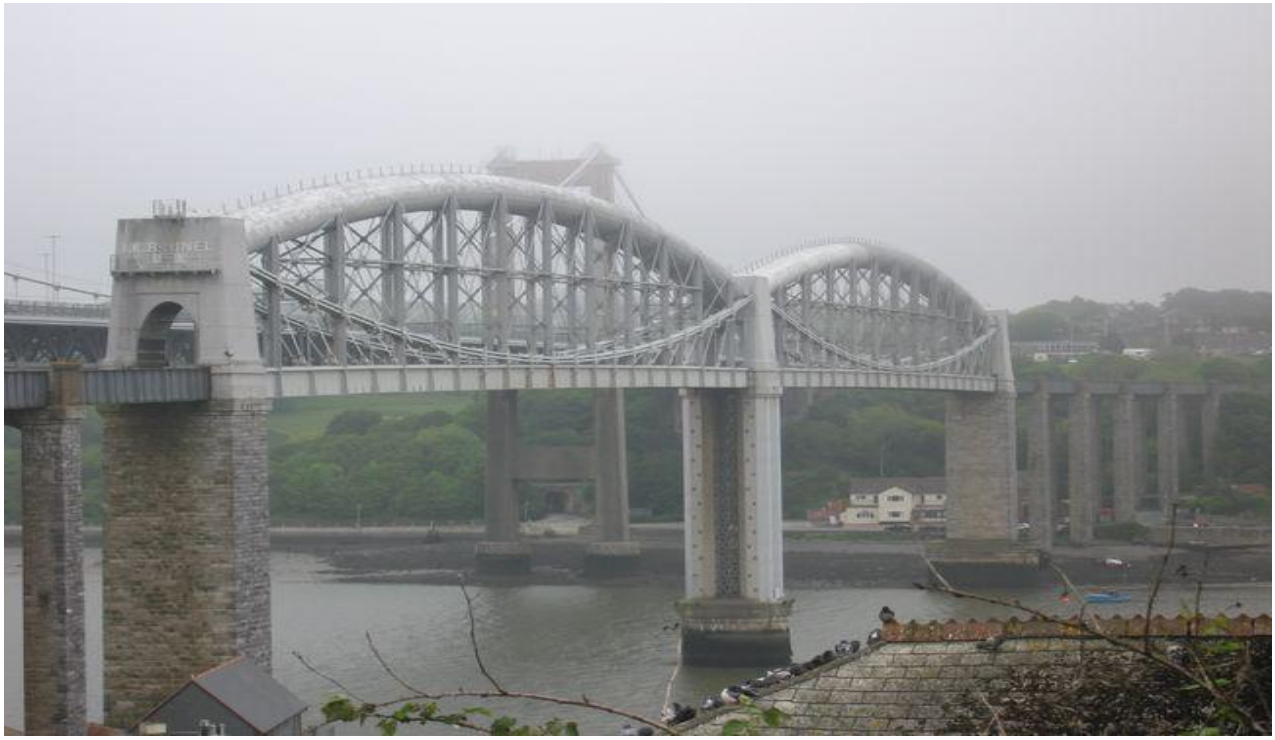
The Iron Bridge

It was not until late in the 18th century that iron came to be generally used in structures, freeing bridge builders from their dependence on timber, brick and stone. The possibilities opened up by the new material were quickly exploited and by 1860 numerous iron arches, suspension bridges had been built. Iron chains had been used in suspension bridges for centuries, but the world's first all-iron bridge was a semicircular arch with 100 foot (30 metre) span built

over the Severn in Shropshire (Great Britain). It is known as the symbol of the Industrial Revolution. The bridge was built between 1777–1779, and had a considerable influence on developments in the field of technology and architecture. It carried roadway traffic for more than 170 years.

This was followed by a number of cast-iron arches designed by a Scottish engineer and road builder Thomas Telford, of which the first was the bridge in Shropshire, with a 130 foot (40 metre) span.

Royal Albert Bridge over the Tamar Cornwall was constructed by the designer Brunel, who employed a wrought (сварочное) iron cylinder 35 feet in diameter for the central pier in this innovative design of 1855–59.



The Royal Albert Bridge over the Tamar Cornwall

The foundation Problem: Compressed Air

Up to the middle of the 19th century, cofferdams were the only means by which bridge foundations could be properly constructed below water. The first use of pneumatic caissons for bridgework was on the foundation of a bridge at Rochester, Kent (Great Britain), in 1851. And then this method for sinking the foundation was used on a much greater scale. Many early tragedies in the use of compressed air

were caused by men working for a long time or coming out of the air lock (воздушный шлюз) too quickly.

The Steel Bridge

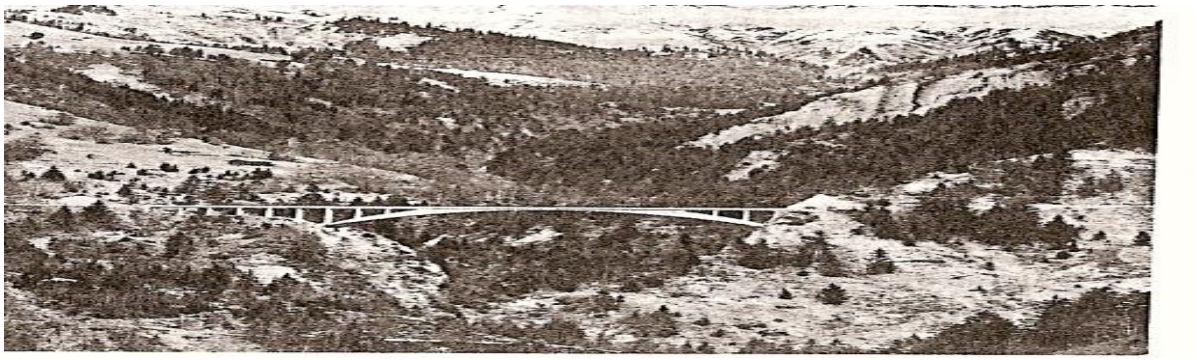
The last 30 years of the 19th century saw the introduction of steel plates and sections which came to be mass-produced in shops by standardized methods. The first big bridge to be built of steel was the Eads Bridge built over the Mississippi River (1867–1874) at St. Louis, Missouri. It was designed with three steel arches with spans of 502, 520 and 502 feet (153, 158, and 153 metres), respectively. The spans were made double-decked to carry wagon and pedestrian traffic on the upper deck and two railway tracks below.

In 1898 an arch bridge with a span of 840 feet (256 metres) was completed below Niagara Falls; it stood 40 years, until the ends of the steel ribs were broken by a huge ice jam in the river. In the same year, the first major steel bridge in France was opened, the Viaur Viaduct, which consisted of an arch 721 feet (220 metres) long, flanked (граничить) by cantilever spans of 311 feet (95 metres). Seven years later the Victoria Falls Bridge, with a braced arch spanning 500 feet (152 metres), was built in Africa to carry the Cape-to-Cairo Railway.

Reinforced-Concrete Bridges

Engineers in the late 19th century first demonstrated the possibilities of reinforced concrete as a new structural material. Visualizing the new forms that could be molded, with concrete resisting the compression forces and steel bars taking the tension, they designed bridges in sweeping curves. The basic element in reinforced concrete was the slab, which replaced the beams, posts, and ties associated with steelwork design. From the start, Switzerland, France, and the Scandinavian countries took the lead, and the longest and most impressive reinforced spans were built in those nations.

From *Encyclopedia Britannica*



Salginatobel Bridge near Schiers, Switzerland, a reinforced-concrete bridge designed by Robert Maillart and built 1929–1930

XII. Say, whether the following statements are true or wrong.

1. Modern bridges began with the introduction of wood and stone.
2. Industrial strength is of no importance in the evolution of bridges.
3. The most significant bridges in the early 19th century were built in Great Britain.
4. In the 20th century the greatest advances in bridge building were made in Switzerland, France and the Scandinavian countries.
5. Concrete has new possibilities for bridge design in comparison with iron.
6. The first iron bridge in great Britain carried traffic for several years.
7. The foundation problem was solved by using pneumatic caissons in the beginning of the 19th century.
8. At the end of the 19th century mass production of steel plates and sections made it possible to build big bridges in different parts of the world.
9. Using steel engineers designed bridges in sweeping curves.
10. Beams and ties were replaced by reinforced concrete slabs.
11. The longest and the most beautiful reinforced spans were made in Switzerland.

XIII. Read the text «Bridge Over the La Perouse Strait» and fill the blanks with the words from the list below.

Bridge Over the La Perouse Strait

Japan and Russia ___1___ to rebuild the tunnel between Sakhalin Island and the continental part of Russia's Far East, dug under the Tatar strait by GULAG prisoners in the early 1950s.

The Japanese firms ___2___ in the development of the oil and gas bearing shelf of Sakhalin Island seriously intend to start building durable transport communications in the areas of hydrocarbon mining. Among other projects, the Japanese are planning to build two bridges across the La Perouse and Tatar Straits.

The Russians believe that the La Perouse Strait is highly complicated with regard to ___3___ and navigational aspects, and are therefore more inclined to restore the old tunnel between the continent and Sakhalin Island, built under the Tatar Strait by prisoners in the late 1940s and early 1950s. Today the documents concerning the tunnel have been ___4___ and the tunnel is most likely flooded with sea water. The outlet to the continent should be looked for near the Pogibi settlement (the coast of Khabarovsk Territory).

Consultations took place between the two parties involved in the above ___5___. Talks are to take place in Japan or on Sakhalin with the participation of the representatives of both governments.

The above projects have been launched by a special «For linking Japan with the Euro-Asian continent». Sakhalin administration believes that, apart from the obvious profit, active propaganda in favor of these projects is being roused by another of the Russian government's projects – the ___6___ of a motor highway linking Moscow with Alaska across the Bering Strait.

From *Moscow News by M. Urusov*

1. intend (намереваться), promise, achieve
2. introduce, engaged (занятый), work
3. ecological, cultural, meteorological
4. written, lost, sent
5. bridge, project, development
6. construction, plan, invention

XIV. Work in pairs. Think of some questions to the following answers.

1. By Gulag prisoners in the early 1950s.
2. To build transport communications.
3. Two bridges across the La Perouse and Tatar Strait.
4. To restore the old tunnel between the continent and Sakhalin Island.
5. Near the Pogibi settlement.
6. The construction of a motor highway linking Moscow with Alaska.

XV. Render the text into English. Make use of the given expressions.

Город его мостов

Новый Кемеровский мост необходим для дальнейшего развития города. Главный инженер проекта и автор нового Кемеровского моста – Борис Александрович Горожанин. Он работает в Московском институте «Гидротрансмост». По его проекту был построен мост по улице Терешковой, который сейчас называют Кузбасским.

Новый мост должен был быть построен за короткий период времени – около одного года. Использовались материалы и технологии, которые обеспечивают прочность и долговечность моста. Прочность и сроки эксплуатации – важные характеристики в проекте новых конструкций. Новый мост, как запланировано, будет использоваться 100 лет. При строительстве моста применяются металлоконструкции. Ширина моста – 40 метров. Это мост с шестиполосным движением в двух направлениях и двумя полосами для движения трамваев. Необходимо было расширить Кузнецкий проспект, построить дополнительные дороги. Новый мост является стимулом для развития г. Кемерово.

Кузбасс, 02.12.2005

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chief engineer, according to his project, during a short period of time, to provide durability and permanence, durability and terms of performance, for a term of 100 years, steel structures, 40-meters wide, to carry six lanes of traffic, two lanes for tram traffic, to expand Kuznetsky avenue.

Составитель
Ирина Борисовна Шестакова

АВТОМАГИСТРАЛИ И МОСТЫ

Методические материалы
по дисциплине «Иностранный язык»
для обучающихся направления подготовки
08.03.01 Строительство

Рецензент С. В. Лебединцев

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