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ENGLISH FOR ROAD BUILDERS

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Учебное пособие предназначено для студентов-бакалавров дневного отделения неязыковых вузов. Основная цель учебного пособия – развитие и совершенствование навыков устной коммуникации и письменной речи в рамках предложенной тематики.

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MAP OF THE BOOK

Предисловие

Данное учебное пособие предназначено для студентов 1 курса автодорожного факультета технических ВУЗов.

Целью учебного пособия является развитие и совершенствование умений и навыков устной речи в деловой и общепрофессиональной коммуникации, формирование профессионально ориентированной лингвистической компетентности студентов.

Деление на главы осуществляется в соответствии с тематикой. Учебное пособие состоит из четырех тематических глав. Первая глава посвящена строительству автомобильных дорог, вторая – организации и безопасности дорожного движения, третья – строительству автодорожных мостов и тоннелей, четвертая глава раскрывает особенности использования строительных и дорожных машин. Каждая тематическая глава включает в себя соответствующие разделы (Units), посвященные таким проблемам как: «История строительства дорог», «Основные элементы дороги», «Этапы строительства автодороги», «Типы дорожного покрытия», «Дорожные развязки», «Дорожные знаки», «Дорожная разметка», «Типы мостов», «Этапы строительства мостов», «Методы строительства тоннелей», «Строительная техника для расчистки территории, отведенной под строительство автодороги», «Строительная техника для формирования дорожного покрытия» и т.д.

Данное учебное пособие направлено на развитие разных видов речевой деятельности: чтения, диалогической и монологической речи, навыков письменного и устного перевода.

Каждый раздел (Unit) включает тексты для ознакомительного, изучающего и просмотрового чтения, которые содержат актуальную информацию из аутентичных источников. Тексты сопровождаются подробным словарем, а также значительным количеством иллюстраций, что

привлекает внимание студентов и облегчает понимание представленного им материала.

Разделы также включают в себя лексические упражнения, направленные на расширение словарного запаса по специальности. Предусмотрены задания для индивидуальной, парной и групповой работы, в которых студенты создают и участвуют в коммуникативных ситуациях профессиональной направленности, что способствует уменьшению языкового барьера при реальном общении с носителями языка. Таким образом, каждый текст сопровождается упражнениями, имеющими коммуникативную направленность и позволяющими активизировать приобретенные навыки в речи.

Представленные задания помогут студентам научиться вести беседы на темы вышеуказанных сфер деятельности на английском языке, тем самым формируя общее представление об области дорожного строительства. Таким образом, изучив представленные в учебном пособии материалы, студенты смогут на базовом уровне участвовать в процессе коммуникации на профессиональные темы.

Каждый раздел содержит контрольные задания (Final Tasks), направленные на контроль усвоения пройденного материала.

Учебное пособие может быть использовано как для работы в аудитории, так и для самостоятельной работы.

CHAPTER I.
HIGHWAY CONSTRUCTION

UNIT 1: HISTORY OF ROAD BUILDING

1. Before you start.

- Who built it?
- How do you think when was the first road built?
- What was its purpose?

2. Read the words and learn them by heart.

1. to tend – стремиться, иметь тенденцию к чему-либо
2. to take for granted – принимать как само собой разумеющееся
3. vast – огромный
4. extensive – большой, протяженный
5. well-maintained – в хорошем состоянии
6. grumbling – ворчание
7. pothole – выбоина, рытвина, яма
8. traffic jam – затор в уличном движении, «пробка»
9. to pave – мостить
10. paved road – мощеная дорога
11. site – территория, площадка, строительная площадка
12. route – маршрут, путь
13. market outlet – рынок сбыта, торговая точка
14. to carry – нести, перевозить
15. to stretch – тянуться, простираться
16. to consume – потреблять

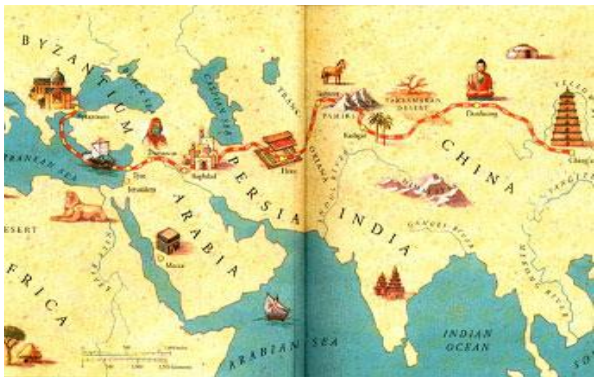
17. supplies – припасы, провиант
18. equipment – оборудование
19. engineer corps – инженерные войска
20. pontoon bridge – понтонный мост
21. to level – выравнивать
22. track – тропа, курс
23. cart – телега, повозка
24. siege engine – осадное орудие
25. stone – камень

3. Read the text, translate it and compare your ideas in ex.1 with the facts.

Roads. How it all started.

Most of us give very little thought to the roads we drive on every day, and tend to take them for granted – at least until they are closed for repairs, washed out in a flood and so on. However, only during the past forty years or so have we enjoyed the luxury of a vast, extensive, and well-maintained system of roads accessible to everyone. In the midst of our grumbling about potholes, traffic jams, and incompetent drivers, we forget how fortunate we truly are. Obviously, it was not always the case.

http://geofacts.ru/tajny-egipetskix-piramid/#



http://www.unmultimedia.org/radio/russian/archives/108878/

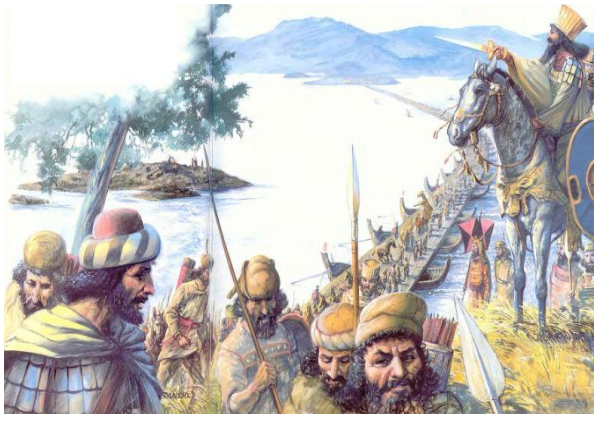
From the earliest times, one of the strongest indicators of a society's level of development has been its road system – or lack of one. Increasing populations and the advent of towns and cities brought with it

the need for communication and commerce between those growing population centres.

A road built in Egypt by the Pharaoh Cheops around 2500 BC is believed to be the earliest paved road on record – a construction road 1,000 yards long and 60 feet wide that led to the site of the Great Pyramid.

The various trade routes, of course, developed where goods were transported from their source to a market outlet and were often named after the goods which travelled upon them. For example, the Silk Route stretched 8,000 miles from China, across Asia, and then through Spain to the Atlantic Ocean. However, carrying bulky goods with slow animals over rough, unpaved roads was a time consuming and expensive. As a general rule, the price of the goods doubled for every 100 miles they had to travel.

Some other ancient roads were established by rulers and their armies. The Old Testament contains references to ancient roads like the King's Highway, dating back to 2000 BC. This was a major route from Damascus in Palestine, and ran south to the Gulf of Aqaba, through Syria to Mesopotamia, and finally on to Egypt. Later it was renamed Trajan's Road by the Romans, and was used in the eleventh and twelfth centuries by the Crusaders.



http://www.razlib.ru/istorija/mosty/p3.php

Around 1115 BC the Assyrian Empire in western Asia began what is believed to be the first organized road-building, and continued it for 500 to 600 years. Since they were trying to dominate that part of the world, they had to be able to move their armies effectively along with supplies and equipment. Their army's engineer corps laid pontoon bridges and levelled tracks for carts and siege engines.

Later another imperial road, the Royal Road, was being built by the Persians from the Persian Gulf to the Aegean Sea, a distance of 1,775 miles. Around 800 BC, Carthage, on the northern coast of Africa, began to use stones for paving roads. Although they may not have been the first to pave their roads with stones, they were among the earliest, and some people believe that the Romans imitated Carthaginian techniques.

Source: http://www.triplenine.org/articles/roadbuilding.asp

4. Answer the following questions.

1. What was one of the indicators of the level society's development?
2. When and where was the first paved road built?
3. Where did it lead?
4. What was one of the main purposes to create routes?
5. How long was the Silk Route?
6. By whom were some ancient roads established?
7. What is the King's Highway?
8. What country began the first organized road-building?
9. Why did the country do it?
10. What road was built by Persians?
11. What is the achievement of Carthage?

5. Say if the sentences concerning Text 1A are true or false.

1. People always have had a good system of roads.
2. Any developed society doesn't have and doesn't need road system.
3. The first paved road was built by Tutankhamun.
4. The Pharaoh Cheops road was 1,000 yards long and 60 feet wide.
5. Ancient routes were usually called after people who built them.
6. The Silk Route includes China, Asia, Egypt and Spain.

7. Romans called the King’s Highway Trajan’s Road.
8. The Assyrian Empire built its road for 200 years.
9. Assyrians used pivots (опоры) to build their bridges.
10. Romans imitated Carthaginian techniques when building their roads.

6. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. pothole	**a.** to cover an area of ground with a hard, flat surface of pieces of stone, concrete, or bricks
2. route	**b.** a large number of vehicles close together and unable to move or moving very slowly
3. to pave	**c.** a bridge that floats on water and in which barge- or boat-like pontoons support the bridge deck and its dynamic loads
4. traffic jam	**d.** a logistical network identified as a series of pathways and stoppages used for the commercial transport of cargo/ a particular way or direction between places
5. to carry	**e.** the set of necessary tools, clothing, etc. for a particular purpose
6. pontoon bridge	**f.** a type of disruption in the surface of a roadway where a portion of the road material has broken away, leaving a hole.
7. equipment	**g.** to make something flat
8. to level	**h.** move someone or something from one place to another

7. Give English equivalents of the following words and word combinations.

В хорошем состоянии, некомпетентные водители, уровень развития, мощеная дорога, торговый путь, инженерные войска, понтонный мост, тропа, строительство дороги, камень, расстояние, широкий, появление городов, оборудование, занимающий много времени.

8. Discuss with the group the following topics:

- ✓ Which of the roads mentioned in the text do you find more important?
- ✓ Are there any other famous ancient roads or routes? (use the Internet for additional information)

1. Before you start.

- Who are the most famous road builders?
- What civilizations do you know? Do they still exist?

2. Read the words and learn them by heart.

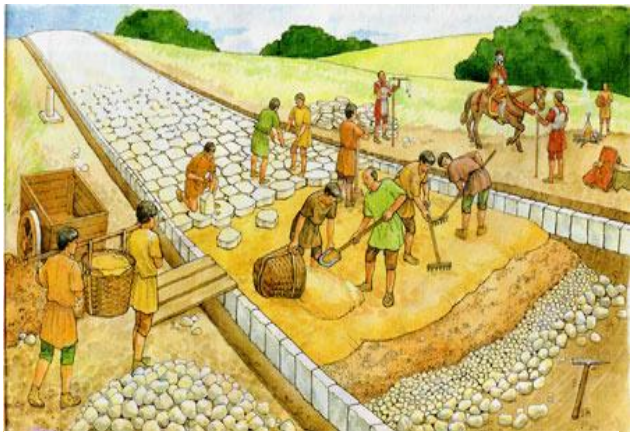
1. road builder – строитель дорог
2. network of roads – система дорог
3. to maintain – осуществлять техническое обслуживание
4. to radiate – расходиться лучами
5. to compose – здесь: составлять, складывать
6. course – слой
7. bedding – основание, выравнивающий слой
8. sand – песок
9. soil –почва, грунт
10. mortar – раствор (строительный)
11. gravel – гравий
12. lime – известняк
13. flint – кремень, мелкий песчаник
14. thick – толстый
15. width – ширина
16. roadway – дорожное полотно

17. branch – ветвь
18. to extend – расширять
19. to invent – изобретать
20. wheel – колесо
21. draft animals – тягловые животные
22. vehicle – транспортное средство
23. to ascend – подниматься, восходить
24. steep – круто, высоко
25. incline – склон, скат, уклон
26. consecutive – последовательный, следующий друг за другом
27. swamp – трясина, болото
28. causeway – дорога по насыпи на заболоченной территории
29. surface – поверхность

3. Read and translate the text to learn more about the Roman and South American roads.

Roman roads

Without doubt, the champion road builders were ancient Romans, who, until modern times, built the world's straightest, best engineered, and most complex network of roads in the world. At their height, the Roman Empire maintained 53,000 miles of roads, which covered all of England to the north, most of Western Europe, radiated throughout the Iberian Peninsula, and encircled and crisscrossed the entire Mediterranean area. Famous for their straightness, Roman roads were composed of a soil foundation topped by



http://pochemy.net/?n=559

four courses: a bedding of sand or mortar; rows of large, flat stones; a thin layer of gravel mixed with lime; and a thin surface of flint-like lava. Typically they were 3 to 5 feet thick and varied in width from 8 to 35 feet, although the average width for the main roads was from 12 to 24 feet. Their design remained the most sophisticated until the advent of modern road-building technology in the very late 18th and 19th centuries. Many of their original roads are still in use today, although they have been resurfaced numerous times.

http://ezhe.ru/ib/issue1008.html

Under Roman law, the public had the right to use the roads, but the district through which a road passed was responsible for the maintenance of the roadway. This system was effective so long as a strong central authority existed to enforce it. Unfortunately, as the Roman Empire declined so did their roads and their work fell into disrepair all across Europe and Great Britain.

South America

On the other side of the Atlantic Ocean, several centuries after the fall of the Roman Empire, the Inca Empire began to rise in South America during a period that corresponded with the Middle Ages in Europe. Centred in what is now Peru, the Incas branched out into Ecuador, Colombia, Bolivia, Argentina, and Chile, and, like the Romans, recognized the need for a system of roads that would enable them to extend their conquests and to govern their empire. Interestingly enough, the Incas built their empire without inventing the wheel, without the use of draft animals, and without a

http://www.vseprokosmos.ru/golos34.html

written language. Because they had no wheeled vehicles to worry about, their roads could ascend steep inclines via terraces or steps.

http://anton-klyushev.livejournal.com/47998.html

In one place a road going up a steep mountainside was built of 3,000 consecutive stone steps. They also built over swamps, and constructed a causeway 24 feet wide and 8 miles long, which had a paved surface and stone walls. Unfortunately, their well-constructed system of roads assisted in their downfall as the invading Spaniards used the Incas' own roads to move Spanish armies, weapons, and supplies.

Source: http://www.triplenine.org/articles/roadbuilding.asp

4. Answer the following questions.

1. Why did the Romans decide to build roads?
2. What territory did Roman roads cover?
3. How long are they?
4. What was the design of these roads?
5. Are Roman roads used nowadays?
6. Who was responsible for the maintenance of the road?
7. What did the Incas recognize?
8. Why did Inca roads differ from Roman roads?
9. What territory did Inca roads cover?
10. What was the reason for road-building?
11. What was the difficulty in building Inca roads?
12. Why were the roads one of the components to lead to Inca civilization fell down?

5. Say if the sentences concerning Text 1B are true or false.

1. First road builders were the Babylonians.
2. The technology of Roman road building used to be advanced till X century.
3. For road-building Romans used sand, mortar, flat stones and flint-like lava.
4. According to Roman law rich and powerful Roman citizens were responsible for the maintenance of roads.
5. The system of road maintenance was effective.
6. The Inca civilization developed on the coast of the Pacific Ocean.
7. The Incas decided to build roads to deliver letters from one town to another.
8. The Incas didn't have wheeled transport so they didn't need very wide roads.
9. The civilization lived in mountainous region that's why their roads had terraces and steps.
10. British invaders used Inca roads to conquer the Inca Empire.

6. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. sand	**a.** small rounded stones, often mixed with sand
2. mortar	**b.** the part of the road on which vehicles drive
3. gravel	**c.** a raised path, especially across a wet area
4. road builder	**d.** a circular object connected at the centre to a bar, used for making vehicles or parts of machines move
5. roadway	**e.** a substance that consists of very small grains of rock, found on beaches and in deserts
6. wheel	**f.** animals, usually domesticated, those are kept by humans and trained to perform tasks
7. causeway	**g.** individual involved into the process of road construction
8. draft animals	**h.** a workable paste used to bind construction blocks together and fill the gaps between them.

7. Give Russian equivalents for the following English words and word combinations.

Course, lime, bedding, soil, to maintain, to extend, swamp, to invent, width, network of roads, straightness, maintenance, step, surface, wheeled vehicle.

8. Using the information from the text and pictures given in the text compare the road systems of two civilizations: Roman roads and Inca roads.

1. Before you start.

- Do you know how technologies have changed since roman times by XVIII century?
- What famous engineers dealing with road building do you know?

2. Read the words and learn them by heart.

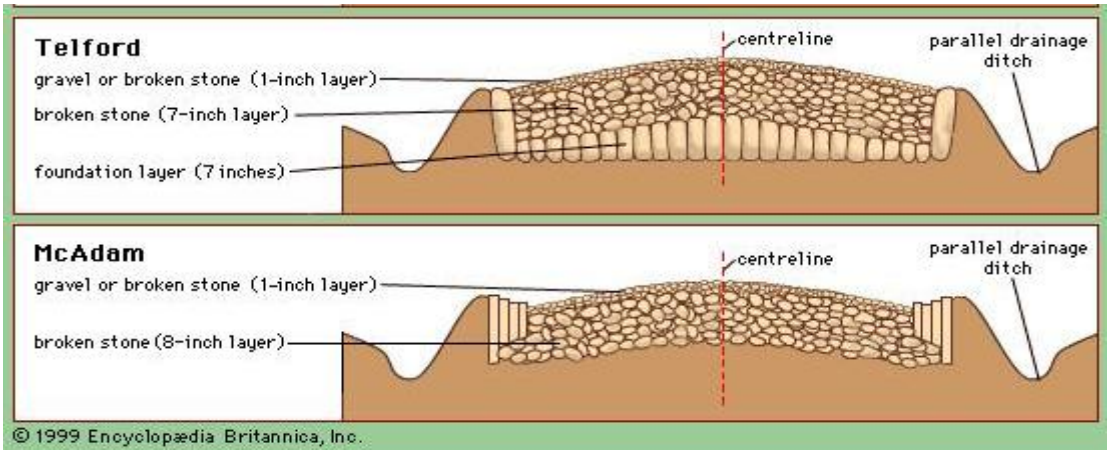
1. highway – скоростная автодорога
2. overdue – запоздалый, опоздавший
3. boost – стремительный рост
4. bridge – мост
5. structure – конструкция
6. to resurface – менять покрытие, покрывать заново
7. stonemason – каменщик
8. speed – скорость
9. turnpike – платная дорога, магистраль
10. to charge for – платить
11. pole – шлагбаум
12. to pay toll – платить дорожную пошлину

13. throughout – повсюду, везде
14. to outstrip – обгонять, превосходить, превышать
15. to face – столкнуться, встретиться лицом к лицу
16. lack – нехватка, недостаток чего-либо
17. foundation – основа, фундамент
18. trail – тропа
19. narrow – узкий
20. single file – движение гуськом, в колонне по одному
21. to wane – убывать, слабеть, идти на убыль

3. Read and translate the text to learn more about the development of road construction in the XVIII century.

18 century and further...

Back across the Atlantic, but later, in 18th century England, the technology of highway construction was getting a long overdue boost from two British engineers, Thomas Telford and John Loudon McAdam. Telford, originally a stonemason, built over 1,000 roads, 1,200 bridges, and numerous other structures.



http://www.britannica.com/EBchecked/media/19288/Cross-sections-of-three-18th-century-European-roads-as-designed

Although his system was faster and less expensive than the Romans' method, it was still costly and required frequent resurfacing with gravel.

On the other hand, the greatest advantages to McAdam's system were its speed and low cost, and it was generally adopted throughout Europe.

During this same time period, the growth of turnpikes was resulting in much improved road conditions across England. Private individuals built roads themselves and then charged for their use, usually blocking passage by setting a long pole (pike) across the road. Once the toll had been paid, the pole would be swung (turned) out of the way, allowing the travellers access to the road (turnpike).

http://www.polyline.ru/publications/istoriya-rossijskih-dorog

By 1829 3,783 different turnpike companies operated 20,000 miles of highway throughout England. However, during the latter half of the 19th century, canal building and the growth of railroads outstripped the turnpikes, and roads in general became less important until the turn of the century.

As European settlers migrated across the Atlantic to the U.S., they found themselves faced with an almost total lack of roads – in Europe they at least had the Roman roads to use as a foundation for rebuilding. In America there were only Indian trails, and while they were long and quite extensive, they were also very narrow, allowing only for single file passage of foot traffic. Like England, went through a period of turnpike development, and for many years, turnpikes were the best roads in the U.S.

http://nevsepic.com.ua/art-i-risovanaya-grafika/12735-starinnye-avto-107-rabot.html

Not surprisingly, the overall development of transportation in the U.S. continued in the same way as in England and interest in building and maintaining long distance roads waned during the last half of the 19th century. But the invention of the motorcar changed all that for everyone. Obviously, motorized vehicles made it possible for both people and goods to travel both more quickly and more comfortably – so long as there were adequate roads upon which they could travel. Thus the Good Roads Movement was born.

Conclusion

As they say, the rest is history – a history that most of us have experienced and just about any drive we take today provides concrete evidence of the outcome. Ironically, even at its height, American modern interstate highway system totals only about 42,500 miles (as of 1991). Granted, this figure does not include surface streets or other roads.

But 2,000 years ago the Romans, without the help of all our engineering technology or road-building machinery, constructed 53,000 miles of roads, much of which is still in use today.

I can't help but wonder if our roads will be as impressive to historians 2,000 years from now.

Source: http://www.triplenine.org/articles/roadbuilding.asp

4. Answer the following questions.

1. What are the two engineers who started developing road-building in England in XVIII century?
2. What were the advantages of Thomas Telford?
3. What type of roads was popular in England in that time?
4. How does a turnpike work?
5. Why did turnpikes become less popular?
6. What was the main difficulty with road-building in America?
7. What was the purpose of Good Road Movement creation?

5. Say if the sentences concerning Text 1C are true or false.

1. Tomas Telford and John McAdam were American engineers.
2. Originally Tomas Telford was a scientist.
3. McAdam's system was worse than Telford's system.
4. Everybody could use turnpikes for free.
5. At the beginning of the road there was a pole to control number of travelers.
6. Road-building in the UK has been rapidly developing since XVIII century.
7. Americans used Roman roads as a base for their own.
8. The invention of motorcar made road building popular again.
9. The Good Roads Movement was born in the UK.
10. During the latter half of the 19th century roads became less important until the turn of the century.

6. Using vocabulary in ex.2 match the words with their definitions.

Word	**Definition**
1. highway	**a.** to put a new surface on a road
2. bridge	**b.** a main road that you usually have to pay to use
3. to resurface	**c.** a long, thin stick made of wood or metal, often used to hold something up or to close a road until the driver gets a permission to use the road
4. speed	**d.** an important public road that joins cities or towns together
5. turnpike	**e.** not having something, or not having enough of something
6. pole	**f.** the distance covered per unit of time
7. trail	**g.** a structure that is built over a river, road, or railway to allow people and vehicles to cross from one side to the other
8. lack	**h.** a path through the countryside, often where people walk

7. Give English equivalents of the following words and word combinations.

Каменщик, конструкция, платить, платить дорожную пошлину, столкнуться, основа, фундамент, узкий, движение гуськом, платная дорога, нехватка, технология строительства дорог, низкая стоимость, железные дороги, моторные транспортные средства.

8. Discuss with the group the following topics:

- ✓ Using additional information, make up your own opinion and say whose system was more efficient: Telford's or McAdam's.
- ✓ What are the difficulties of road building nowadays?

FINAL TASKS

1. Fill in the gaps using the words below:

traffic jams, network of roads, well-maintained, roadway, potholes, road-builders, route, maintain, lack, turnpikes.

We take for granted that all roads must be [1]_____. But in real life we have quite opposite situation. Unfortunately roads in our city have many [2]_____. Another problem is [3]_____. Sometimes it takes us plenty of time to travel the [4]_____ which in fact takes 15 minutes. So, what should we do to make our [5]_____ better? May be first of all it is necessary to provide a [6]_____ of a good quality and [7]_____ it efficiently to avoid cracks and potholes. We may also use [8]_____ as an alternative. If there is no [9]_____ of funding it will be easier to have good maintenance. And certainly [10]_____ must be highly qualified.

2. Translate the following sentences using the vocabulary of Unit 1.

1. В России есть протяженная система дорог, однако, их качество не всегда хорошее.
2. Построить понтонный мост проще, чем обычный.
3. Оборудование для строительства дорог должно быть высокого качества.
4. Раньше строительством дорог занимались инженерные войска.
5. Для строительства дорог использовались гравий, известняк, камень, песок.
6. Первый слой дорожного покрытия – это основание.
7. Изобретение колеса привело к созданию колесного транспорта и развитию строительства дорог.
8. Скоростная автодорога – это дорога, на которой ограничение скорости составляет 130 километров в час.
9. Министерство транспорта планирует строительство платных магистралей, дублирующих наиболее популярные маршруты движения.
10. Конструкция моста должна быть прочной и устойчивой.
11. После того как вы заплатили дорожную пошлину, шлагбаум открывается, и вы едете дальше.
12. Основой для дорог в Америке были индейские тропы.

3. Make a presentation on the following topics:

1. Importance of building roads in ancient times and nowadays
2. Process of building any famous road
3. History of road-building in Russia

UNIT 2: ELEMENTS OF THE ROAD

1. Before you start.

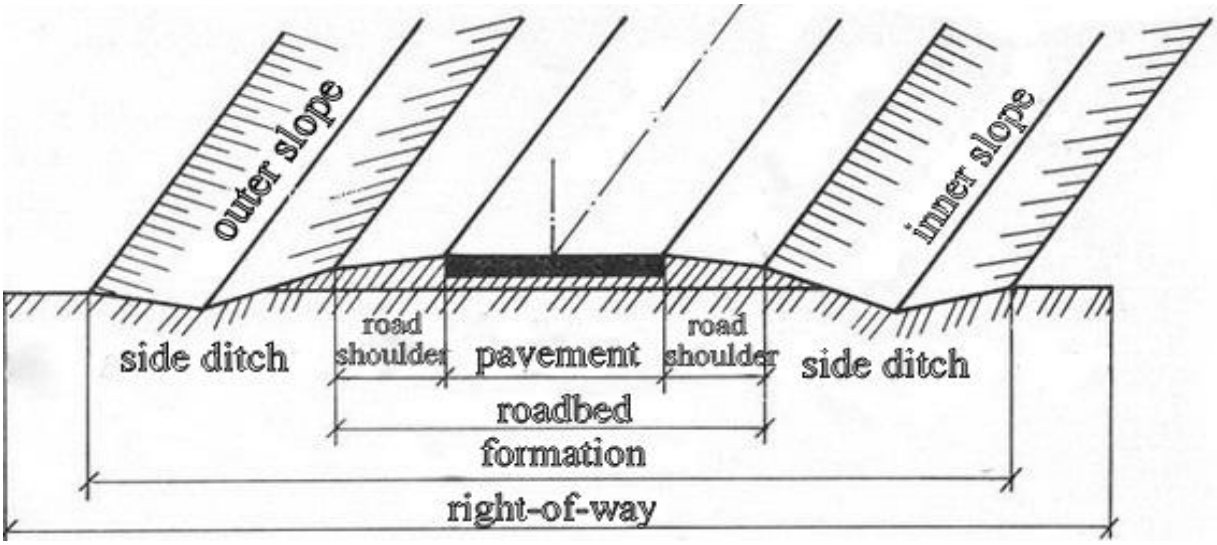
- What is a road?
- What parts of the road do you know?

2. Read the words and learn them by heart.

1. right-of-way – полоса отвода дороги
2. carriageway – проезжая часть дороги
3. road shoulder – обочина
4. inner slope – внутренний откос
5. outer slope – внешний откос
6. pavement – дорожное покрытие
7. lateral support – боковая опора
8. roadbed – дорожное полотно, дорожная одежда
9. formation (earth roadbed) – земляное полотно
10. embankment – насыпь
11. cutting – выемка
12. side ditch – кювет
13. diversion – отвод
14. borrow pit – грунт выемки
15. spoil bank – кавальер (насыпь по бокам выемки)
16. edge of the roadbed – бровка земляного полотна
17. required – требуемый
18. level – уровень
19. to reinforce – усилить, укрепить

3. Read and translate the text to learn more about the basic steps in road construction.

Right-of-Way.



http://stroitelstvo-new.ru/1/dorogi

The zone which is marked to lay the road is called the road zone or right-of-way. The higher is the technical classification of the road, the wider is the right-of-way for its construction. The road zone includes such parts of a road as a carriageway, road shoulders, inner and outer slopes, and other parts.

The road surface strip within the limits of which motor vehicles run is called a carriageway. Usually it is reinforced by means of natural or artificial stone aggregates. These stone aggregates form the pavement.

The strips of the ground which adjoin the carriageway are called the road shoulders. The shoulders render lateral support to the pavement. In future the pavement will always be made of solid materials within the limits of the carriageway.

To lay the carriageway at the required level above the ground surface a formation or roadbed is constructed. It is constructed in the form of embankments or cuttings with side ditches for drainage and the diversion of water.

The formation includes borrow pits – shallow excavations from which the soil was used for filling the embankments. It also includes spoil banks. Spoil banks are heaps of excessive soil remaining after the excavation of cuttings.

The carriageway and shoulders are separated from the neighbouring land by slopes. The cuttings and side ditches have inner and outer slopes. The junction of the surface of the shoulders and the embankment slope is called the edge of the roadbed. The distance between the edges is called the width of the roadbed.

Source: Английский язык. Контрольные задания. / Л.В. Лукина, Л.Н. Крячко, О.Ф. Нестерова,Н.В.Сидорова. Воронеж: Воронеж. гос. арх.-строит. ун.-т., 2009 – С.72

4. Answer the following questions.

1. What is called the road zone or right-of-way?
2. What parts of a road does the road zone include?
3. What is called a carriageway?
4. Is the carriageway usually reinforced by means of natural or artificial stone aggregates?
5. What is a roadbed constructed for?
6. What is called the edge of the roadbed?
7. What is called the width of the roadbed?

5. Say if the sentences concerning Text 2A are true or false.

1. Road shoulders include carriageway, inner and outer slopes.
2. Outer slopes adjoin the carriageway.
3. Sand aggregates form the pavement.
4. Formation includes borrow pits and spoil banks.
5. Vehicles run within the limits of carriageway.
6. Slopes separate carriageway from neighbouring land.
7. The distance between the edges of roadbed is called length of the roadbed.

6. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. borrow pit	**a.** the result created by excavation of earth materials from a site
2. spoil bank	**b.** the prepared location for a road, including its foundation
3. roadbed	**c.** a narrow channel dug at the side of a road or field, to hold or carry away water
4. road shoulder	**d.** describes an area where material (usually soil, gravel or sand) has been dug for use at another location
5. side ditch	**e.** various kinds of synthetic stone products used in building construction, civil engineering work
6. artificial stone	**f.** a strip of land immediately adjacent to the traffic lane of a road not bordered by kerb

7. Give English equivalents of the following words and word combinations.

Излишний грунт, кювет, требуемый уровень, поверхность дороги, в пределах чего-либо, твердый материал, полоса отвода дороги, прилегать к проезжей части, автотранспортное средство, боковая опора, отвод воды, в форме насыпи, включать, прилегающая земля, откосы, бровка земляного полотна, ширина дорожного полотна.

8. Make a short description of the main parts of the road.

1. Before you start.

- What information do you remember about pavements from the previous text?
- What layers do you think a road consists of?

2. Read the words and learn them by heart.

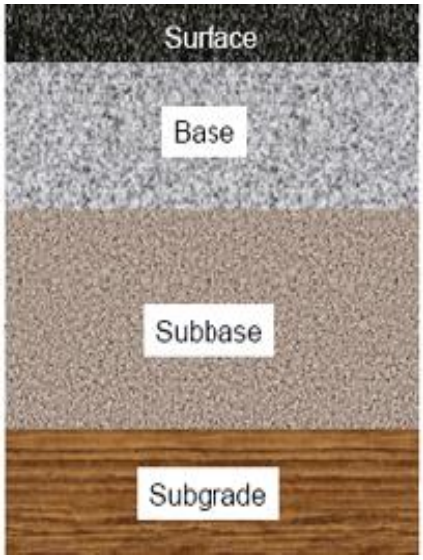
1. to ensure – обеспечивать
2. vehicle – транспортное средство
3. rigid – жесткий
4. semirigid – полужесткий
5. wheel – колесо
6. multilayer – многослойный
7. surfacing – покрытие
8. pavement base – основание дорожного покрытия
9. sub-base – дополнительный слой основания
10. subgrade – грунт земляного полотна
11. abrasion – износ
12. course – основной слой покрытия
13. wearing course – слой износа
14. gravel – гравий
15. slag – шлак

3. Read and translate the text to learn more about the basic layers of pavement used in road construction.

Pavement Structural Layers

To ensure all-year-round operation of vehicles traffic on a road, the carriageway is covered with a pavement. The pavement is laid on the surface of the roadbed. It can have rigid or semi-rigid structure. The pavement resists traffic stresses and climatic factors.

The stresses induced in the pavement by motor vehicle wheels attenuate with the depth. This enables the pavement to be designed in the form of a multilayer structure. The pavement consists of the following layers: the surfacing, the pavement base, the sub-base and the subgrade.



http://www.fhwa.dot.gov/engineering/geotech pubs/05037/03a.cfm

1. Surfacing is the upper and most rigid layer of the pavement. It is comparatively thin, but resists well the abrasion and the impacts caused by the wheels, and also the effect of weather conditions. Usually the surfacing is the most expensive part of the pavement. Surfacing usually comprises two coats or courses – a course and a wearing course. Surface course generally contains superior quality materials.

2. Below the surfacing base coat is the pavement base, a strong bearing layer of stony material or stone with a binding matrix. This layer is designed to distribute the individual wheel-loads. The pavement base is not subjected to the direct action of automobile wheels.

3. The sub-base is a layer of earth or stone materials, resistant to moisture, inserted when necessary between the pavement base and the roadbed. The sub-base is made of gravel, slag, soil treated with binding agents, sand, etc. Subbase is often the main load-bearing layer of the pavement. The primary functions of the sub-base are to provide structural support and improve drainage. The quality of subbase is very important for the useful life of the road.

4. The subgrade is the native material underneath a pavement. It comprises the thoroughly compacted upper layers of the roadbed upon which the layers of the pavement are laid. It is also called formation level.

Source: Английский язык. Контрольные задания. / Л.В. Лукина, Л.Н. Крячко, О.Ф. Нестерова,Н.В.Сидорова. Воронеж: Воронеж. гос. арх.-строит. ун.-т., 2009 – С.72-73

4. Answer the following questions.

1. For what is the carriageway covered with a pavement?
2. What structure can the pavement be?
3. What enables the pavement to be designed in the form of a multilayer structure?
4. How many courses does the surfacing comprise?
5. Where is the pavement base laid?
6. What is the pavement base designed for?
7. What does the subgrade comprise?
8. What is sub-base made of?
9. What does pavement resist?
10. How can the sub grade course be also called?
11. What are the main functions of the sub-base?

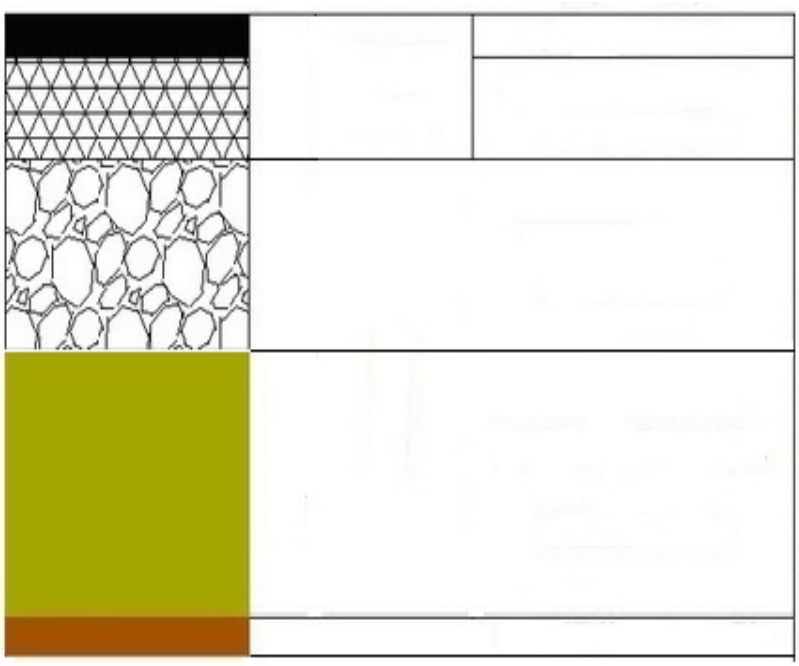
5. Say if the sentences concerning Text 2B are true or false.

1. The pavement resists only traffic stresses.
2. Surfacing is the most expensive part of the pavement.
3. The stresses induced in the pavement by vehicle wheels attenuate with the width.
4. The sub-base is the most rigid layer of the pavement.
5. The sub-base is inserted when necessary between the pavement base and the roadbed.
6. The pavement base is laid on the surface of the roadbed.
7. The subgrade consists of a course and a wearing course.
8. The pavement base contains stony material or stone with a binding matrix.
9. The sub-base layer is not always necessary.
10. The pavement base course is subjected to the direct actions of wheels.

6. Explain in English the meaning of the following words and word-combinations used in the text:

Pavement base, wearing course, multilayer structure, sub-base, subgrade, wheel, stone.

7. Fill in the table "Pavement structural layers" using the basic terms from the text:



8. Find in the text synonyms to the following words and word-combinations:

top, include, relatively, provide, allow, effect, decrease, spread, wet, substance, under, formation level.

9. Describe each structural layer of the pavement.

1. Before you start.

- Do you know why after heavy rain many streets of our city are flooded?
- What is the main function of side ditches?

2. Read the words and learn them by heart.

1. flume – открытый водоотвод
2. interceptor ditch – нагорная канава
3. drain channel – дренажный канал
4. water discharge – сток воды
5. crown – уклон
6. roadside – обочина
7. evaporation – испарение
8. ponding – затопление
9. saturation – подтопление
10. impermeable soil – непроницаемая почва
11. runoff – сток
12. surface runoff – поверхностный сток
13. ground water – грунтовые воды
14. flue – канал
15. blade grader – автогрейдер

3. Read and translate the text to learn more about a side ditch, its functions and use.

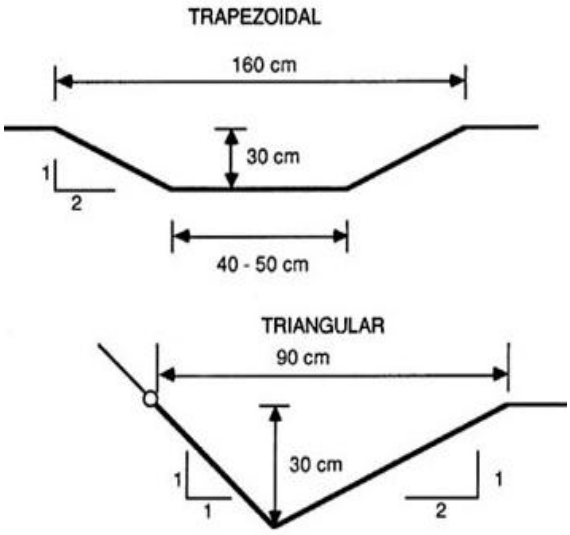
Side Ditches

For collecting water from the roadbed side ditches, flumes, interceptor ditches and drain channeling can be used. Present road construction provides side ditches parallel with the roadway. A side ditch is intended to collect the water

discharged by the crown. It also collects the water from the roadside. Water from the adjoining land must be collected by the side ditch too. The side ditch discharges into a natural outlet at the first opportunity.

Side ditches in cuttings and next to embankments may be excavated to a depth of up to 0.6 m. These ditches are for the collection of water flowing off the road surface and from adjoining land during rainfall or snow thawing. The side ditch may contribute to the drainage of the subgrade because of the evaporation of moisture from the side ditch inner slopes. However, the major use of the side ditch is to permit the rapid discharge of water. When this water discharge is not ensured and ponding occurs, the side ditch becomes a source from which water may penetrate back under the road, resulting in saturation of the subgrade.

The cross-section of the ditch is either V-typed (triangular) or trapezoidal. In the case of impermeable soils and in less favorable conditions of runoff the side ditches can be given a trapezoidal cross-section with a bottom width of 0.4 m and a depth of up to 0.7-0.8 m from the edge embankment. If the road must be built in dry country with a rapid surface runoff, and the occurrence of ground water is deep, the side ditches are given the shape of triangular flues of 0.3 m minimum depth. The V-typed side ditch can be easily constructed and maintained with the blade grader. The V-typed side ditch cannot be deep and, therefore, it is much safer than the trapezoidal side ditch.



http://www.fao.org/docrep/006/t0099e/t0099e0

Source: Английский язык. Контрольные задания. / Л.В. Лукина, Л.Н. Крячко, О.Ф. Нестерова, Н.В.Сидорова. Воронеж: Воронеж. гос. арх.-строит. ун.-т., 2009 – С.73-74

4. Answer the following questions.

1. What does the present road construction provide?
2. What is the side ditch intended to?
3. What does the side ditch discharge into?
4. Why may the side ditch contribute to the drainage of the subgrade?
5. What is the major use of the side ditch?
6. When does the side ditch become a source from which water may penetrate back under the road?
7. What are the main types of cross-section of the ditch?
8. When are side-ditches given a trapezoidal form?
9. Which of the types of cross-section is safer? Why?
10. What machine can the side ditch be easily constructed and maintained with?
11. When are side-ditches given a triangular form?

5. Say if the sentences concerning Text 2C are true or false.

1. Road construction provides side ditches perpendicular with the roadway.
2. Saturation of the subgrade takes place water discharge is not ensured.
3. The side ditch permits the rapid discharge of water.
4. Side ditches are used for the collection of water during dry periods.
5. There are several types of cross-sections of the ditch.
6. Triangular flues are used if the road must be built in dry country with a rapid surface runoff.
7. The V-typed side ditch is much safer than the trapezoidal one.
8. The cross-section of the ditch can be categorized as triangular and trapezoidal.
9. The main aim of a side ditch is to collect the water discharged by the crown.
10. The V-typed side ditch can be very deep.

6. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. surface runoff	**a.** the water located beneath the earth's surface in soil spaces and in the fractures of rock formations
2. interceptor ditch	**b.** a construction machine used to create a flat surface
3. ground water	**c.** the process by which water changes from a liquid to a gas
4. blade grader	**d.** the water flow that occurs when the soil is infiltrated to full capacity and excess water from rain or other sources flows over the land
5. ponding	**e.** soil through which water has difficulty flowing
6. evaporation	**f.** a small ditch or channel constructed to intercept and convey water to an area where it can be safely discharged
7. impermeable soil	**g.** the unwanted pooling of water

7. Give English equivalents of the following words and word-combinations.

Предназначен для сбора воды, примыкающий участок, при первой же возможности, во время ливня, вода, стекающая с поверхности дороги, таяние снега, способствовать, дренаж грунта земляного полотна, испарение влаги, внутренний откос, быстрый сток воды, подтопление грунта земляного полотна, при менее благоприятных условиях, ширина дна, быстрый поверхностный сток.

8. Describe the main characteristics of side ditches.

FINAL TASKS

1. Fill in the gaps using the words below:

sub-base, cross-section, road shoulders, to ensure, to excavate, rigid, surface runoff, right-of-way, vehicle, road zone.

1. _____ is the territory on which the road is laid.
2. Ditches may be _____ to a depth of up to 0.6 m.
3. _____ reduces the required thickness of the pavement base.
4. In addition to causing water erosion and pollution, _____ in urban areas is a primary cause of urban flooding which can result in property damage and street flooding.
5. Pavement base _____ the distribution of individual wheel-loads over the sub-base.
6. Pavement can have _____ structure.
7. If the occurrence of ground water is deep, the side ditch is given triangular _____.
8. _____ are intended to support the pavement.
9. Most _____ have internal combustion engines.
10. _____ contains such parts as carriageway, slopes, road shoulders, etc.

2. Translate the sentences from Russian into English using the vocabulary list of Unit 2.

1. Полоса отвода автомобильной дороги – это участок, который предназначен для размещения конструктивных элементов дороги и дорожных сооружений.
2. Дорога может иметь одну или несколько проезжих частей, между которыми располагается разделительная полоса.

3. Обочина не предназначена для движения транспортных средств.
4. Дорожная одежда имеет многослойную структуру: покрытие, основание дорожного покрытия, дополнительный слой основания, грунт земляного полотна.
5. Дополнительный слой основания сделан из гравия, шлака, песка и т.д.
6. Кюветы собирают воду, стекающую с поверхности дороги, в период дождей или таяния снега.
7. Колеса автомобиля оказывают влияние на слой износа дорожного покрытия.
8. Если участок, на котором запланирована выемка грунта, имеет большую площадь, его разделяют на сектора.
9. Дорожное покрытие укладывается на поверхность основания.
10. Кюветы обеспечивают сток воды, в противном случае подтопление грунта земляного полотна неизбежно.
11. При неблагоприятных условиях используется трапециевидное поперечное сечение кювета.
12. Внешний и внутренний откосы земляного полотна также являются важными элементами в дорожном строительстве.
13. Качество дополнительного слоя основания играет очень важную роль, т.к. имеет огромное влияние на срок службы автомобильной дороги.

3. Form several groups and using the plan of the road given on p.24 make your own plan of the road and describe its main elements.

UNIT 3: TYPES OF PAVEMENT

1. Before you start.

- What do we call a pavement?
- What structural layers of pavement do you remember?

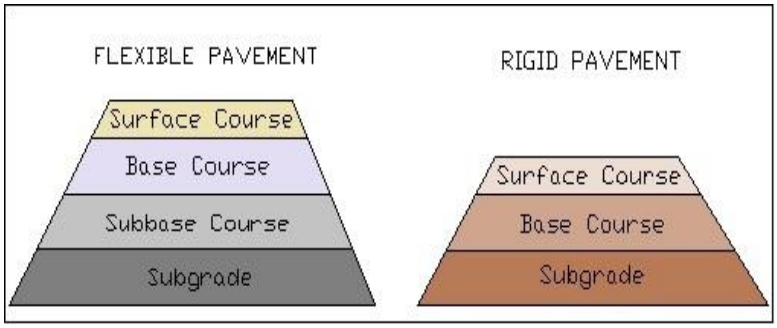
2. Read the words and learn them by heart.

1. road network – дорожная сеть
2. mode of communication – способ связи
3. indirect – косвенный
4. long-term – долговечный
5. asset – достояние
6. cobblestone – булыжник
7. granite setts – гранитные брусчатки
8. to bend – изгибаться
9. flexing – деформация, изгиб
10. stiff – жесткий
11. modulus of elasticity – степень эластичности
12. maintenance – содержание дороги
13. rehabilitation – ремонт
14. subsequent layer – следующий слой
15. flexural strength – прочность при изгибе
16. life span – срок службы
17. curing – выдерживание бетона для набора прочности
18. significant – значительный
19. benefit – выгода, польза

3. Read and translate the text to learn more about the main types of pavement.

Rigid and Flexible Pavements

Development of a country depends on the connectivity of various places with adequate road network. Roads are the major channel of transportation for carrying goods and passengers. They play a significant role in improving the socio-economic standards of a region. Roads constitute the most important mode of communication in areas where railways have not developed much and form the basic infrastructure for the development and economic growth of the country. The benefits from the investment in road sector are indirect, long-term and not immediately visible. Roads are important assets for any nation. In the past, gravel road surfaces, cobblestone and granite setts were extensively used, but these surfaces have mostly been replaced by asphalt or concrete.



http://www.enggpedia.com/civil-engineering-encyclopedia/dictionary/highway-a-transportation/1564-flexible-and-rigid-pavement

There are various types of pavements depending upon the materials used. Basically, all hard surfaced pavement types can be categorized into two groups, flexible and rigid. Flexible pavements are those which are surfaced with asphalt materials. These types of pavements are called “flexible” since the total pavement structure “bends” due to traffic loads. A flexible pavement structure is generally composed of several layers of materials which can accommodate this “flexing”. On the other hand rigid pavements are composed of a PCC (Portland Cement Concrete) surface course. Such pavements are “stiffer” than flexible pavements due to the high modulus of elasticity of the PCC material.

State highway agencies generally select pavement type either by policy, economics or both. Flexible pavements generally require some sort of maintenance or rehabilitation every 10 to 15 years. Rigid pavements, on the other hand, can often serve 20 to 40 years with little or no maintenance. Thus, it should come as no surprise that rigid pavements are often used in urban, high traffic areas. But, when a flexible pavement requires major rehabilitation, the options are generally less expensive than for rigid pavements.

Comparison of Flexible and Rigid Pavement

Flexible Pavements	Rigid Pavements
- Deformation in the subgrade is transferred to the upper layers	- Deformation in the subgrade is not transferred to subsequent layers
- Have low completion cost but repairing cost is high	- Have low repairing cost but completion cost is high
- Have low life span	- High life span
- Surfacing cannot be laid directly on the subgrade but a subbase is needed	- Surfacing can be directly laid on the subgrade
- Road can be used for traffic within 24 hours	- Road cannot be used until 14 days of curing
- Have low flexural strength	- Have high flexural strength
- Damaged by oils and certain chemicals	- No Damage by oils

Source: http://www.aboutcivil.org/types-of-pavements.html

4. Answer the following questions.

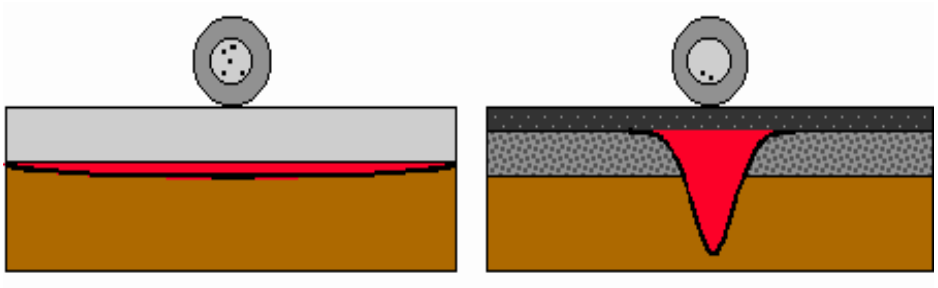
1. What role do roads play?
2. How can you characterize the benefits from the investment in road sector?
3. What types of road surfaces were used in the past?
4. What do the variety of pavement types depend on?
5. What groups of pavement types are distinguished?
6. Why are flexible pavements called so?

7. What are rigid pavements composed of?
8. What are the principles of state highway agencies in choosing the pavement type?
9. What are the basic differences between flexible and rigid pavements?

5. Say if the sentences concerning Text 3A are true or false.

1. Flexible pavements are composed of a PCC surface course.
2. Roads are used as a mode of communication in areas where railways are not developed much.
3. Variety of pavement types depends on the instruments used.
4. Roads form the infrastructure for the cutback of economic activity of the country.
5. Rigid pavements do not require maintenance.
6. Rigid pavements have high repairing cost.

6. Look at these pictures and define the types of pavement.



7. Circle the odd word.

1.	rigid	subgrade	subbase	base
2.	concrete	asphalt	gravel	maintenance
3.	cost	economic growth	passengers	investment
4.	pavement	chemicals	road network	road surface
5.	repair	rehabilitation	maintenance	cobblestone

8. Give English equivalents of the following words and word combinations.

Перевозка товаров, значительная роль, не сразу заметный, в зависимости от используемых материалов, нагрузка от транспортных средств, портландцементный бетон, высокая степень эластичности, требовать определенного содержания дороги, район с интенсивным транспортным движением, высокая прочность при изгибе.

9. Describe advantages and disadvantages of each pavement type.

1. Before you start.

- What pavement type can asphalt be referred to?
- Is asphalt pavement popular in your country?

2. Read the words and learn them by heart.

1. volume – интенсивность движения
2. rural road – сельская дорога
3. primary highway – магистральная автомобильная дорога
4. traffic load – интенсивность движения
5. perceived – очевидный
6. durability – срок службы
7. tensile strength – предел прочности при растяжении
8. slick – гладкий, скользкий, ровный
9. amount – количество
10. hydrocarbon – углеводородный

11. pollution – загрязнение

3. Read and translate the text to learn more about asphalt pavement.

Asphalt

Asphalt (specifically, asphalt concrete) has been widely used since the 1920s. Most asphalt surfaces are laid on a gravel base, which is generally at least as thick as the asphalt layer, although some asphalt surfaces are laid directly on the native subgrade.

http://rollacity.blogspot.ru/2012/09/city-of-rolla-weekend-e-updates-sept-21.html

Depending on the temperature at which it is applied, asphalt is categorized as hot mix, warm mix and cold mix. Cold mix asphalt is often used on lower volume rural roads, where hot mix asphalt would cool too much on the long trip from the asphalt plant to the construction site.

An asphalt concrete surface will generally be constructed for high volume primary highways having an average annual daily traffic load greater than 1200 vehicles per day. Advantages of asphalt roadways include relatively low noise, relatively low cost compared with other paving methods, and perceived ease of repair. Disadvantages include less durability than other paving methods, less tensile strength than concrete, the tendency to become slick and soft in hot weather and a certain amount of hydrocarbon pollution to soil and groundwater.

Source: http://en.wikipedia.org/wiki/Asphalt_concrete

4. Answer the following questions.

1. Where are most asphalt surfaces laid?
2. What types of asphalt are distinguished depending on the temperature?
3. Which type of asphalt is used on rural roads?
4. What highways is asphalt pavement constructed for?
5. When did road builders start to use asphalt?
6. Are there more advantages or disadvantages of asphalt pavement?

5. Say if the sentences concerning Text 3B are true or false.

1. Asphalt has not been widely used until the 1920s.
2. Gravel base is as thick as subgrade layer.
3. Asphalt roadways have less tensile strength than gravel.
4. One of the main disadvantages of asphalt roadways is low noise.
5. Depending on the temperature at which asphalt is applied, it can be hot mix, warm mix and cold mix.
6. Asphalt causes pollution to groundwater.
7. Generally asphalt surfaces are laid on gravel base, however, sometimes some asphalt surfaces are laid directly on the native subgrade.

6. Put the following words in the right column:

use, surface, long-term, directly, depend, hot, site, rural, volume, categorize, generally, annual, include, soft, low, greater, average, highway, relatively, groundwater, durability, load, vehicle, thick, widely, native.

NOUN	VERB	ADJECTIVE	ADVERB

7. Give English equivalents of the following words and word combinations.

Ежедневная интенсивность движения, загрязнение почвы и грунтовых вод, сельские дороги с меньшей интенсивностью движения, в зависимости от температуры, широко используемый, асфальтовый завод, относительно низкая цена, очевидная легкость ремонта, меньший срок службы, в жаркую погоду, преимущества, определенное количество, бетон, скользкий, хотя, строительная площадка.

8. Tell all the information that you learnt about asphalt pavement.

1. Before you start.

- What pavement type can concrete be referred to?
- Is concrete pavement popular in your country?

2. Read the words and learn them by heart.

1. coarse aggregate – крупный щебень
2. admixtures – примеси, добавки
3. workability – пригодность к обработке
4. to mitigate – ослабить
5. purpose – цель
6. substitute – заменитель
7. fly ash cement – зольный цемент
8. jointed plain concrete pavement – бетонное дорожное покрытие с поперечными швами

9. jointed reinforced concrete pavement – армированное железобетонное дорожное покрытие с поперечными швами
10. continuously reinforced concrete pavement – непрерывно армированное железобетонное дорожное покрытие без регулярно расположенных поперечных швов
11. crack – трещина
12. slab – плита
13. contraction joints – шов сжатия (поперечный шов бетонного покрытия)
14. reinforcing steel – арматура
15. dowel bar – стыковой штырь
16. tie bar – соединительный штырь
17. skid-resistant – противоскользящий
18. consuming – затратный
19. offset – возмещение, компенсация

3. Read and translate the text to learn more about concrete pavement.

Concrete

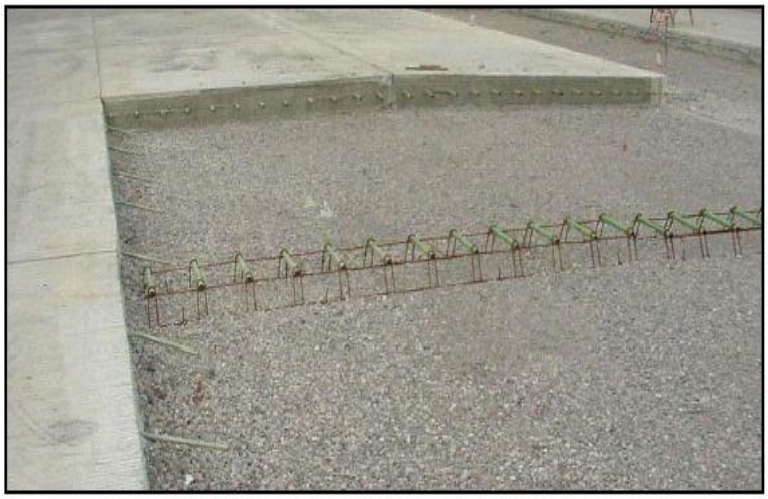
Concrete surfaces (specifically, PCC) are usually used on roads with heavy traffic of heavy vehicles and created using a concrete mix of Portland cement, coarse aggregate, sand and water. In virtually all modern mixes there will also be various admixtures added to increase workability, reduce the required amount of water, mitigate harmful chemical reactions and for other beneficial purposes. In many cases there will also be Portland cement substitutes added, such as

http://www.concretepavements.org/Membership/Newsletter/ISCP_enewsletter_Vol1_No2.htm

fly ash. This can reduce the cost of the concrete and improve its physical properties.

Concrete surfaces are divided into three common types: jointed plain (JPCP), jointed reinforced (JRCP) and continuously reinforced (CRCP). Each of the jointing system types is used to control crack development.

Jointed plain concrete pavement is the most common type of rigid pavement. JPCP controls cracks by dividing the pavement up into individual slabs separated by contraction joints. JPCP does not use any reinforcing steel but uses dowel bars and tie bars. Today the majority of US state agencies build jointed plain pavements.



http://dc261.4shared.com/doc/W3tVqUxD/preview.html

Jointed reinforced concrete pavements control cracks by dividing the pavement up into individual slabs separated by contraction joints. However, these slabs are much longer than JPCP slabs, so JRCP uses reinforcing steel within each slab to control within-slab cracking. Today very few of agencies use this design, because it is not recommended as both of the other types offer better performance and are easier to repair.

Continuously reinforced concrete pavements use reinforcing steel rather than contraction joints for crack control. Cracks are held tightly together by the underlying reinforcing steel. A number of agencies have made decisions to use continuously reinforced designs in their heavy urban traffic corridors.

One of the major advantages of concrete pavements is that they are typically stronger and more durable than asphalt roadways. They can also provide a durable skid-resistant surface. A notable disadvantage is that it can typically have a higher

initial cost, as well as can be more time consuming to construct. This cost can typically be offset through the long life cycle of the pavement.

Source: http://en.wikipedia.org/wiki/Road_surface

4. Answer the following questions.

1. What materials are concrete surfaces created from?
2. For what purposes are various admixtures added?
3. What are the main types of concrete surfaces?
4. What type of concrete pavement does not use any reinforcing steel?
5. Why is jointed reinforced concrete pavement used only by very few agencies?
6. Where are continuously reinforced concrete pavements used?
7. What are the advantages of concrete pavements?
8. Is concrete or asphalt pavement more time consuming to construct?

5. Put the following sentences in the right order.

a. Portland cement substitutes can reduce the cost of the concrete and improve its physical properties.
b. Concrete pavements are typically stronger and more durable than asphalt roadways.
c. JPCP controls cracks by dividing the pavement into slabs separated by contraction joints.
d. Concrete surfaces are created using a concrete mix of Portland cement, coarse aggregate, sand and water.
e. Continuously reinforced concrete pavements use reinforcing steel rather than contraction joints for crack control.
f. JRCP uses reinforcing steel within each slab to control within-slab cracking.

6. Find in the text synonyms to the following words and word-combinations:

aim, regulate, divide, though, fix, lasting, perceptible, taking much time, primary, decide, plus.

7**. Give English equivalents of the following words and word combinations.**

Интенсивное движение, большегрузное транспортное средство, бетонная смесь, требуемое количество воды, ослабить вредные химические реакции, физические свойства, отдельные плиты, противоскользящее покрытие, заметный недостаток, требующий много времени.

8. Tell all the information that you learnt about concrete pavement, its types, advantages and disadvantages.

1. Before you start.

- Do you know any other pavement types?
- Have you ever seen a road covered with material different from concrete or asphalt?

2. Read the words and learn them by heart.

1. to rehabilitate – реконструировать, восстановить
2. low-traffic – низкая интенсивность движения
3. bituminous surface treatment – поверхностная обработка дорожного покрытия битумом
4. sealing coat – покрывающий слой
5. to rejuvenate – обновить
6. aggregate – щебень

7. emulsion – эмульсия
8. cut-back asphalt cement – жидкий асфальтовый битум
9. to embed – укладывать
10. rolling – укатка
11. rubber-tired roller – каток на пневматических (резиновых) колесах
12. chip seal – щебеночное уплотнение
13. unstable terrain – слабый грунт
14. application – применение
15. to thaw – таять
16. granular surface – поверхность из мелкого каменного материала (гравия, щебня)
17. to top – покрывать
18. paver – материал для мощения (камень, кирпич, брусчатка, гравий)
19. pre-cast concrete block – бетонный блок заводского изготовления
20. cobblestone – булыжный камень
21. sett – брусчатка

3. Read and translate the text to learn more about other types of pavement.

Other pavements

Composite surface combines Portland cement concrete and asphalt. They are usually used to rehabilitate existing roadways rather than in new construction.

http://www.forconstructionpros.com/article/10616882/clearing-the-air-about-pneumatic-rollers

Bituminous surface treatment (BST) is used mainly on low-traffic roads, but also as a sealing coat to rejuvenate an asphalt concrete pavement. It generally consists of aggregate spread over a sprayed on asphalt emulsion or cut-back asphalt

cement. The aggregate is then embedded into the asphalt by rolling it, typically with a rubber-tired roller. This type of surface is described by a wide variety of regional terms including "chip seal", "oil and stone" etc.

The ease of application of BST is one reason for its popularity, but another is its flexibility, which is important when roadways are laid down over unstable terrain that thaws and softens in the spring.

http://commons.wikimedia.org/wiki/File:Gravel_Road_Coober_Pedy.jpg

Gravel is known to have been used extensively in the construction of roads by soldiers of the Roman Empire. A granular surface can be used with a traffic volume where the average annual daily traffic is 1,200 vehicles per day or less. There is some structural strength as the road surface combines a sub base and base and is topped with a seal aggregate with emulsion. The decision whether to pave a gravel road or not often depends on traffic volume. Obviously, it is not as durable as concrete or asphalt pavements, but relatively cheap.


en.wikipedia.org/wiki/Road_surface

Pavers generally have the form of pre-cast concrete blocks, are often used for aesthetic purposes. Pavers are rarely used in areas with high-speed vehicle traffic.


http://en.wikipedia.org/wiki/Road_surface

Brick, cobblestone, sett pavements were once common in urban areas throughout the world, but fell out of fashion in most countries, due to the high cost of labor required to lay and maintain them, and are typically only kept for historical or aesthetic reasons. In some countries, however, they are still common in local streets.

Source: http://en.wikipedia.org/wiki/Road_surface

4. Answer the following questions.

1. What other types of pavement did you learn from the text?
2. For what purposes are composite surfaces used?
3. What materials does BST consist of?
4. Why is BST so popular?
5. When was gravel road extensively used?
6. What does the decision to pave a gravel road or not depend on?
7. What is the main disadvantage of a gravel road?
8. Where are pavers rarely used?
9. Why did brick, cobblestone, sett pavements fall out of fashion?
10. Where is bituminous surface treatment used?

5. Say if the sentences concerning Text 3D are true or false.

1. Pavers are used only in areas with high-speed vehicle traffic.
2. Composite surface is used to rehabilitate existing roadways.
3. BST consists of pre-cast concrete blocks spread over a sprayed on asphalt emulsion.
4. Gravel was extensively used in Ancient Greece.
5. Pavers fell out of fashion in most countries because the cost of labor required to lay and maintain them is rather high.
6. BST is popular because of its flexibility and ease of application.
7. Concrete pavement is more durable than gravel.
8. The decision whether to pave a gravel road or not never depends on traffic volume.
9. Gravel is as durable as concrete or asphalt pavements, and it is relatively cheap.

6. Put the following words in the right column:

Portland cement, pre-cast concrete blocks, low-traffic roads, rubber-tired roller, cut-back asphalt cement, structural strength, emulsion, relatively cheap, high-speed vehicle traffic, cobblestone, seal aggregate, flexibility, chip seal, unstable terrain, sub base and base, sett, high cost of labour.

Composite surface	Bituminous surface treatment	Gravel surface	Pavers

7. Give English equivalents of the following words and word combinations.

Реконструировать существующие дороги, обновить асфальтобетонное дорожное покрытие, широкое разнообразие, легкость применения, широко использовался, зависеть от интенсивности движения, иметь форму бетонных блоков заводского изготовления, в целях эстетики, интенсивное скоростное движение транспортных средств, выйти из моды, в городской местности.

8. Describe the following types of pavements:

- ✓ *Composite surface*
- ✓ *Bituminous surface treatment*
- ✓ *Gravel surface*
- ✓ *Pavers*

FINAL TASKS

1. Fill in the gaps using the words below:

flexible, combine, reinforcing steel, sett, mode of communication, *repairing cost, depend on, time consuming, cobblestone, asphalt pavement, rigid, Portland cement, rural roads, flexibility, jointed plain concrete pavement.*

1. All pavement types are divided in two groups: _____ and _____.
2. A road is the most important _____ in areas where railways have not developed much.
3. The decision whether to pave a gravel road or not _____ traffic volume.
4. Cold mix asphalt is used on lower volume _____.
5. Advantages of _____ include relatively low noise and low cost compared with other paving methods.
6. Concrete pavement is created using _____, coarse aggregate, sand and water.
7. _____ controls cracks by dividing the pavement up into individual slabs separated by contraction joints.
8. Composite surface _____ Portland cement concrete and asphalt.
9. There are two main reasons for BST popularity: ease of application and _____.
10. Continuously reinforced concrete pavements use _____ rather than contraction joints for crack control.
11. A notable disadvantage of concrete pavement is that it can be more _____ to construct.
12. The _____ of flexible pavements is high.
13. Brick, _____, _____ pavements were once common in urban areas throughout the world, but fell out of fashion in most countries.

2. Circle the odd word.

1.	bituminous surface treatment	rubber-tired roller	gravel surface	pavers
2.	concrete	asphalt	gravel	chemical reactions
3.	brick	sett	composite surface	cobblestone
4.	sand	properties	water	Portland cement
5.	continuously reinforced concrete pavement	jointed reinforced concrete pavement	maintenance	jointed plain concrete pavement

3. Translate the sentences from Russian into English using the vocabulary list of Unit 3.

1. Жесткая дорожная одежда более долговечная, чем нежесткая.
2. Асфальтобетонные дорожные покрытия строятся на участках с высокой интенсивностью движения.
3. На строительство бетонного дорожного покрытия требуется больше времени.
4. Большинство асфальтобетонных дорожных покрытий укладывается на щебеночную основу.
5. Бетонный слой состоит из портландцемента, щебня, песка и воды.
6. При непрерывно армированном железобетонном дорожном покрытии используется арматура, а не швы сжатия.
7. Нежесткие дорожные покрытия состоят из битумных материалов, а жесткие из портландцемента.
8. Поверхностная обработка дорожного покрытия битумом используется в основном на участках с низкой интенсивностью дорожного движения.
9. Гравийное основание является относительно дешевым.

10. Кирпич, булыжный камень и брусчатка используются для эстетических целей.
11. Жесткие покрытия предназначены для дорог с высокой интенсивностью движения.

4. Form three groups. Each group should describe one of the following points for discussion:

- ✓ *rigid (cement) pavement*
- ✓ *flexible (asphalt) pavement*
- ✓ *other types of pavements.*

UNIT 4: ROAD CONSTRUCTION PROCESS

1. Before you start.

- Have you ever seen road works? What were the road builders doing?
- What do you think about the quality of roads in our country? What influences the quality of roads?

2. Read the words and learn them by heart.

1. timing – расчет времени
2. land survey – топографическая съемка
3. to handle – осуществлять, проводить, контролировать
4. evaluating – оценка
5. to take into account – учитывать, принимать во внимание
6. to maintain – сохранять, поддерживать
7. data – данные, сведения
8. transportation planner – дорожно-транспортный планировщик
9. environmentalist – эколог

10. landscape architect – специалист по вопросам ландшафтной архитектуры
11. soil scientist – почвовед
12. to determine – определить
13. accuracy – точность
14. terrain – грунт
15. drainage – водоотвод
16. capability – возможность, способность
17. ratio – соотношение
18. level – уровень (n); выравнивать (v)
19. to provide – обеспечивать
20. screened dirt – просеянный грунт
21. bump – дорожная неровность
22. dip – впадина
23. to spray – опрыскивать
24. to compact – спрессовывать
25. density – плотность
26. sewer – канализационная труба

3. Read and translate the text to learn more about the basic steps in pre-construction activities.

Pre-construction activities

The type of construction adopted for a particular road depends on:

- the volume and nature of traffic,
- the nature of available materials,
- the topography,
- foundation conditions,
- type and availability of construction equipment,

- financing arrangements and timing.

http://www.michigan.gov/mdot/0,1607,7-151-9615-129011--,00.html

There are many steps in the road construction process. They involve many teams of people and much organization from the use of a surveying company to handle land surveys to project managers. The steps must be carefully followed to ensure a successful project is completed. These steps can be summarized as:

1. planning;
2. design;
3. earthworks;
4. pavement construction;
5. open to traffic.

Step I: Planning

A road project begins with evaluating the transportation system, taking into account statewide priorities, including strategic plans for the state's transportation system. Department of Transportation collects and maintains information about our roads, including road and bridge conditions, traffic volumes, crash statistics.

http://www.michigan.gov/mdot/0,1607,7-151-9615-129011--,00.html

Using this data, transportation planners, engineers, environmentalists, landscape architects, soil scientists and others identify trends that determine what and how to build.

Step II. Design

A survey of the area is step two. Recently, Global Positioning Systems, laser surveys, and other technology have sped up the process and improved accuracy.

Many factors influence designs, including location, terrain and soil properties, drainage capabilities, traffic volume, the ratio of cars to trucks and buses, possible future development in the area, effects on the environment or nearby residents.

Step III. Earthwork

Earthwork is one of the most important elements in road construction because it establishes a stable foundation. The aim of the earthworks phase of the construction is to position the subgrade underlying the pavement layers in the right location and at the correct level and to provide drainage.

http://www.michigan.gov/mdot/0,1607,7-151-9615-129011--,00.html

First, embankments are built. Next, a grader or bulldozer levels the screened dirt. Leveling bumps and filling in dips creates a surface that will support a road for decades. The screened dirt is sprayed with water and compacted to its maximum density. During this stage, drains and sewers are installed. The center of the road must be higher than the edges so water will run off into the storm sewers. Drainage is a critical element because improper drainage will greatly reduce the new pavement's life expectancy. All of this work must pass strict inspections before the project can continue. To complete the earthwork, workers place gravel in 12-inch layers on the road bed, then moisten and compact each layer. Layers are added and compacted until the road bed reaches the height called for in the design.

The earthwork is often the largest task in the road building process and therefore careful planning and organization are essential. Speed and efficiency depend very much upon the quantity and types of earthmoving plant available.

Source: http://www.michigan.gov/mdot/0,1607,7-151-9615-129011--,00.html

4. Answer the following questions.

1. What are the main factors on which the type of construction depends?
2. How many steps are distinguished in road construction?
3. What does the road project begin with?
4. What data do transportation planners and others use to identify trends?
5. What has improved the accuracy of surveying the area?
6. Why is earthwork considered one of the most important elements in road construction?
7. By what machines is the screened dirt leveled?
8. When are drains and sewers installed?
9. Why should the centre of the road be higher than the edges?
10. What do speed and efficiency of earthworks depend upon?

5. Say if the sentences concerning Text 4A are true or false.

1. The type of road construction doesn’t depend on any factors.
2. The road construction process involves many teams of people and much organization.
3. A road project begins with positioning the subgrade underlying the pavement layers in the right location.
4. Global Positioning Systems, laser surveys and other technology have slowed down the process of surveying the area.
5. Terrain and soil properties, drainage capabilities, traffic volume have no influence on design.
6. Earthwork establishes a stable foundation.
7. Improper drainage reduces the new pavement’s life expectancy.
8. Excavator levels the screened dirt.
9. Screened dirt is sprayed with water at the stage of paving.

6. Explain in English the meaning of the following words and word combinations used in the text:

topography, drainage, sewer, landscape architect.

7. Give English equivalents of the following words and word combinations.

Статистика аварий, срок службы, воздействие на окружающую среду, находящийся под слоем дорожной одежды, ускорить процесс, прочный фундамент, подготовительные строительные работы, обеспечить водоотвод, максимальная плотность, интенсивность движения, приоритеты государственного масштаба, соотношение автомобилей и грузовиков, выравнивание дорожных неровностей.

8. Describe the steps of pre-construction activities on the site.

1. Before you start.

- What is the last step of pre-construction activities?
- Is that step basic for the following construction steps?

2. Read the words and learn them by heart.

1. paving – мощение
2. crushed rock – щебень
3. finishing machine – бетоноотделочная машина
4. joint – стык
5. wire basket – сетчатая корзина

6. dowel – стыковой стержень
7. paving equipment – асфальтобетоноукладочное оборудование
8. to grind – шлифовать
9. landscaping – озеленение
10. pavement marking – дорожная разметка

3. Read and translate the text to learn more about the basic steps in highway construction activities.

Construction activities

Step IV. Pavement Construction

http://www.michigan.gov/mdot/0,1607,7-151-9615-129011--,00.html

At last, the road bed is ready for paving. Planners and engineers study such factors as the cost of maintaining the road, the amount and type of traffic, the cost of paving material.

A formula that includes all these factors tells engineers to use either asphalt (bituminous) or concrete pavement.

Asphalt uses bitumen, a petroleum product, to glue together sand and crushed rock. This mixture is heated to approximately 300 degrees at the asphalt plant. At the construction site, workers spread and compact the hot mixture onto the roadbed.

Concrete uses cement and water as the glue between sand and crushed rock. Workers place concrete into steel molds called forms. A finishing machine vibrates and trims it to the necessary height. To prevent cracks, workers cut joints between the concrete slabs.

At each joint, wire baskets and steel dowels connect the slabs. These allow the slabs to expand and contract as the temperature changes. The slabs can slide from side to side along the dowels, but not up and down.

Step V. Open to traffic

With the new surface in place, quality testing is conducted. Testers use seismology equipment to measure vibrations of the new pavement. If there is too much vibration, the contractor must grind the pavement to ensure a smooth surface. The final steps are:

http://www.michigan.gov/mdot/0,1607,7-151-9615-129011--,00.html

- another drainage test;
- grading and landscaping around the pavement (where applicable);
- applying the permanent pavement markings.

Source: http://www.michigan.gov/mdot/0,1607,7-151-9615-129011--,00.html

4. Answer the following questions.

1. How many stages are distinguished in highway pre-construction and construction activities?
2. What tells the engineers to use either asphalt or concrete pavement?
3. What does asphalt use to glue sand and crashed stone?
4. What connects the slabs at each joint?
5. Why is landscaping around the pavement necessary?
6. What does concrete use to glue sand and crashed stone?
7. What does seismology equipment measure?
8. What are the final steps?

5. Say if the sentences concerning Text 4B are true or false.

1. Asphalt uses cement and water to glue together sand and water.
2. Concrete slabs can slide from side to side, up and down.
3. Seismology equipment is used to measure vibrations of the new pavement.
4. Applying pavement markings is the initial step in road building activities.
5. Workers cut joints between the concrete slabs to prevent cracks.
6. Contractor grinds the pavement if there is too much vibration.

6. Put the following words in the right column:

factor, cost, type, include, bitumen, approximately, glue, rock, heat, roadbed, hot, steel, height, prevent, necessary, joint, concrete, change, slab, expand, slide, dowel, new, quality, conduct, grind, permanent, marking.

NOUN	VERB	ADJECTIVE	ADVERB

7. Give English equivalents of the following words and word combinations.

Заливается бетон, предотвращение трещин, содержание дороги, современное асфальтобетоноукладочное оборудование, отшлифовать покрытие, приблизительно 300 градусов, долговременная дорожная разметка, дорожное полотно, озеленение вокруг дорожного покрытия, гладкая поверхность.

8. Describe the main stages of highway construction.

FINAL TASKS

1. Find in the texts 4A and 4B synonyms to the following words and word combinations:

information, ecologist, precision, correlation, decrease, get better, affect, lorry, location, wrong, price, quantity, using.

2. Using the vocabulary of Unit 4 match the words with their definitions.

1. landscaping	**a.** the native material underneath a constructed road
2. paving	**b.** activity of growing plants with the aim of creating a beautiful environment
3. paving equipment	**c.** a space-based satellite navigation system that provides location and time information in all weather conditions
4. earthwork	**d.** material used on a road surface in order to provide separation between traffic moving in opposite directions
5. drain	**e.** a sticky, black and highly viscous liquid or semi-solid form of petroleum
6. asphalt	**f.** work involving moving quantities of soil
7. to grind	**g.** surfacing of roads and walkways
8. subgrade	**h.** a collection and transportation system for storm water
9. Global Positioning System	**i.** a piece of construction equipment used to lay asphalt on roads, bridges, parking lots and other such places
10. pavement marking	**j.** to produce a smooth finish on flat surfaces

3. Translate the following sentences using the vocabulary of Unit 4.

1. Иногда земля не подходит для озеленения.
2. Бульдозер выравнивает просеянный грунт.
3. Мы должны принять во внимание все факторы, включая интенсивность движения и доступные материалы.
4. Огромное количество специалистов, таких как почвоведы, экологи, инженеры вовлечены в строительство дорог.
5. Подрядчик отвечает за безопасность рабочих на стройплощадке.
6. Дорожная разметка – заключительная часть дорожных работ.
7. Ливнеприемники устанавливаются на этапе земляных работ.
8. Ось дороги выше обочин.
9. Рабочие укладывают слой гравия на песчаный слой.
10. Скорость и эффективность работы зависит от асфальто/бетоно-укладочного оборудования.
11. Дорожные неровности уменьшают срок службы дорожной одежды.
12. Битум связывает песок и щебень.
13. Бетон состоит из цемента и воды.
14. Рабочие укладывают асфальт на дорожное полотно.
15. Стальные стыковые стержни связывают бетонные плиты.
16. Под слоем дорожной одежды находится грунтовое основание.
17. Вода уплотняет просеянный грунт.

4. Form several groups and make up your own plan of road construction. Consider the following points:

- ✓ *the place of construction*
- ✓ *the amount and type of traffic*
- ✓ *type of the pavement*
- ✓ *describe the process of construction.*

UNIT 5: ROAD JUNCTIONS AND INTERSECTIONS

1. Before you start.

- Do you have many road junctions in your city?
- What is the main purpose of road junctions?

2. Read the words and learn them by heart.

1. road junction – пересечение нескольких дорог, транспортный узел
2. intersection – пересечение дорог в одном уровне, перекресток
3. to cross – пересекать
4. collision – столкновение
5. segregation – разделение потоков движения
6. to achieve – достигать
7. stream – поток
8. to avoid – избегать
9. clover-leaf junction – развязка типа «клеверный лист»
10. multi-level junction – многоуровневая транспортная развязка
11. roundabout – круговое движение
12. flyover junction – дорожная развязка в разных уровнях
13. condition – условие
14. to fulfill – выполнять
15. percentage – процентное соотношение
16. through route – сквозной проезд
17. sufficient – достаточный
18. to justify – признать допустимым, обосновать
19. to drop the speed – сбавить скорость
20. pedestrian – пешеход
21. costly – дорогостоящий

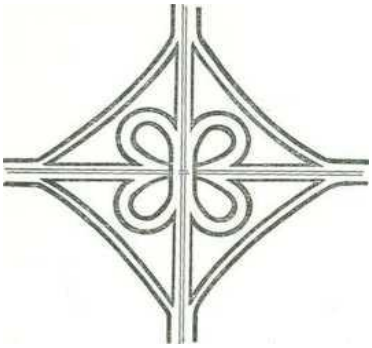
22. over-pass – надземный переход, путепровод
23. under-pass – тоннель для автотранспорта, пешеходный тоннель
24. to weave – перестраиваться в другой ряд движения
25. traffic lane – полоса движения
26. angle of approach – угол сближения
27. converging streams – сходящиеся потоки
28. to perform – выполнять
29. island – островок безопасности
30. angle of convergence – угол сближения
31. flyover bridge – путепровод

3. Read and translate the text to learn more about road junctions and their types.

Road junctions and intersections

A road junction is the point at which one road meets another; an intersection is the point at which two or more roads cross each other. Both junctions and intersections are the worst danger spots in a road system.

The problems of reducing danger at these points are those of cost and space. If junctions and intersections are such that all classes of traffic meet each other at the same level, there is a danger of collision. Almost complete segregation of different classes can be achieved, and the need for users of the same class to cross traffic streams can be avoided.



Пособие по английскому языку для студентов II-III курсов строительных вузов / М.: Высш. школа, 1978. – С.20

The perfect example of complete segregation of different classes of traffic and of the avoidance of crossing traffic streams is the *clover-leaf junction,* at which no collision can occur between vehicles.

All forms of road junction can be classified into

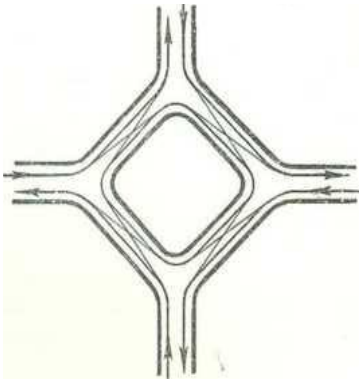
three groups: multi-level junctions, roundabouts and flyover-junctions.

Multi-level junctions. The clover-leaf, the most typical of these, has already been mentioned. There is need for multi-level intersections where three conditions are fulfilled:

- only a small percentage of the traffic must turn to left or right
- the major volume of traffic is travelling on a fast through route
- the volume of traffic would otherwise be sufficient to justify the provision of a roundabout.

Roundabouts. Unlike multi-level intersections, roundabouts do not enable traffic to cross without dropping speed but pedestrians and cyclists cannot be segregated unless costly over- or under-passes are constructed.

The success of a roundabout depends greatly upon the ease with which vehicles using it can "weave" or pass from one traffic lane to another. The greater the length of the road in which the weaving can be carried out and the smaller the angle of approach of converging streams of traffic, the more easily can weaving be performed. The angle should not be greater than 30 degrees. The greater the diameter of the island, the smaller the angle of convergence.



Пособие по английскому языку для студентов II-III курсов строительных вузов / М.: Высш. школа, 1978. – С.21

Flyover-junctions. These have been developed chiefly at places where there are no pedestrians. These "flyovers", which enable high speeds to be maintained, are extremely expensive, costing about ten times as much as roundabout, so it is much better to have ten roundabouts at ten dangerous junctions than a single flyover at a single junction. A combination of roundabout and flyover bridge can be of great value.

Source: Пособие по английскому языку для студентов II-III курсов строительных вузов / М.: Высш. школа, 1978. – 159 с.

4. Answer the following questions.

1. What is the difference between a road junction and intersection?
2. In what case is there a danger of collision?
3. What is the perfect example of complete segregation?
4. What are the main groups of road junctions?
5. What conditions should be fulfilled for multi-level junctions?
6. What should be constructed for pedestrians in the case of roundabouts?
7. What does the success of a roundabout depend on?
8. Where have flyover junctions been developed?
9. What advantages and disadvantages does a flyover have?

5. Say if the sentences concerning Text 5A are true or false.

1. Intersection is the point at which one road meets another.
2. Cost and space are the problems connected with reducing danger at junctions and intersections.
3. The greater the angle of convergence, the more easily weaving can be performed.
4. In the case of roundabout junctions the most part of traffic volume travels on a fast through route.
5. Roundabouts are expensive and cost about ten times as much as flyover.
6. The perfect example of avoidance of crossing traffic streams is clover-leaf junction.
7. The combination of multi-level junctions and roundabouts is of great value.
8. Clover-leaf junctions have been developed chiefly at places where there are no pedestrians.
9. Junctions and intersections are dangerous spots in a road system.

6. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. underpass	**a.** a type of circular intersection or junction in which road traffic flows almost continuously in one direction around a central island
2. collision	**b.** a crash or conflict
3. island	**c.** a place for pedestrians and/or cyclists beneath a road or railway, allowing them to reach the other side in safety
4. road junction	**d.** a raised curbed area, often used to delineate rows of parking spaces or lanes of traffic
5. roundabout	**e.** a bridge, road, railway or similar structure that crosses over another road or railway
6. flyover	**f.** a person traveling on foot, whether walking or running
7. pedestrian	**g.** the point at which one road meets another

7. Give English equivalents of the following words and word combinations.

Дороги пересекаются, опасное место, снижение опасности, опасность столкновения, полное разделение потоков движения, пересечение транспортных потоков, выполняются три условия, небольшое процентное соотношение, дорогостоящие надземные переходы и тоннели для автотранспорта, перестраиваться из одной полосы движения в другую, угол сближения сходящихся потоков, диаметр островка безопасности, сохранять высокие скорости, в десять раз больше, иметь большую ценность.

FINAL TASKS

1. Fill in the gaps using the words below:

to turn right, pedestrians, flyover bridge, angle of convergence, to achieve, costly, sufficiently, speed, traffic lane, clover-leaf junction.

1. You should watch out for _____ crossing a road into which you are turning.
2. Improvements for cyclists can be _____ by: rising drivers' awareness of cyclists and dropping the _____.
3. _____ less than 30º is generally considered to be safest, with better visibility and slower vehicle speeds.
4. Increased journey times for all users is _____.
5. At some spots drivers are not permitted _____.
6. At many existing roundabouts vehicle speeds are not dropped _____.
7. The major advantage of _____ is that they require only one bridge, which makes such junctions inexpensive.
8. A combination of roundabout and _____ is very valuable.
9. _____ can be indicated by road marking.

2. Translate the following sentences using the vocabulary of Unit 5.

1. Благодаря многоуровневым развязкам риск столкновения снижается.
2. Транспортное средство может легко выполнить перестроение на другую полосу при круговом движении.
3. Если водитель видит пешехода, переходящего дорогу, он должен сбавить скорость.
4. Развязка типа «клеверный лист» способствует разделению потоков движения.

5. При круговом движении, как правило, строятся надземные переходы и тоннели для автотранспорта.
6. Обычно постоянное движение транспортных средств в одном направлении организуется по полосе движения.
7. Островок безопасности был обозначен горизонтальной дорожной разметкой.
8. На дорожных развязках на разных уровнях транспортные средства могут сохранять самые высокие скорости.
9. Данных условий недостаточно для построения путепровода, так как это чрезвычайно дорого.
10. Дорожная разметка является необходимым условием безопасного движения и помогает избежать нарушения правил дорожного движения.

4. Speaking. Describe all types of road junctions.

CHAPTER II.
TRAFFIC SAFETY

UNIT 1: TRAFFIC SIGNS

1. Before you start.

- What is the purpose of traffic signs?
- What traffic signs do you know?

2. Read the words and learn them by heart.

1. traffic (road) sign – дорожный знак
2. milestone – камень с указанием расстояния в милях, мильный камень
3. intersection – перекресток, пересечение
4. directional arm – здесь: указатель
5. fingerpost – указательный столб на развилке дорог
6. to enhance – увеличивать
7. cast iron – чугун
8. sheet aluminium – листовой алюминий
9. adhesive coating – клейкое покрытие
10. retroreflective – светоотражающий
11. visibility – видимость
12. to set into – вставлять, вмонтировать
13. measurement system – система измерения
14. metric standard – эталон единицы измерительной системы
15. metric distance – метрическое расстояние

Major international traffic signs:

1. right bend – опасный поворот направо
2. double bend – извилистая дорога
3. roadway narrows – сужение дороги
4. stop at intersection – проезд без остановки запрещен
5. no entry – въезд запрещен
6. no U-turn – разворот запрещен
7. passing prohibited – обгон запрещен
8. direction to be followed – обязательное направление движения
9. one-way traffic – одностороннее движение
10. yield – уступите дорогу
11. priority intersection – примыкание второстепенной дороги
12. falling rocks – падение камней
13. overhead clearance – ограничение высоты
14. signal ahead – регулируемое пересечение (участок дороги)
15. school zone – дети
16. pedestrian crossing – пешеходный переход
17. roadwork ahead – дорожные работы
18. slippery road – скользкая дорога
19. railroad crossing – железнодорожный переезд со шлагбаумом
20. deer crossing – дикие животные
21. steep hill – крутой спуск / крутой подъем
22. bumps – неровная дорога / искусственная неровность
23. closed to trucks – движение грузовых автомобилей запрещено
24. closed to pedestrians – движение пешеходов запрещено
25. passing prohibited – обгон запрещен
26. customs – таможня
27. oncoming vehicles priority – преимущество встречного движения

28. sound signals prohibited – подача звукового сигнала запрещена
29. minimum safety space – ограничение минимальной дистанции
30. end of all bans (except parking stopping) – конец всех ограничений (кроме стоянки и остановки)
31. stopping and parking prohibited – остановка запрещена
32. no parking – стоянка запрещена
33. mandatory right turn ahead – обязательный поворот (направо)
34. snow chains obligatory – цепи противоскольжения обязательны
35. no through road – тупик
36. facilities for handicapped – инвалиды
37. garage – техническое обслуживание автомобилей

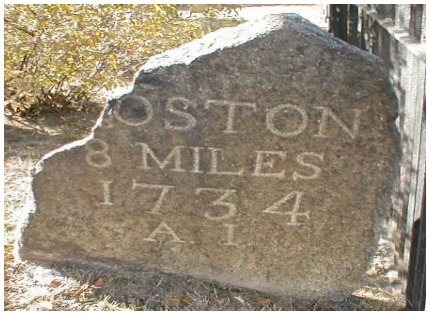
3. Read and translate the text and learn more about road signs.

Road signs

http://www.liveinternet.ru/users/cdefg/post181491573/

Traffic signs or road signs are signs erected at the side of or above roads to give instructions or provide information to road users. The earliest road signs were milestones, giving distance or direction; for example, the Romans erected stone columns throughout their empire giving the distance to Rome.

In the Middle Ages, multidirectional signs at intersections became common, giving directions to cities and towns.



http://fotki.yandex.ru/

The first modern road signs erected on a wide scale were designed for riders of high or “ordinary” bicycles in the late 1870s and early 1880s. With traffic volumes increasing since the 1930s, many countries have adopted pictorial signs or otherwise simplified and standardized their signs to overcome

language barriers, and enhance traffic safety. Such pictorial signs use symbols in place of words and are usually based on international protocols. Such signs were first developed in Europe, and have been adopted by most countries to varying degrees. Pre-industrial signs were stone or wood. In the late 18th and 19th centuries painted cast iron became popular. Since 1945 most signs have been made from sheet aluminium with adhesive plastic coatings, these are normally retroreflective for night-time and low-light visibility. Before the development of reflective plastics, reflectivity was provided by glass reflectors set into the lettering and symbols.

New generations of traffic signs based on electronic displays can also change their text (or, in some countries, symbols) to provide for "intelligent control" linked to automated traffic sensors.

http://autokadabra.ru/shouts/61302

Traffic signs can be grouped into several types. For example, Annexe 1 of the Vienna Convention on Road Signs and Signals (1968), which on 30 June 2004 had 52 signatory countries, defines eight categories of signs:

A. Danger warning signs
B. Priority signs
C. Prohibitory or restrictive signs
D. Mandatory signs
E. Special regulation signs
F. Information, facilities, or service signs
G. Direction, position, or indication signs
H. Additional panels


http://www.pametka.ru/story.php?title=SVETODIODNYE-DOROZHNYE-ZNAKI-OT-PROIZVODITELYA-PO-NIZKIM-TSENAM

Units

Distances on traffic signs generally follow the measurement system in use by the country. Most US road signs use miles or feet, although the Federal Department of Transportation has developed metric standards for all signs. The United Kingdom signs also display distances in miles. Elsewhere, metric distances are in very wide use, though not universal.

Languages

Where signs use a language, the recognized languages of the area is normally used. Signs in most of the US, Canada, Australia, and New Zealand are in English. Quebec uses French, while, in Montreal and some other Canadian provinces use both English and French, a territory of the US, Mexico, and Spain use Spanish. Within a few miles of the US–Mexico border, road signs are often in English and Spanish in places like San Diego.

Source: http://en.wikipedia.org/wiki/Traffic_sign

4. Answer the following questions

1. What is a road sign?
2. What were early road signs made of?
3. When did multidirectional signs become common?
4. Why did pictorial signs appear?
5. What material was used for road signs in 18th and 19th centuries?
6. What were road signs like in XX century?
7. What do modern signs look like?
8. What categories of signs do you know?
9. What measurement systems are used for road signs?
10. Who has developed the metric standards for all signs?
11. What languages are used for road signs?

5. Say if the sentences concerning Text 1A are true or false.

1. Greeks were first to introduce milestones.
2. In Stone Age multidirectional signs became common to show directions to country borders.
3. First modern road signs were created for bicycles.
4. With the development of water transport there was a necessity to introduce understandable road signs.
5. Pictorial signs use words to give information.
6. Modern signs were made retroreflective for them to be well seen in the day-time.
7. There are eight common categories of road signs.
8. Meter is used all over the world as the measurement of distance on road signs.
9. Each country uses its national language to give information on road signs.
10. Road signs provide safety on roads.
11. Most US road signs use miles or feet as a measurement system.

6. Circle the odd word.

1.	cast iron	sheet aluminium	stone	glass
2.	measurement system	metric standard	mandatory sign	metric distance
3.	traffic (road) sign	directional arm	fingerpost	direction
4.	visibility	traffic volume	road quality	retroreflective

7. Give English equivalents of the following words and word combinations.

Предписывающий дорожный знак, перекресток, преодолеть языковой барьер, отражающая пластмасса, дорожные знаки с электронным дисплеем, видимость в ночное время, увеличить дорожную безопасность,

запрещающие и ограничивающие знаки, знаки, предупреждающие об опасности, система измерения, графические знаки, новое поколение дорожных знаков, чугун.

8. Match the image of the road sign with its name.

Right bend, passing prohibited, one-way, yield, pedestrian crossing, deer crossing, stopping and parking prohibited, garage, no entry, parking.

1 2 3 4 5

6 7 8 9 10

9. Make up a Power Point presentation about strange road signs.

FINAL TASKS

1. Fill in the gaps using the words below:

road signs, intersection, traffic volume, retroreflective, sheet aluminium, visibility, distance, stone and wood, mandatory sign, prohibitory signs.

1. _____ were used as materials for first road signs.
2. If the _____ on the road is bad you should be very careful while driving.
3. Road signs may be done of _____.
4. _____ are necessary to regulate traffic flows.
5. In Russia the _____ between cities is usually given in kilometres.
6. To avoid car accidents it is better to place a traffic-light at the road _____.
7. _____ tells us how to behave on the road.
8. _____ say what is not allowed to do on the road.
9. Nowadays cars become more available and _____ increases.
10. Road signs must be _____ for them to be well seen at night.

2. Translate the following sentences using the vocabulary of Unit 1.

1. Дорожные знаки обеспечивают безопасность дорожного движения.
2. Римляне ставили столбы-указатели, чтобы показать расстояние до Рима.
3. В туман видимость ухудшается.
4. В деревне еду готовят в чугунных горшках.
5. Дети должны носить одежду со светоотражающими элементами, чтобы быть хорошо заметными на дороге.
6. Предписывающие дорожные знаки – это одностороннее движение, пешеходный переход и т.д.

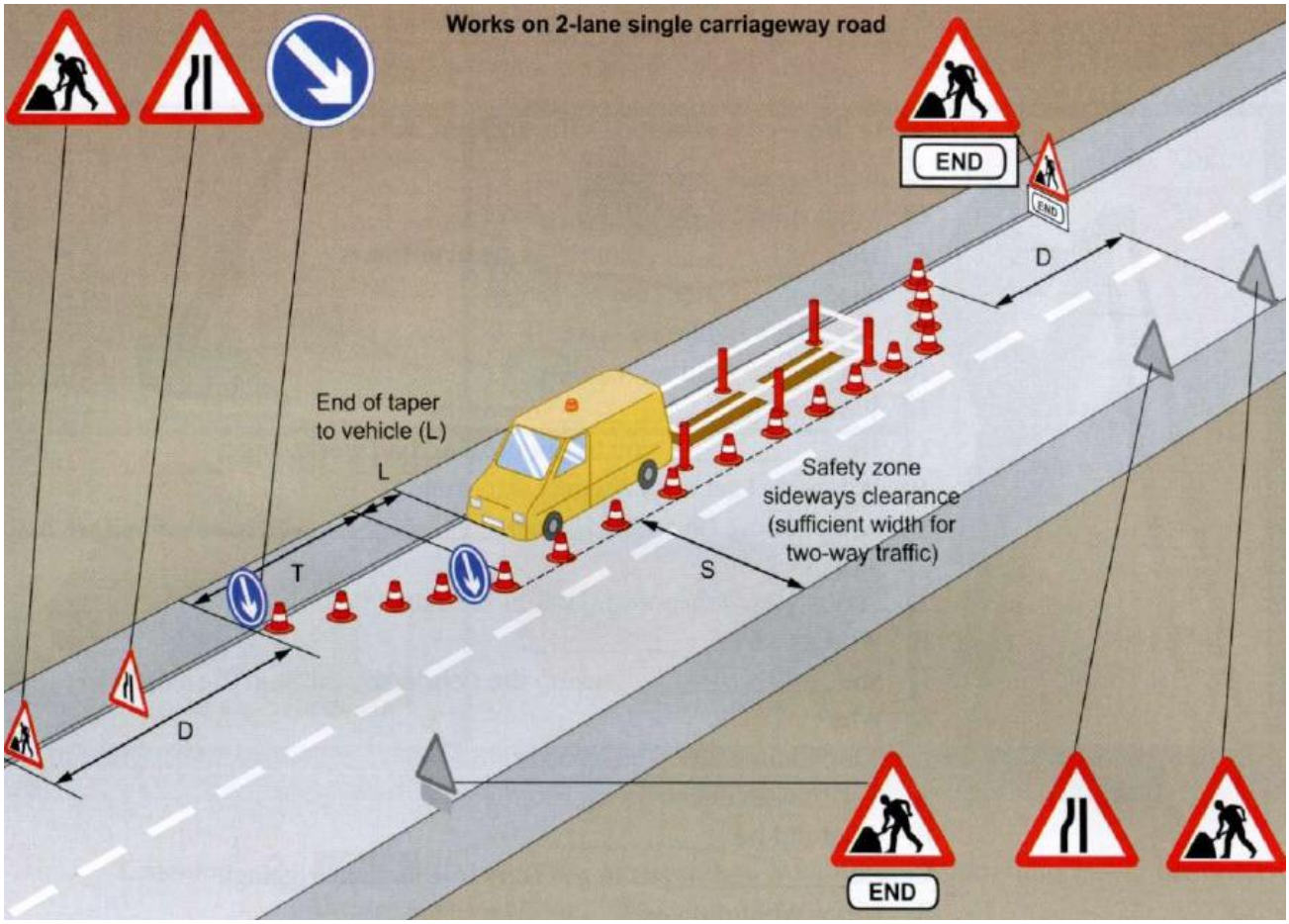
7. Листовой алюминий – легкий многофункциональный материал.
8. С каждым годом машин в Казани становится больше, и интенсивность движения сильно увеличивается.
9. Указательный столб на развилке дорог показывает направление и расстояние.
10. Увидев знак «пешеходный переход», водитель должен снизить скорость и пропустить пешеходов.
11. Дорожные знаки служат источником информации для участников дорожного движения.
12. В центре города стоянка запрещена.
13. Первые дорожные знаки были созданы для велосипедистов.

3. Match the words with their definitions.

Word	Definition
1. sheet aluminium	**a.** tables at the side of or above roads to give instructions or provide information to road users
2. traffic volume	**b.** the number of cars on the road
3. visibility	**c.** to give someone something that they need
4. measurement system	**d.** a type of hard iron that will not bend easily and is made into shapes by being poured into a mould when melted
5. road sign	**e.** a chemical element that is a light, silver-coloured metal, having a form of thin flat plate
6. cast iron	**f.** the amount of space between two places
7. distance	**g.** how clearly objects can be seen, or how far you can see clearly, usually because of the weather conditions
8. to provide	**h.** a set of units of measurement which can be used to specify anything

4. Look at the illustration from the UK Department for Transport road safety guidelines. Label it with the words given below.

barrier, "end of road works" sign, hazard, "keep right" sign, kerb, lane, "road narrows ahead" sign, "road works" sign, single carriageway, traffic cone, vehicle.



FrendoE. English for construction 2/ Pearson Education Limited, 2012. – P. 63.

5. Discuss in groups road traffic regulations in Russia. Are they necessary? What would you like change?

UNIT 2: TRAFFIC CONTROL

1. Before you start.

- Are there any congestions in your city?
- Do the authorities try to solve the problem of congestion?

2. Read the words and learn them by heart.

1. urban area – городская местность
2. congestion – пробка
3. incapable – неспособный
4. peak-hour – час-пик
5. pedestrian subway – пешеходный подземный переход
6. signposting – установка дорожных указателей
7. directional control – путевое управление
8. cross traffic – пересекающиеся потоки движения
9. side street – переулок
10. to eliminate – ликвидировать, устранить
11. objection – недостаток
12. delay – замедление, задержка времени
13. reservations – отведение участков
14. vertical (grade) separation – разделение уровней дорог

3. Read and translate the text to learn more about the basic means of traffic control.

Traffic control

It is obvious that in existing urban areas much of the congestion is due to narrow streets and junctions which are incapable of taking peak-hour traffic. The solutions of this problem are costly. They include adequate roundabouts and street

widening and the segregation of traffic by means of flyover roads, underpasses, bridges and pedestrian subways.

http://blog.william-russell.com/beijings-plan-to-introduce-congestion-charge-to-ease-traffic-problems/

Much of the congestion in urban areas is due to traffic which has no business in the area but is only passing through.

There is a tendency for drivers to keep to the well-lit shopping streets. If they can be made to use less important streets and those not occupied by shops, then conditions are improved not only for the through traffic but also for the local traffic.

http://www.humshaugh.org.uk/?attachment_id=153

Signposting is, of course, a directional control and a very effective one. In fact it is important for all signs and symbols used on the roads to be seen well in advance by drivers approaching at normal speed. Directional control cannot increase the capacity of the highway system but it can avoid local congestion.

One-way traffic is a special kind of directional control which is very effective in maintaining the traffic flow in congested areas.

A major cause of congestion in towns is the interruption to the free flow of traffic by cross traffic at junctions. But if the need for traffic streams to cross each other can be avoided then the movement of vehicles will be much easier. This easier movement of traffic can often be achieved by making traffic move in one direction only along certain streets and by prohibiting incoming vehicles from side streets from crossing the main stream. The streets may be either one-way or two-

way according to local conditions of traffic or width of carriageway, and traffic at the junctions can be guided by constructing suitably-shaped islands. Besides, one-way traffic can also be introduced where the carriageway width is inadequate for two opposing lines of traffic.

The disadvantages of a one-way traffic system are that it increases the distance travelled by some vehicles, that it makes it more difficult for strangers to find their way about. The true aim of a one-way system is to eliminate cross traffic, and under conditions of continuous flow on crossing streets the introduction of a properly designed one-way scheme can double the carrying capacity of the highways.

http://www.esi.info/detail.cfm/Sustainable-Options/Recycled-plastic-finger-signposts/_/R-40765_LS90RQ

The two main objections to street intersections are that they are a cause of accidents and that they interrupt the flow of traffic. The best thing to do with intersections is to get rid of them. If that is not possible they may be improved and made safer but they will always remain a source of danger and delay.

Many accidents are caused because traffic streams of different types, or traffic streams travelling in different directions are using the same carriageway, and these accidents can be avoided either by reservations between traffic lanes, or by vertical (or "grade") separation.

In many cities in America and in Europe segregation of traffic is achieved by means of flyovers or underpasses; at some junctions there are even three different levels. Each has its advantages and disadvantages according to the circumstances. Flyover structures are not always aesthetically pleasing while an underpass may be more expensive to construct. The separation of fast and slow traffic from the heavier and faster traffic is most desirable not only in the interests of freedom of

traffic movement, but also of safety. This ideal is not easy to achieve.

Urban traffic control will be of benefit to the general public in the district concerned and will result in greater comfort for road users of all classes, as well as bringing economic advantages to the community as a whole.

Source: Пособие по английскому языку для студентов II-III курсов строительных вузов / М.: Высш. школа, 1978. – С.27-29

4. Answer the following questions.

1. What is the main reason of congestions?
2. What are the main solutions of this problem?
3. Why is directional control very effective?
4. What is necessary to construct for traffic guidance at junctions?
5. Why is one-way traffic so effective?
6. What are the main disadvantages of one-way traffic system?
7. What are the main disadvantages of street intersections?
8. How can many accidents be avoided?
9. How is traffic segregated in America and Europe?
10. What will urban traffic control result in?

5. Say if the sentences concerning Text 2A are true or false.

1. Directional control increases the capacity of highways.
2. According to junctions streets may be either one-way or two-way.
3. Vehicles will move easier if traffic streams do not cross each other.
4. One-way traffic is introduced where the carriageway length is inadequate for two opposing lines of traffic.
5. Street widening is one of the solutions of congestion problem.
6. On-way traffic increases the distance travelled by vehicles.
7. Intersections never interrupt the flow of traffic.
8. Accidents can be avoided by horizontal separation.
9. Underpasses are not aesthetically pleasing.

10. Traffic control brings economic disadvantages.
11. Much of the congestion in urban areas is due to traffic having no business in the area but is only passing through.

6. Put the following sentences in the right order according to Text 2A.

a. If drivers can be made to use less important, then conditions are improved.
b. Urban traffic control will result in greater comfort for road users of all classes.
c. Directional control cannot increase the capacity of the highway system but it can avoid local congestion.
d. Intersections may be improved and made safer but they will always remain a source of danger and delay.
e. The true aim of a one-way system is to eliminate cross traffic.
f. The solutions of congestion problem are costly.
g. Easier movement of traffic can be achieved by making traffic move in one direction only along certain streets.
h. The separation of fast and slow traffic from the heavier and faster traffic is most desirable in the interests of freedom of traffic movement and safety.
i. Many accidents are caused because traffic streams of different types or traffic streams travelling in different directions are using the same carriageway.
j. Traffic at junctions can be guided by constructing suitably-shaped islands.

7. Explain in English the meaning of the following words and word-combinations:

one-way traffic, congestion, pedestrian subways, peak-hour traffic, reservations, cross traffic.

8. Give English equivalents of the following words and word combinations.

Расширение дорог, придерживаться хорошо-освещенных улиц, сквозное движение, одностороннее движение, движение транспортных средств, въезжающие транспортные средства, ширина проезжей части дороги, островки безопасности подходящего размера, противоположные полосы движения, увеличивает расстояние, непрерывный поток движения, разработанный должным образом, пропускная способность, источник опасности, между полосами движения, приятный с эстетической точки зрения, общественность.

9. Describe the main ideas of traffic control. What do you know about traffic control and site safety regulations in your country?

FINAL TASKS

1. Fill in the gaps using the words below:

lane, road signs, one-way, road capacity, congestion, advantages, pedestrians, flyovers, lane markings, increase.

1. Streets are divided into 2 types: _____ and two-way according to the width of carriageway.
2. Sidewalks and bike lanes are being added to both sides of the road, improving safety for _____ and bicyclists.
3. Congestion can be reduced by either increasing _____, or by reducing traffic.

4. _____ is part of a carriageway that is designated for use by a single line of vehicles, to control and guide drivers and reduce traffic conflicts.
5. _____ is a condition on roads that occurs as use increases, and is characterized by slower speeds, longer trip times, and increased vehicles queuing.
6. Most highways have at least two lanes, one for traffic in each direction, separated by _____.
7. In many cities segregation is achieved by means of _____.
8. One-way traffic system _____ the distance travelled by vehicles.
9. _____ give instructions or provide information to road users.
10. Traffic control brings economic _____ to the community.

2. Translate the sentences from Russian into English using the vocabulary list of Unit 2.

1. Как правило, трудно избежать пробок в городских условиях.
2. В часы-пик многие дороги неспособны выдерживать высокий уровень интенсивности движения.
3. Увеличение пропускной способности произойдет благодаря организации непрерывного потока движения.
4. Установка дорожных указателей является неотъемлемым компонентом для обеспечения безопасности на дороге.
5. Пробки становятся основной причиной временных задержек.
6. Подземный переход способствует решению проблем безопасности пешеходов.
7. Если потоки движения не будут пересекаться, то транспортные средства смогут передвигаться быстрее и легче.
8. В зависимости от условий и обстоятельств движение может быть односторонним и двусторонним.

9. Основной функцией одностороннего движения является устранение пересекающихся потоков движения.
10. Многие несчастные случаи можно избежать при помощи строительства транспортных развязок.

Form several groups and prepare presentations about the problem of congestion in different countries and the ways of its solution.

UNIT 3: ROAD SAFETY

1. Before you start.

- Are Russian roads safe?
- Do road signs help to increase road safety?

2. Read the words and learn them by heart.

1. road traffic safety – дорожная безопасность
2. to injure – ранить, причинить травму
3. public transport – общественный транспорт
4. prevention – предотвращение, предупреждение
5. to prevent – предотвращать
6. crash – авария, катастрофа
7. fallibility – погрешность
8. human tolerance – допустимая для человека нагрузка
9. urban road – городская дорога
10. vulnerable – незащищенный, уязвимый

11. road user – участник дорожного движения
12. traffic calming – ограничение скорости движения путем установки различных препятствий
13. tool – инструмент
14. traffic circle – кольцевая развязка
15. to implant – внедрять
16. collision – авария, столкновение
17. shared space – общее пространство
18. safety barrier – защитное ограждение
19. to absorb impact energy – поглощать энергию удара
20. a bystander – свидетель, наблюдатель
21. vicinity – окрестность, близость, соседство
22. oncoming traffic – встречное движение, встречные автомобили
23. head-on collision – лобовое столкновение
24. countermeasure – контрмера, противодействие
25. grade separated junctions – развязка дорог на разных уровнях
26. obstacle – препятствие
27. prohibition – запрет

3. Read the text and learn more about road safety.

Road safety

Road traffic safety refers to methods and measures for reducing the risk of a person using the road network being killed or seriously injured. The users of a road include pedestrians, cyclists, motorists, their passengers, and passengers of on-road public transport, mainly buses and trams. Best-practice road safety strategies focus upon the prevention of serious injury and death crashes in spite of human fallibility. Safe road design is now about providing a road environment which

ensures vehicle speeds will be within the human tolerances for serious injury and death wherever conflict points exist.

http://www.otradny-13sad.ru/index/profilaktika_detskogo_dorozhno_transportnogo_travmatizma/0-50

On existing urban roads where many vulnerable road users, such as pedestrians and bicyclists can be found, traffic calming can be a tool for road safety. Though not strictly a traffic calming measure, mini-traffic circles implanted in existing, normal intersections of urban streets, have been shown to reduce collisions at intersections dramatically. Shared space schemes, which rely on human instincts and interactions, such as eye contact, for their effectiveness, and are characterised by the removal of traditional traffic signals and signs, and even by the removal of the distinction between roadway and footway, are also becoming increasingly popular. Both approaches can be shown to be effective.

Major highways are designed for safer high-speed operation and generally have lower levels of injury per vehicle km than other roads.

Safety features include:

- Limited access from properties and local roads.
- Grade separated junctions
- Median dividers between opposite-direction traffic to reduce likelihood of head-on collisions
- Removing roadside obstacles.
- Prohibition of more vulnerable road users and slower vehicles.

http://kevah.ru/photo/trodden_path.html

Modern safety barriers are designed to absorb impact energy and minimize the risk to the occupants of cars, and bystanders. For example some road fixtures such as road signs and fire hydrants are designed to collapse on impact. Highway

authorities have also removed trees in the vicinity of roads; while the idea of "dangerous trees" has attracted a certain amount of skepticism, unforgiving objects such as trees can cause severe damage and injury to any road users.

Source: http://en.wikipedia.org/wiki/Road_traffic_safety

4. Answer the following questions.

1. What is road safety?
2. What measures can be taken to reduce crashes?
3. What vulnerable road users can you meet on the urban road?
4. Where can traffic circles be introduced?
5. What is shared space scheme?
6. Which of the approaches is more effective?
7. What is the difference between an urban road and a highway?
8. What are safety barriers designed for?
9. What obstacles can be found along roads?
10. Are trees dangerous at roadside?

5. Say if the sentences concerning Text 3A are true or false.

1. Only drivers and pedestrians can be considered road users.
2. The worst road safety strategy is to prevent possible car crashes.
3. Safe road design limits vehicle speed.
4. Bicyclists and pedestrians are dangerous for other road users.
5. Road safety measures reduced collisions immensely.
6. Shared space gives strict regulations about behavior on the road.
7. Highways are designed for high-speed operation.
8. There are many pedestrian crossings on highways.
9. Median drivers lower the risk of head on collisions.
10. Safety barriers are really useful.

6. Using vocabulary in ex.2 match the words with their definitions.

Word	Definition
1. road traffic safety	**a.** the act of stopping something from happening or of stopping someone from doing something
2. pedestrian	**b.** how fast something moves
3. prevention	**c.** the act of building raised areas, small roundabouts, or other similar structures on roads, usually roads where there are houses, so that vehicles are forced to move more slowly along them
4. public transport	**d.** a motorway in a city or town
5. speed	**e.** teaching people how to behave safely when driving or crossing the road
6. urban road	**f.** a system of vehicles such as buses and trains that operate at regular times on fixed routes and are used by the public
7. traffic calming	**g.** a person who is walking, especially in an area where vehicles go

7. Give English equivalents of the following words and word combinations.

Уменьшать, причинить травму, велосипедист, погрешность, авария, незащищенный, участник дорожного движения, кольцевая развязка, поглощать энергию удара, свидетель, полоса дороги, защитное ограждение, развязка дорог на разных уровнях.

8. Discuss what can be done to make our roads safer and who is responsible for it. Make up a table to show the result.

FINAL TASKS

1. Fill in the gaps using the words and word combinations given below:

car crash, pedestrians, speed, motorcyclist, bystanders, head-on collision, prevent, traffic calming, traffic circle, collision.

1. The negative effect of _____ is the car needs repair more often.
2. _____ is an accident when several cars crash.
3. On a highway to avoid _____ there are safety barriers.
4. Road safety helps to reduce _____.
5. _____ can develop very high speed and may be dangerous for other road users.
6. For vehicles _____ limit on urban roads is 60km/h.
7. _____ at an intersection can substitute traffic-light.
8. As a result of collision not only drivers and passengers but also _____ may suffer.
9. Following road signs may _____ car crash.
10. _____ must be attentive crossing the street.

2. Translate the following sentences using the vocabulary of Unit 3.

1. Дорожная безопасность это инструмент для предотвращения аварий.
2. Общественный транспорт медленнее, чем личный автомобиль.
3. Водители должны уделять особое внимание незащищенным участникам дорожного движения.
4. К сожалению, в нашем городе пока нет специальных дорожек для велосипедистов.
5. Недавно в Казани была внедрена специальная полоса для общественного транспорта.
6. Поворачивая налево, нужно обратить внимание на встречное движение.

7. Городские дороги более опасны, чем автомагистрали.
8. Защитные ограждения поглощают энергию удара при столкновении.
9. Для уменьшения количества аварий необходимо очистить окрестности дороги от деревьев и прочих препятствий.
10. Штраф за нарушение скоростного режима высокий.

3. Make up a Power Point presentation describing the effectiveness of road safety measures. Choose one measure and tell the group about it.

UNIT 4: ROAD SURFACE MARKING

1. Before you start.

- What is the main purpose of road markings?
- What colour are road markings in your country?

2. Read the words and learn them by heart.

1. uniformity – единообразие
2. cat's eyes – дорожный световозвращатель «кошачий глаз»
3. to mount – устанавливать
4. rubber – резина, каучук
5. housing – установка
6. fore – вперед
7. aft – назад
8. Botts' dots – точки Боттса
9. epoxy – эпоксидная смола

10. snow plow – снегоочиститель
11. rumble strips – предохранительная полоса
12. to warn – предупредить
13. crossing – перекресток
14. to assist – помогать
15. striper – машина для нанесения разметки
16. drum – цилиндр
17. retroreflectivity – ретроотражение, световозвращающее отражение
18. stop bar – стоп линия
19. pylon – дорожный конус
20. HOV (high-occupancy vehicle) lane – полоса для автомобилей с пассажирами

3. Read and translate the text to learn more about the basic types of road surface markings.

Road surface markings

http://www.roadsafeco.com.au/

Road surface marking is a kind of device or material used on a road surface in order to convey official information. They can also be applied to mark parking spaces or areas for other uses.

Road surface markings provide guidance and information to drivers and pedestrians. Uniformity of the markings is an important factor in minimizing confusion about their meaning. However, countries and areas categorize and specify road surface markings in different ways.

Road surface markings can be mechanical, non-mechanical, or temporary.

Mechanical devices may be raised into the road surface. They are either reflective or non-reflective. Most are permanent; some are movable.

Cat's eyes equip most major routes in the British Isles. They consist of four reflective lenses mounted in durable white rubber housing, two facing fore and two facing aft. The lenses are available in a variety of different colours, mainly white, yellow, orange, green, red and blue.

http://www.commercialmotor.com/big-lorry-blog/solarlites-cats-eye-saves-lives

Botts' dots are round non-reflective raised pavement markers named after California Department of Transportation engineer Elbert Botts, who invented the epoxy that keeps them glued down. Generally they are used to mark the edges of traffic lanes often together with reflective raised pavement markers. They are used only in warm climates since snow plows usually remove them along with the snow.

http://www.reflective-safety.com/snoline-polystud.html

A rumble strip is usually either applied in the direction of travel along an edge- or centerline to alert drivers when they drift from their lane, or in a series across the direction of travel to warn drivers of a stop ahead or nearby danger spot. In favorable circumstances rumble strips are effective (and cost-effective) at reducing accidents due to inattention.

Reflective markers are used as lane dividers to mark the central reservation. They are typically more visible at night than standard road marking lines. The color of markers varies depending on the country of use. Reflective markers are also referred to as raised pavement markers. In the United Kingdom and elsewhere, raised markers are used to mark crossings

http://paulpetersoncompany.com/news/blog/

to assist the blind in crossing streets. In colder climates reflective markers may be installed below ground.

Non-mechanical markers

Paint is generally used to mark traffic lanes, spaces in parking lots or special purpose spaces for disabled parking. Colors for these applications vary by locality. Paint is usually applied right after the road has been paved. The road is marked commonly by a truck called a "striper". These trucks contain hundreds of gallons of paint stored in huge drums. The markings are controlled manually or automatically by the controller.

Thermoplastic is one of the most common types of road marking. The main advantages of thermoplastic are durability and retro-reflectivity. Most thermoplastic is produced in white and yellow colours.

http://www.roadtraffic-technology.com/contractors/road_marking/kadcam/

Plastic is used to mark crossroads, stop bars, and traffic guidance such as turn lanes, train crossings, pedestrian crossings, taxi lanes, bus and bike lanes.

Pylons are sometimes used to separate HOV lanes from regular traffic lanes.

Source: http://en.wikipedia.org/wiki/Road_surface_marking

4. Answer the following questions.

1. What is the function of road surface marking?
2. Why is uniformity of markings important?
3. What types of markings are distinguished?
4. What type of mechanical devices is used on major routes in the British Isles?
5. Why are Bott's dots called so?

6. Why aren't Bott's dots used in cold climates?
7. Where is a rumble strip applied?
8. What is function of reflective markers?
9. What is function of raised markers in the UK?
10. What non-mechanical markers do you know?
11. What machine carries out paint marking?
12. What are the advantages of thermoplastic?
13. What is plastic used for?
14. What kind of marker is a pylon?
15. What type of road surface markings do you think the most common in your country?

5. Say if the sentences concerning Text 4A are true or false.

1. All countries have uniform markings.
2. Road surface markings provide official information.
3. There are only non-reflective mechanical markers.
4. Cat's eyes consist of six lenses mounted in durable white paint.
5. Elbert Botts invented a rumble strip.
6. Bott's dots are used together with reflective markers.
7. Non-reflective markers are also referred to as raised pavement markers.
8. In cold climates reflective markers are installed below ground.
9. A striper is a machine which marks the road surface.
10. Most thermoplastic is produced in red and white colours.
11. Paint is used to mark traffic lanes, spaces in parking lots or special spaces for disabled parking.
12. Reflective markers are more visible at night than standard road marking lines.

6. Circle the odd word.

1.	Bott's dots	uniformity	cat's eyes	rumble strip
2.	mechanical	non-mechanical	temporary	route
3.	striper	pedestrian	driver	bicyclist
4.	paint	plastic	thermoplastic	confusion
5.	bus lane	pedestrian crossing	turn lane	durability

7. Give English equivalents of the following words and word combinations.

Предоставить официальную информацию, единообразие разметок, отражающие линзы, разнообразие различных цветов, края полос движения, вместе со снегом, при благоприятных обстоятельствах, снижение несчастных случаев, разделитель полосы движения, более заметный, место для парковки, сотни галлон, контролироваться вручную, один из самых распространенных типов разметки, пешеходный переход.

8. Describe the main types of road surface markings.

FINAL TASKS

1. Fill in the gaps using the words below:

road safety, Botts' dots, cat's eye, HOV lanes, paint, colour, line striper, markings, bike lane, machinery.

1. _____ are used as a means of guiding and controlling the traffic.
2. Markings ensure _____ and smooth flow of traffic along the lanes.

3. _____ is the material commonly used for marking.
4. The commonly used _____ for road marking are yellow and white.
5. The road marking must be laid using appropriate road marking _____.
6. The name _____ comes from Shaw's inspiration for the device: the eyeshine reflecting from the eyes of a cat.
7. More recently, _____ have been used in the snow-free areas of Alabama, Arizona, Florida, Hawaii, Louisiana, Mississippi, Nevada, Georgia, Washington and Texas.
8. _____ are normally created to increase higher average vehicle occupancy and person with the purpose of reducing traffic congestion and air pollution although their effectiveness is questionable.
9. _____ produces clear, visible lines.
10. _____ is a portion of a road which is separated from traffic lanes by the use of a white stripe on the pavement and has been designated for use by bicyclists.

2. Translate the sentences from Russian into English using the vocabulary list of Unit 4.

1. Световозвращатель «кошачий глаз» состоит из четырех линз, которые доступны в различных цветах.
2. Единообразие дорожной разметки является важным фактором в дорожной безопасности.
3. Стоп линия предупреждает водителей об опасности.
4. Краска для разметки хранится в огромных цилиндрах.
5. Как правило, краска наносится машиной для нанесения разметки.
6. Основным преимуществом термопласта является световозвращающее отражение.

7. Пластик используется для разметки пешеходных переходов и перекрестков.
8. Линии белого цвета были впервые нанесены в Великобритании в 1914 году.
9. Отражающая разметка обычно более заметна ночью по сравнению с другими типами.
10. Разметка предоставляет информацию участникам дорожного движения.
11. Эдвард Н. Хайнз (Edward N. Hines) считается изобретателем дорожной разметки.
12. Дорожная разметка может применяться в сочетании с другими средствами с целью повышения безопасности организации дорожного движения.
13. Данная машина используется для нанесения горизонтальной разметки термопластом на пешеходные переходы.

4. Speaking. Make presentations about road markings in: USA, Great Britain, Russia, Australia

CHAPTER III.

BRIDGE AND TUNNEL CONSTRUCTION

UNIT 1: HISTORY OF BRIDGE BUILDING

1. Before you start.

- How do you think first bridges appeared?
- What was their purpose?
- What materials were they made of?

2. Read the words and learn them by heart.

1. log – бревно
2. stream – ручей
3. span – перекрытие
4. pole – столб
5. well – водоем
6. stick – палка
7. branch – ветка
8. deciduous – опавший, упавший
9. fibre – волокно (древесное)
10. to wave (wove, woven) – сплетать
11. rope – веревка
12. to bind – связывать
13. intact – сохранившийся
14. volcanic rock – вулканическая порода
15. aqueduct – акведук

16. suspension bridge – подвесной мост
17. timber – древесина, пиломатериал
18. breakthrough – прорыв
19. erection – возведение, строительство
20. cast iron – чугун
21. truss system – решетчатая конструкция
22. wrought iron – кованое железо
23. tensile strength – нагрузка на растяжение
24. load – нагрузка
25. advent – появление
26. welding – сварка
27. welded bridge – сварной мост
28. to stand – выдерживать
29. variation – колебание
30. pozzolana – пуццолана
31. lime – известняк

Proper names:

- Arkadiko Bridge – мост Аркадико
- Mycenaean [maisi'niən] – микенский
- Peloponnese [pɛləpəni:z] – Пелопоннес
- Alcántara Bridge – Алькантарский мост
- river Tagus ['teigəs] – река Тахо
- Mughal – могольский (империя)
- Warring States – Сражающиеся Царства
- Zhaozhou [djaodjou] Bridge – мост Аньцзи

3. Read the text, translate it and compare your ideas in ex.1 with the facts.

History of bridges

The first bridges were made by nature itself – as simple as a log fallen across a stream or stones in the river. The first bridges made by humans were probably spans of cut wooden logs or eventually stones, using a simple support and crossbeam arrangement. Some early Americans used trees or bamboo poles to cross small wells to get from one place to another. A common form of sticks, logs, and deciduous branches together involved the use of long fibres woven together to form a rope used for binding and holding together the materials used in early bridges.

http://www.marshruty.ru/Photos/Photo.aspx?PhotoID=b46cc940-65af-4636-8c6a-

The Arkadiko Bridge is one of four Mycenaean arch bridges, part of a former network of roads in Greece. Dating to the Greek Bronze Age (13th century BC), it is one of the oldest arch bridges still in existence and use. Several intact arched stone bridges from the Hellenistic era can be found in the Peloponnese in southern Greece.

http://ru.advisor.travel/poi/Arkadiko-Bridge-12306

The greatest bridge builders of antiquity were the ancient Romans. The Romans built arch bridges and aqueducts that could stand in conditions that would damage or destroy earlier designs. Some stand today. An example is the Alcántara Bridge, built over the river Tagus, in Spain. The Romans also used cement, which reduced the variation of strength found in natural stone. One type of cement, called pozzolana, consisted of water, lime, sand, and volcanic rock. Brick and mortar

bridges were built after the Roman era, as the technology for cement was lost then later rediscovered.

Alcántara Bridge

An ancient Indian treatise mentions the construction of dams and bridges. The use of stronger bridges using plaited (переплетенный) bamboo and iron chain was visible in India by about the 4th century. A number of bridges, both for military and commercial purposes, were constructed by the Mughal administration in India.

Although large Chinese bridges of wooden construction existed at the time of the Warring States (476-221 BC), the oldest surviving stone bridge in China is the Zhaozhou Bridge, built from 595 to 605 AD.

Rope bridges, a simple type of suspension bridge, were used by the Inca civilization in the Andes Mountains of South America, just prior to European colonization in the 16th century.

During the 18th century there were many innovations in the design of timber bridges by Hans Ulrich, Johannes Grubenmann, and others. The first book on bridge engineering was written by Hubert Gautier in 1716. A major breakthrough in bridge technology came with the erection of the Iron Bridge in Coalbrookdale, England in 1779. It used cast iron for the first time as arches to cross the river Severn.

http://www.history.ucsb.edu/faculty/marcuse/classes/2c/2c06/lectures/06L03IndRev.htm

With the Industrial Revolution in the 19th century, truss systems of wrought iron were developed for larger bridges, but iron did not have the tensile strength to

support large loads. With the advent of steel, which has a high tensile strength, much larger bridges were built, many using the ideas of Gustave Eiffel.

In 1927 welding pioneer Stefan Bryła designed the first welded road bridge in the world.

Source: http://en.wikipedia.org/wiki/Bridge#History

4. Answer the following questions.

1. What were first bridges like?
2. What did early Americans use to build bridges?
3. What is one of the oldest survived bridges?
4. Who were the most famous bridge builders?
5. What did Indians use to reinforce the structure of their bridge?
6. When was the oldest stone bridge in China built?
7. What nation started building rope bridges?
8. What innovation was introduced in the XVIII century?
9. What is the disadvantage of using iron for bridge construction?
10. What did Stefan Bryla invent?

5. Say if the sentences concerning Text 1A are true or false.

1. First bridges were built by aliens.
2. Wooden logs, bamboo poles and timber boards were used to build early bridges.
3. Aqueducts and arch bridges were built by the Romans.
4. Pozzalana used by Romans consisted of lemon, sand, water анв crushed stone.
5. Ancient Indians started building bridges and dams using bamboo and iron chains.
6. In China wooden and stone bridges appeared in Christian Era (Common Era).

7. Rope bridge is the prototype of an arch bridge.
8. First rope bridges appeared in South America.
9. The most significant achievement of XVII century was the construction of a concrete bridge.
10. Steel has lower tensile strength than iron.

6. Using vocabulary in ex.2 put the following words into the correct column.

Span, stick, cement, arch, destroy, pole, timber, erect, branch, aqueduct, steel, weld, cast iron, cut, rope, suspension bridge, wave, sand, damage, volcanic rock, bind, dam, stand, cross, mortar, log, lime, build.

Building materials	Actions	Structures

7. Using the vocabulary of Unit 1 match the words with their definitions.

1. tensile strength	**a.** the activity of joining metal parts together
2. log	**b.** to go across from one side of something to the other
3. variation	**c.** iron that can be bent into attractive shapes and used to make gates, furniture, etc.
4. welding	**d.** the ability of a material or object to be stretched or pulled without breaking.
5. wrought iron	**e.** a mixture of sand, water, and cement or lime that is used to fix bricks or stones to each other when building walls
6. aqueduct	**f.** a thick piece of tree trunk or branch, especially one cut for burning on a fire or building something.

7. dam	**g.** a structure, consisting of a curved top on two supports, that holds the weight of something above it.
8. mortar	**h.** a wall built across a river that stops the river's flow and collects the water, especially to make a reservoir (= an artificial lake) that provides water for an area.
9. to cross	**i.** a change in amount or level.
10. arch	**j.** a structure for carrying water across land, especially one like a high bridge with many arches that carries pipes or a canal across a valley

8. Discuss with the group the following topic:

- ✓ What did the invention of a bridge mean for ancient people?
- ✓ How did it influence their life?

FINAL TASKS

1. Fill in the gaps using the words below:

Aqueduct, logs, to damage, arch, sticks, mortar, load, ropes, welding, erection, branches, to stand.

1. Imitating monkeys, ancient people used _____ to cross obstacles such as wells and chasms (ущелье).
2. Ancient Romans built _____ to provide water to their cities.
3. _____ is a way to connect metal units with each other.
4. To span a stream or a well _____, _____ and _____ are used.
5. _____ on the bridge should be spread along the whole span length.
6. A bridge must be strong enough to _____ the entire load imposed.

7. The influence of bad weather conditions may _____ the bridge.
8. _____ of a bridge is difficult process.
9. _____ is made of cement, sand and water.
10. _____ was invented by Romans.

2. Translate the sentences from Russian into English using the vocabulary list of Unit 1.

1. Чтобы сплести веревку, древние люди использовали древесное волокно.
2. Арка – это красивое и прочное сооружение, которое может выдерживать большую нагрузку.
3. К сожалению, многие древние мосты на сегодняшний день повреждены или разрушены.
4. Первый сварной мост был построен по проекту Стефана Брила в 1927 году.
5. Основным недостатком использования железа, как материала для строительства мостов, является низкая нагрузка на растяжение.
6. После индустриальной революции XIX века для строительства мостов начали использоваться решетчатые конструкции.
7. Строительный раствор может состоять из известняка или цемента, смешенного с песком и водой.
8. Возведение дамбы необходимо для защиты земель от затопления, а также для создания водохранилищ и других искусственных водоемов.
9. Веревочный мост это самая простая форма подвесного моста.
10. Акведук – очень прочное сооружение, построенное римлянами и сохранившееся до наших дней.

3. Do you know any other ancient bridges? Using Power Point presentation tell your groupmates about one of them. (Use the Internet for additional information)

UNIT 2: TYPES OF BRIDGES

1. Before you start.

- What is a bridge?
- How many types of bridges do you think exist?

2. Read the words and learn them by heart.

1. span – расстояние между опорами, пролет
2. simple span – разрезное пролетное строение моста
3. continuous span – неразрезное пролетное строение моста
4. cantilever span – консольное пролетное строение
5. pony – низкая ферма без верхних связей
6. deck – ферма с ездой поверху
7. through – ферма с ездой понизу
8. truss – ферма
9. suspended span – подвесной пролет моста
10. superstructure – пролетное строение
11. cross-brace – поперечные раскосы
12. girder bridge – мост с балочным пролетным строением
13. deck beam – балка, поддерживающая настил
14. deck plate girder – балочная ферма моста со сплошными стенками с ездой поверху
15. knee brace – изогнутый угол

16. deflection – деформация
17. load capacity – грузоподъемность
18. web depth – толщина стенки балки
19. haunch – полудужье
20. parallel flanges – параллельные пояса
21. curved – изогнутый
22. to rivet – приковывать
23. splice plate – стыковой лист
24. stress analysis – анализ нагрузки
25. rigid frame – жесткий каркас
26. substructure – опорное строение
27. to integrate – объединять
28. leg – опора

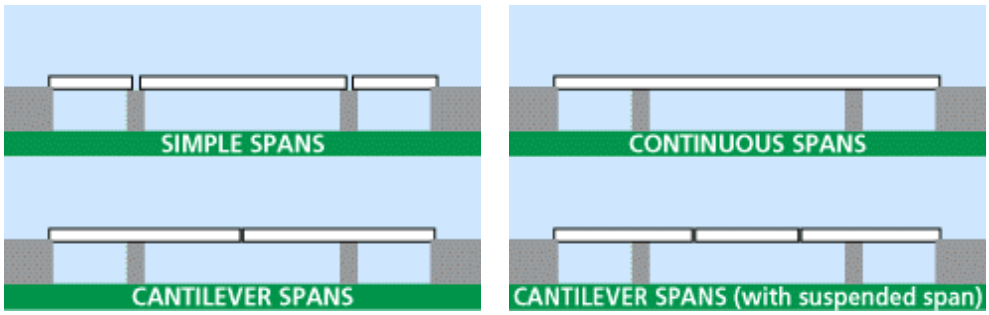
3. Read and translate the text to learn more about the basic types of bridges and beam bridge in particular.

Beam type

The four main factors are used in describing a bridge. By combining these terms one may give a general description of most bridge types:

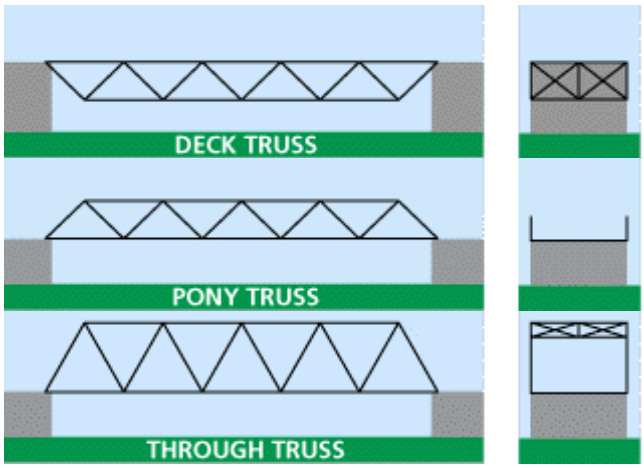
- span (simple, continuous, cantilever),
- material (stone, concrete, metal, etc.),
- placement of the travel surface in relation to the structure (deck, pony, through),
- form (beam, arch, truss, etc.).

The three basic types of spans are shown below. Any of these spans may be constructed using beams, girders or trusses. Arch bridges are either simple or continuous. A cantilever bridge may also include a suspended span.



http://pghbridges.com/basics.htm

Examples of the three common travel surface configurations are shown in the truss type drawings below. In a deck configuration, traffic travels on top of the main structure; in a pony configuration, traffic travels between parallel superstructures which are not cross-braced at the top; in a through configuration, traffic travels through the superstructure (usually a truss) which is cross-braced above and below the traffic.



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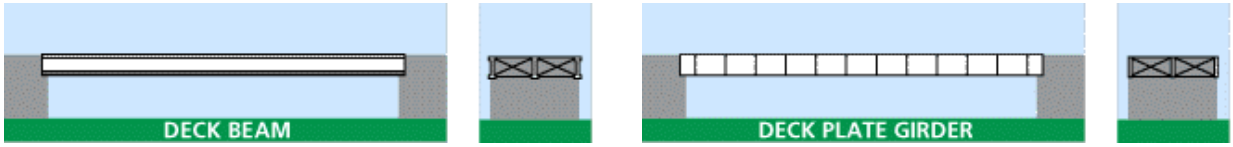
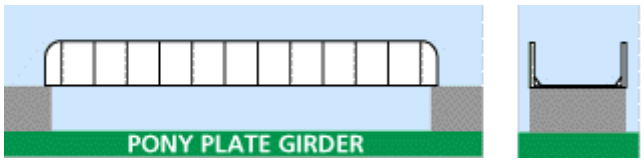
Simple deck beam bridges are usually metal or reinforced concrete. Other beam and girder types are constructed of metal. The end section of the two deck configuration shows the cross-bracing commonly used between beams. The pony end section shows knee braces which prevent deflection where the girders and deck meet.





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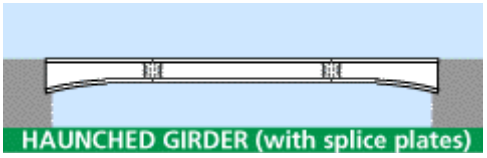
One method of increasing a girder's load capacity while minimizing its web depth is to add haunches at the supported ends. Usually the center section is a standard shape with parallel flanges; curved ends are riveted using splice plates.



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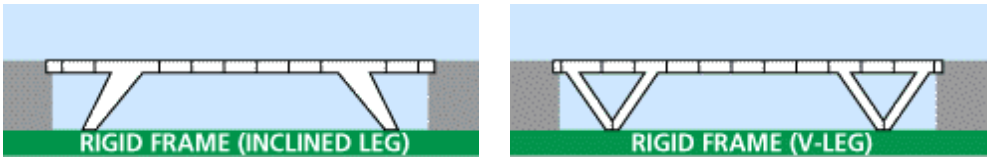
Many modern bridges use new designs developed using computer stress analysis. The rigid frame type has superstructure and substructure which are integrated. Commonly, the legs and deck are a single piece which is riveted to other sections.



http://pghbridges.com/basics.htm

Source: http://pghbridges.com/basics.htm

4. Answer the following questions.

1. What four main factors are used in describing a bridge?
2. What is the difference between truss, pony and through configuration?
3. What material are simple deck beam bridges made of?
4. What is the function of knee braces?
5. What is the method of increasing a girder's load capacity?
6. What new designs are used in bridge construction?

5. Say if the sentences concerning Text 2A are true or false.

1. Simple deck beam bridges are usually clay.
2. Spans may be simple, continuous and cantilever.

3. According to the placement of the travel surface in relation to the structure bridges may be beam, arch, truss.
4. The pony end section shows the cross-bracing commonly used between beams.
5. A cantilever bridge may include a suspended span.
6. In a pony configuration traffic travels between parallel superstructures.

6. Match the words in the left column with the definitions on the right.

1. superstructure	**a.** the portion of a bridge structure which carries the traffic load and passes that load to the substructure.
2. bridge	**b.** a structure member supporting vertical loads by resisting bending.
3. beam	**c.** the horizontal space between two supports of a structure.
4. haunch	**d.** the top surface of a bridge which carries the traffic.
5. span	**e.** the enlarged part of a beam near its supported ends which results in increased strength; visible as the curved bottom edge of a beam.
6. deck	**f.** a raised structure built to carry vehicles or pedestrians over an obstacle.

7. Give English equivalents of the following words and word combinations.

Общее описание, консольное пролетное строение, типы расстояний между опорами, арочные мосты, подвесной пролет моста, мостовая ферма с ездой поверху, мост со сквозными фермами, грузоподъемность балки, между параллельными пролетными строениями, железобетонный, добавить полудужья, предотвратить деформацию, изогнутые концы, прикованы используя стыковые листы, толщина стенки балки.

8. Find the example of a beam bridge and make its short description.

1. Before you start.

- How old do you think arch bridge is?
- Are arch bridges widely used in your country?

2. Read the words and learn them by heart.

1. abutment – опора
2. midpoint – середина
3. hinge – шарнир
4. through arch – арочное пролетное строение моста с ездой понизу
5. tied arch – арка с затяжкой
6. truss deck arch – сквозная арочная ферма с ездой поверху
7. girder section – профиль балки
8. spandrel-braced arch – арка с решетчатой надсводной частью
9. suspender – подвесной кабель
10. wind bracing – ветровая связь

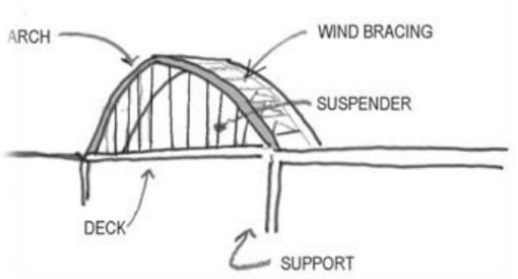
3. Read and translate the text to learn more about arch bridge.

Arch types

Arch bridge is one of the most popular types of bridges, which came into use over 3000 years ago and remained in height of popularity until industrial revolution and invention of advanced materials enabled architect to create other

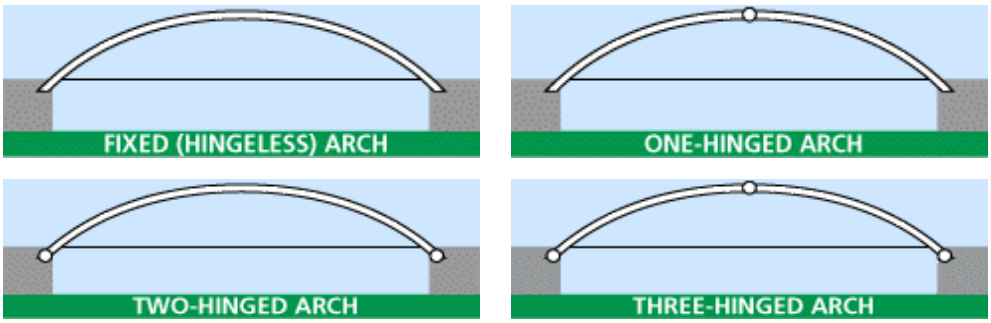
modern bridge designs. However, even today arch bridges remain in use, and with the help of modern materials arches can be build on much larger scales.

The basic principle of arch bridge is its curved design. Abutments carry the load of the bridge and are responsible for holding the arch in the unmoving position.



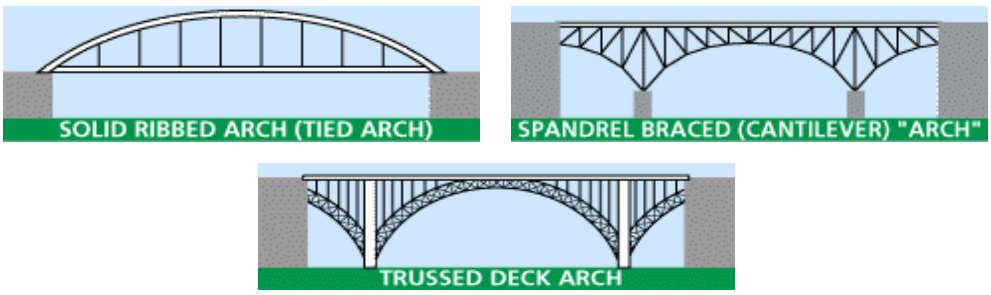
http://www.aiacincinnati.org/community/abc/

Also the type of connections used at the supports and the midpoint of the arch may be used – counting the number of hinges which allow the structure to respond to stresses and loads.



http://pghbridges.com/basics.htm

Arch configuration is another method of classification. Examples of tied arch**,** trussed arch and spandrel-braced arches are shown. A tied arch is commonly constructed using curved girder sections. A trussed arch has a curved through truss rising above the deck. A spandrel-braced arch carries the deck on top of the arch.



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Arch bridges rely on vertical members to convey the load carried by the arch.

Source: http://www.aiacincinnati.org/community/abc/curriculum/fivebridgetypes.pdf

4. Answer the following questions.

1. When did arch bridges appear?
2. Are arch bridges used today?
3. What is the main principle of arch bridges?
4. What do hinges allow?
5. What is the function of an abutment?
6. What is the difference between tied, trussed and spandrel-braced arches?

5. Say if the sentences concerning Text 2B are true or false.

1. Arch bridge remained in height of popularity until the XII century.
2. A tied arch carries the deck on top of the arch.
3. The basic principle of arch bridge is its straight design.
4. Hinges are used at the supports and the midpoint of the arch.
5. Vertical members transmit the load which is carried by the arch.
6. Without the help of modern materials arches can be build on much larger scales.

6. Put the following words in the right column.

Basic, configuration, truss, transmit, carry, girder, apply, load, modern, enable, revolution, popular, remain, create, use, midpoint, allow, deck, suspender, larger, responsible, design, scale.

NOUN	VERB	ADJECTIVE	ADVERB

7. Give English equivalents of the following words and word combinations.

Подвесной кабель, изогнутая структура (дизайн), арка с решетчатой надсводной частью, середина арки, изогнутый профиль балки, неподвижное положение, выдерживать нагрузку, арочное пролетное строение моста с ездой понизу, применимо ко всем типам арочных мостов, количество шарниров.

8. Do you know any famous arch bridges? (Use the Internet for additional information)

1. Before you start.

- Are truss bridges popular in your country?
- What do you think is the difference between arch and truss bridges?

2. Read the words and learn them by heart.

1. compression force – сила сжатия
2. tension forces – сила натяжения
3. to determine – определить
4. to remove – передвинуть, убрать
5. to eliminate – устранить
6. under-stressed – слабо нагруженный
7. king post truss – одностоечная ферма
8. queen post truss – стропильная ферма с двумя подвесками
9. to lean – опираться
10. to angle – наклоняться (под углом)
11. end panel – концевая панель

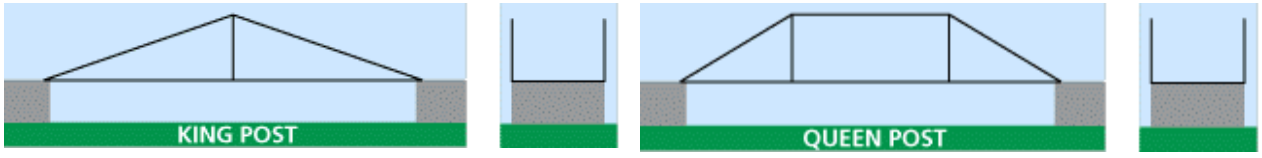
12. web member – элемент решетки фермы
13. top chord – верхний пояс
14. dead load – собственный вес

3. Read and translate the text to learn more about a truss bridge.

Truss types

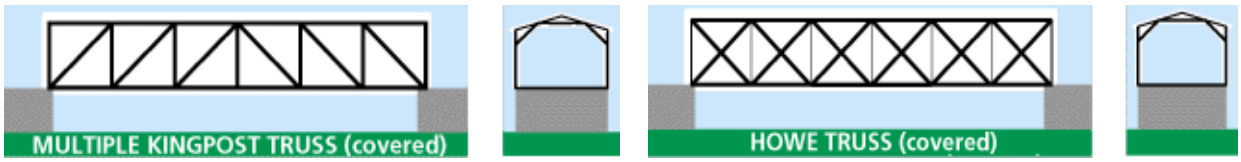
Trusses work much like beams: they carry a combination of compression and tension forces. The main difference is that trusses are less heavy than beams. Beams use extra material in some areas; these areas don't use the full strength available to them. Engineers and builders can determine which portions of beams can be removed. The resulting truss concentrates the forces into many smaller members and eliminates the under-stressed areas of beams.

A truss is made of many smaller parts. Once constructed of wooden timbers, and later including iron members, most truss bridges are built of metal. As for the placement of the travel surface in relation to the superstructure truss bridges are divided into king and queen post trusses. The *king post* consists of two angled supports leaning into a common vertical support. The *queen post* truss is similar to a king post truss in that the outer supports are angled towards the center of the structure.



http://pghbridges.com/basics.htm

Covered bridges are typically wooden truss structures. The enclosing roof extended the life of the bridge. One of the most common methods used for achieving longer spans was the multiple kingpost truss. A simple, wooden, kingpost truss forms the center and panels are added symmetrically. With the use of iron in bridge construction, the *Howe truss* in its simplest form appears to be a type of multiple kingpost truss.



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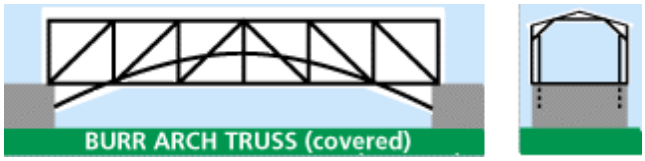
Theodore *Burr* built a bridge the Hudson River in 1804. This combines an arch with a truss to form a structure both strong and rigid.



http://pghbridges.com/basics.htm

Lattice truss type of bridge uses a number of lightweight elements, easing the task of construction. Truss elements are usually of wood, iron, or steel.

http://pghbridges.com/basics.htm

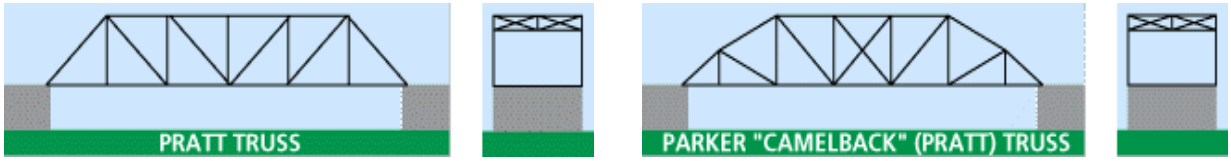
Herman Haupt designed his truss configuration in 1839. The *Haupt truss* concentrates much of its compressive forces through the end panels and onto the abutments.

http://pghbridges.com/basics.htm

The *Pratt truss* is a very common type, but has many variations. Originally designed by Thomas and Caleb Pratt in 1844, the Pratt truss successfully made the transition from wood designs to metal. The basic features are the diagonal web members which form a V-shape. The center section commonly has crossing diagonal members.

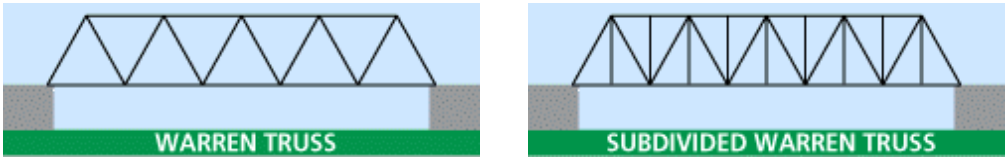
Charles *Parker* modified the Pratt truss to create a “camelback” truss having a top chord which does not stay parallel with the bottom chord. This creates a

lighter structure without losing strength; there is less dead load at the ends and more strength concentrated in the center.



http://pghbridges.com/basics.htm

A *Warren truss*, patented by James Warren and Willoughby Monzani in 1848, contains many triangles formed by the web members which connect the top and bottom chords. These triangles may also be further subdivided. Warren truss may also be found in covered bridge designs.



http://pghbridges.com/basics.htm

Source: http://pghbridges.com/basics.htm

4. Answer the following questions.

1. What is the difference between trusses and beams?
2. What materials are truss bridges built of?
3. What does king post consist of?
4. What does multiple king post consist of?
5. What does Lattice truss type use?
6. What does Warren truss contain?
7. What truss did Charles Parker modify?

5. Say if the sentences concerning Text 2C are true or false.

1. In the queen post truss the inner supports are angled towards the center of the structure.
2. Beams are less heavy than trusses.
3. One of the most common methods used for achieving longer spans was the multiple queen post truss.

4. Burr truss combines truss with wooden timber.
5. Howe truss is a type of multiple kingpost truss.
6. In the Haupt truss compressive forces are concentrated through the end panels and onto the abutments.
7. Lattice truss type has many variations.
8. In the Pratt truss diagonal web members have T-shape.
9. Parker modified the Pratt truss to create a “turtleback” truss having a top chord which does not stay parallel with the bottom chord.
10. Warren truss may be found in covered bridge designs.

6. Complete the sentences using the right truss.

1. _____ has a diagonal web members which form a V-shape.
2. _____ has a top chord which does not stay parallel with the bottom chord.
3. In a _____ a kingpost truss forms the center and panels are added symmetrically.
4. In a _____ compressive forces are concentrated through the end panels and onto the abutments.
5. _____ combines an arch with a truss.
6. _____ has many triangles formed by the web members which connect the top and bottom chords.
7. _____ has many lightweight elements.

7. Give English equivalents of the following words and word combinations.

Наружная опора, крытый мост, основное отличие, сосредоточить силы, вертикальная опора, элемент решетки фермы, пересекающиеся диагональные элементы, объединяет арку с фермой, легковесные элементы, упрощать задачи строительства.

8. Match the synonyms.

1. contain	**a.** build
2. construct	**b.** additional
3. feature	**c.** remove
4. basic	**d.** consist of
5. determine	**e.** strength
6. eliminate	**f.** reach
7. force	**g.** characteristic
8. extra	**h.** key
9. achieve	**i.** modification
10. variation	**j.** decide

9. What other types of truss bridges do you know? (Use the Internet for additional information)

1. Before you start.

- What types of bridges do you remember?
- Do you know any suspension bridges in your country?

2. Read the words and learn them by heart.

1. suspension bridge – висячий мост
2. eye bar – звено стержневой оттяжки
3. masonry – каменная или кирпичная кладка
4. pier – опора

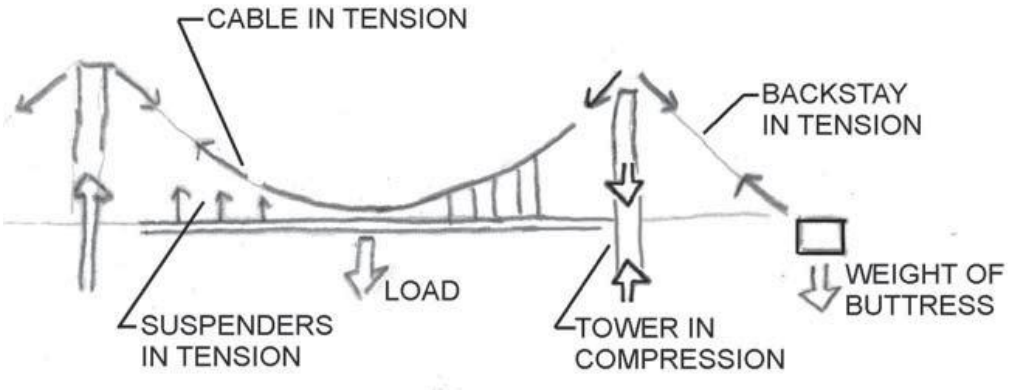
5. in compression – при сжатии, находящийся под давлением
6. in tension – растянутый, подверженный растяжению
7. backstay – оттяжной трос
8. buttress – промежуточная опора моста, контрфорс
9. bending – сгибание
10. earthquake – землетрясение
11. structural failure – потеря устойчивости строительной конструкции
12. severe – суровый
13. galloping – скачущий
14. withstand – выдерживать, противостоять

3. Read and translate the text to learn more about a suspension bridge.

Suspension types

The longest bridges in the world are suspension bridges or their cousins, the cable-stayed bridge. The deck is hung from suspenders of wire rope, eye bars or other materials. Materials for the other parts also vary: piers may be steel or masonry; the deck may be made of girders or trussed.

How a suspension bridge works



http://www.aiacincinnati.org/community/abc/curriculum/fivebridgetypes.pdf

The cables that go from the top of the towers down to the ground are the backstays. The backstays are connected to big rock or concrete piers buried in the ground. The backstays keep the towers from bending in.

Suspension bridges are very light. This allows them to span very long distances. The longest suspension bridge in the world is the Askashi Kaikyo Bridge in Japan. In addition to the long span, this bridge was designed to resist huge earthquakes and hurricane force winds.

Some bridges have in the past suffered from structural failure. This may be combination of poor design and severe weather conditions.

When it was opened in 1940, the Tacoma Narrows Bridge was the third longest suspension bridge in the world. It later became known as "Galloping Gertie", due to the fact that it moved not only from side to side but up and down in the wind. Attempts were made to stabilize the structure with cables, but they were unsuccessful.

Eventually on November 7, 1940, only four months after it was built the bridge collapsed in a wind of 42 mph. The bridge was designed to withstand winds of up to 120 mph. Some experts have blamed the collapse of the bridge upon a phenomenon called resonance.

Today all new bridges prototypes have to be tested in a wind tunnel before being constructed. The Tacoma Narrows bridge was rebuilt in 1949.

Source: http://www.aiacincinnati.org/community/abc/curriculum/fivebridgetypes.pdf

4. Answer the following questions.

1. What are the main materials for piers and deck?
2. What is a backstay?
3. What is the longest suspension bridge?
4. Why was the Tacoma Narrows Bridge called "Galloping Gertie"?
5. Why did the Tacoma Narrows Bridge collapse according to some experts?
6. What is the function of backstays?
7. What is the reason of structural failures?
8. What kind of test is held over bridges nowadays?

5. Say if the sentences concerning Text 2D are true or false.

1. Piers may be made of clay or sand.
2. Deck keeps the tower from bending it.
3. Suspension bridges can span long distances.
4. Askashi Kaikyo Bridge is the third longest bridge in the world.
5. Askashi Kaikyo Bridge collapsed in 1940.
6. Bridges prototypes are tested in a wind tunnel before being constructed.
7. Suspenders are of wire rope, eye bars or other materials.

6. Give English equivalents of the following words and word combinations.

Бетонные опоры, охватывать большие расстояния, ветры ураганной силы, обвал моста, были сделаны попытки, потеря устойчивости строительной конструкции, суровые погодные условия, плохой проект, стабилизировать конструкцию, крупная скала (горная порода).

7. Complete the article on the Akashi-Kaikyo suspension bridge, by adding the missing words and phrases.

1988, 2 million, longest, cubic, Awaji, 181 000, Circle, Japan's, 1955, Kobe.

The Akashi Kaikyo Suspension Bridge is the [1]_____ suspension bridge in the world and it is probably [2]_____ greatest engineering feat (подвиг).

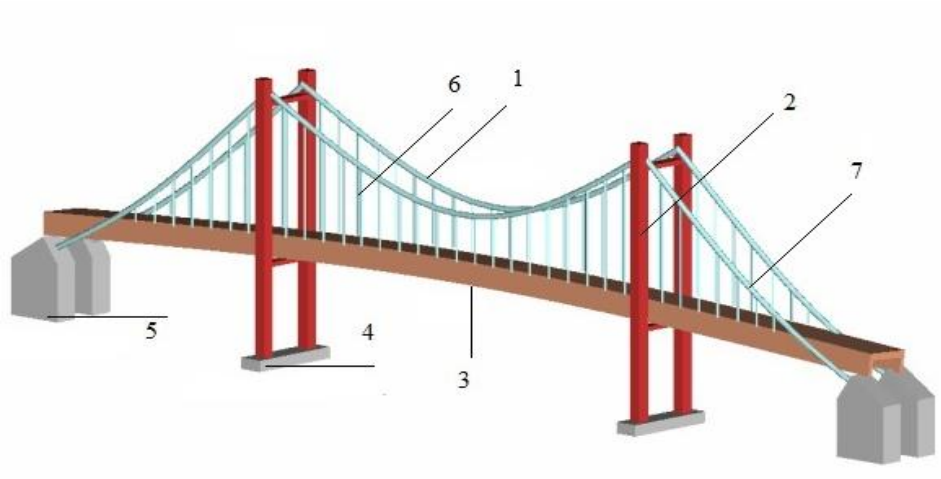
It took [3]_____ workers ten years to construct the bridge, [4]_____ tones of steel and 1.4 million [5]_____ metres of concrete. The steel cable used would [6]_____ the world seven times.

It has six lanes and links the island of [7]_____ and the mainland city of [8]_____, a distance of four miles. The concept of building a bridge across the Akashi Straits became urgent after a disaster in [9]_____. A ferry (паром) carrying over one hundred children sank after colliding with another ferry, in the busy shipping lane. One hundred and sixty eight children and adults died in the

disaster. Political pressure for a bridge increased and in [10]_____ construction began.

8. Match the following words and word combinations with parts shown in the picture given below:

Cable, tower, foundation of the tower, backstay, deck, buttress, suspender.



9. Describe three well-known suspension bridges. One in each of the following countries:

- ✓ Japan
- ✓ UK
- ✓ USA

1. Before you start.

- Do you know any cable stayed bridges in your country?
- Are they similar to suspension bridges?

2. Read the words and learn them by heart.

1. cable-stayed bridge – вантовый мост
2. computer aided design – система компьютерного проектирования
3. to simulate – моделировать

4. precisely – точно, четко
5. anchor block – анкерный блок
6. to counter balances – уравновешивать
7. substantially – практически, по существу
8. to reduce – уменьшать
9. to surpass – превосходить

3. Read and translate the text to learn more about a cable-stayed bridge.

Cable-stayed type

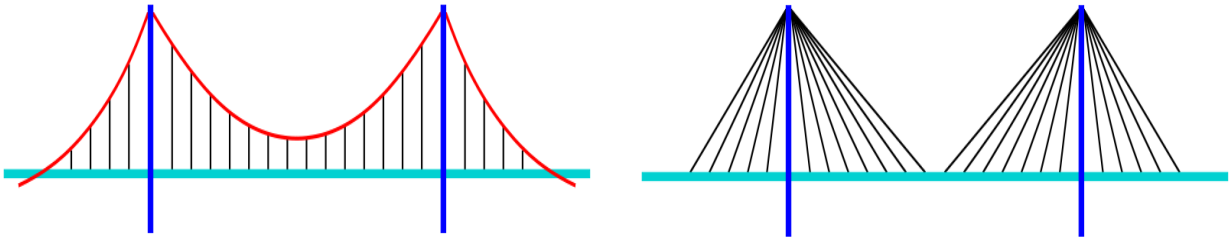
A scientific understanding of the properties of modern materials and the availability of computer software have made it possible to construct new types of bridges. The newest type of bridge is the cable-stayed bridge. They have great popularity in recent years because of their great beauty and economy.

These modern bridges are designed using computer aided design (CAD). Bridge designers are now able to design a bridge on computer, simulate its use and correct any faults before building begins. Modern materials, especially special steels are used to construct this type of bridge. This means that bridges can be made from lighter, stronger materials and engineered precisely. Today materials are used efficiently. Older bridges (built in the 19th and early 20th century) such as suspension bridges were designed on paper and the design could not be simulated before being built. Consequently, designers ensured that early steel, stone, concrete bridges were constructed from more materials than were actually required – just in case the final bridge was too weak and collapsed.

Unlike suspension bridges, cable stayed bridges do not need anchor blocks. The cables are fixed to either side of each tower – this means that the weight of each side of the bridge counter balances the opposite side. The absence of anchor blocks substantially reduces the amount of materials needed and the cost of

building the bridge. Also, the towers tend to be positioned down the centre of the roadway and half as many towers are needed compared to suspension bridges.

Two well known cable stay bridges can be found in France. The ‘Le Pont de Normandie’, can be found in Normandy, Northern France. This was once the longest cable stay bridge in the world. However, this engineering feat has been surpassed by the opening of the Millau Bridge in Southern France. This cable stay bridge is the highest bridge in the world, with its deck almost at the same height as the Eiffel Tower.



Suspension type Cable-stayed type

http://commons.wikimedia.org/wiki/File:Bridge-harp-cable-stayed.svg

Source: http://www.aiacincinnati.org/community/abc/curriculum/fivebridgetypes.pdf

4. Answer the following questions.

1. Why are cable-stayed bridges so popular?
2. What do bridge designers use for the construction of a cable stayed bridge?
3. Does a cable stayed bridge need an anchor block?
4. What modern material is used to construct a cable stayed bridge?
5. Where are the cables fixed?
6. What does the absence of anchor reduce?
7. Where are towers positioned?
8. What is the highest bridge in the world?
9. How are modern bridges designed?

5. Put the following sentences in the right order.

a. Suspension bridges were designed on paper.
b. These modern bridges are designed using CAD.
c. Cable-stayed bridges have great popularity because of their great beauty and economy.
d. The absence of anchor blocks reduces the amount of materials needed and the cost of building the bridge.
e. The 'Le Pont de Normandie' was once the longest cable stay bridge in the world.
f. The cables are fixed to either side of each tower – this means that the weight of each side of the bridge counter balances the opposite side.
g. Millau Bridge in Southern France is the highest bridge in the world.
h. Cable stayed bridges do not need anchor blocks.
i. Modern materials, especially special steels are used to construct this type of bridge.
j. The towers tend to be positioned down the centre of the roadway.

6. Give English equivalents of the following words and word combinations.

Свойства современных материалов, система компьютерного проектирования, самый высокий мост, в отличие от висячих мостов, кабели (тросы) зафиксированы, уравновешивать противоположные стороны, исправлять какие-либо ошибки, следовательно, слишком слабый, количество требуемых материалов, отсутствие анкерных блоков, стоимость строительства моста, компьютерное программное обеспечение, спроектированы на бумаге, такой же высоты, доступность, до начала строительства, разрушаться, значительно снижает.

7. Complete the article on the Normandy bridge, by adding the missing words and phrases.

Engineers, suspension, 1995, France, lorries, employed, tested, largest, height, expensive.

Le Pont De Normandie or the Normandy Bridge (Northern France) is one of the [1]_____ cable stay bridges in the world and while under construction the building site was the largest in [2]_____. Over 1600 people were [3]_____ to help design and build the bridge including designers, [4]_____, suppliers and people from other sectors of industry. It was built from 1988 to [5]_____ and at this time it was the longest in the world.

One of the main reasons for building a cable stay bridge is that it is more stable in the wind than a [6]_____ bridge but also it is less [7]_____ to construct. The Normandy Bridge has 184 cable stays which support the weight of the deck. The bridge was [8]_____ after completion with a weight of [9]_____ equal to 16000 tons. Each of the two pylons which hold the cables are 214 metres in [10]_____ and weigh 20,000 tons.

8. Read these texts about three cable-stayed bridges. Are sentences 1-5 *true* (T) or *false* (F)? Correct the false sentences.

1. The longest bridge is the Sutong Yangtze River Bridge.
2. The oldest bridge is the Tatara Bridge.
3. The Tatara Bridge is longer than the Rion-Antirion Bridge.
4. The Rion-Antirion Bridge has the highest towers.
5. The Sutong Yangtze River Bridge has the shortest main span.

The Sutong Yangtze River Bridge in China has a main span of 1,088 m. There are also side spans, making the total bridge length 8,206 m. The two highest towers in the bridge are 306 m high. The bridge opened in May 2008.

The Rion-Antirion Bridge is in Greece. Completed in August 2004, the bridge is 2,880 m long and 28 m wide. The cable-stayed deck is 2,252 m long. It has four towers, each 220 m high.

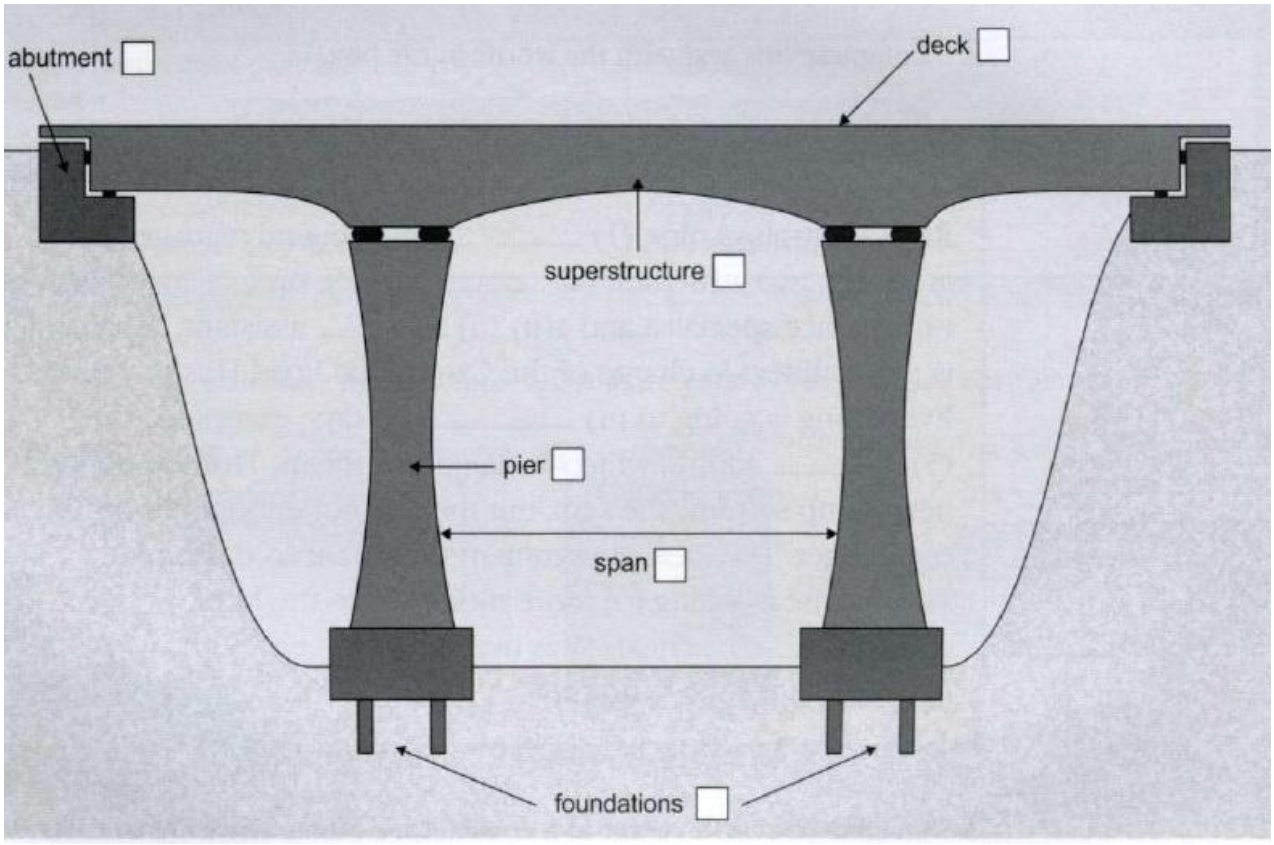
The Tatara Bridge in Japan has a total length of 1480 m, with a main span of 890 m. The deck width is 30.6 m and the towers are 220 m high. The Tatara Bridge was completed in May 1999.

9. Find the information about a bridge of cable-stayed type in the internet and make a presentation.

FINAL TASKS

1. Look at the picture given below and say whether these sentences are *true* (T) or *false* (F). Correct the false sentences.

1. The deck is above the superstructure.
2. The piers are below the foundations.
3. The superstructure rests on the piers and abutments.
4. The bridge has three abutments.



2. Read these descriptions of five bridges and match texts A-E to pictures 1-5.

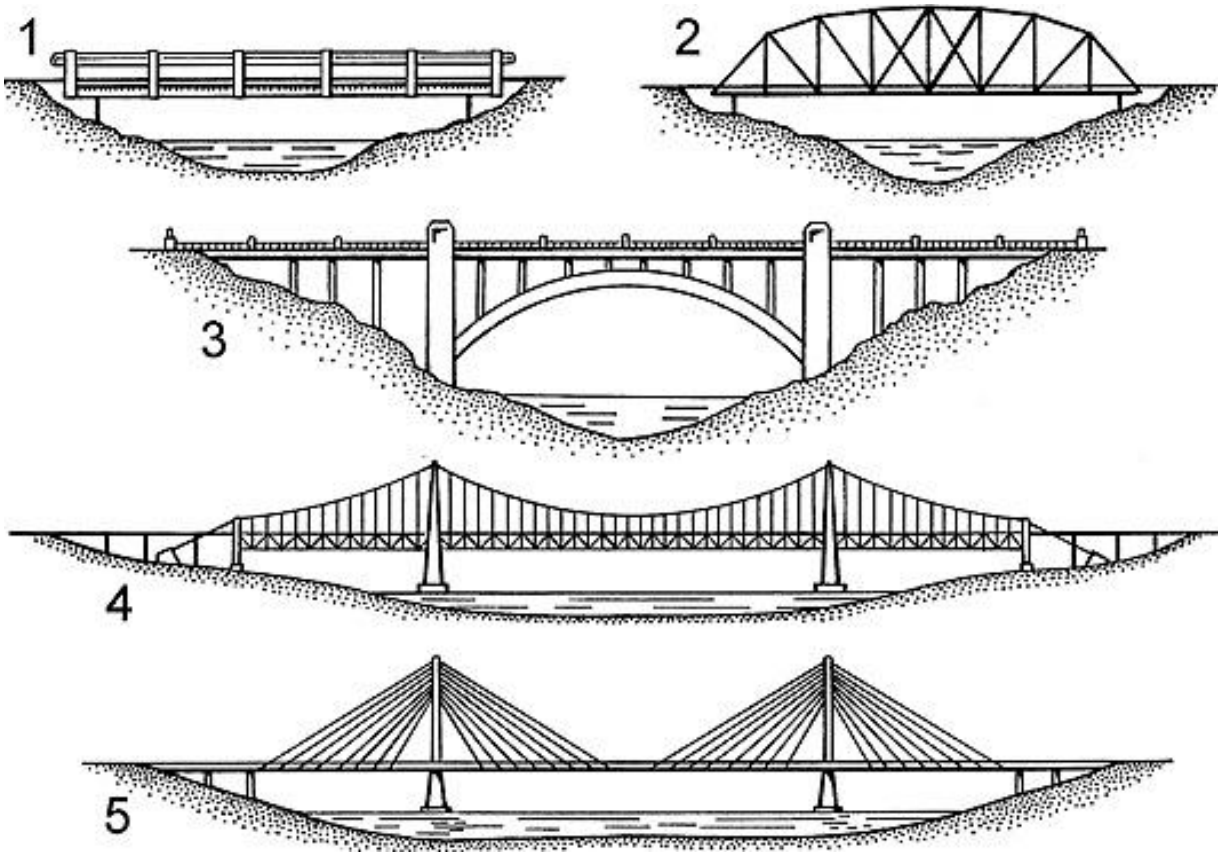
A. In a suspension bridge, cables go from one tower to another and the deck hangs from vertical suspenders attached to the main cable.

B. Arches are normally semicircular in shape. In this type of bridge, there are no cables or towers.

C. Beam bridges are the most common type of bridge. The design is very simple. The beam sits on t o p of two or more supports or abutments.

D. In a cable-stayed bridge, the cables go directly from the tower to the deck. Cable-stayed bridges can have any number of towers.

E. A truss bridge is a bridge whose load-bearing superstructure is composed of a truss, a structure of connected elements forming triangular units.



3. Put these phases of bridge construction in the correct order 1-7.

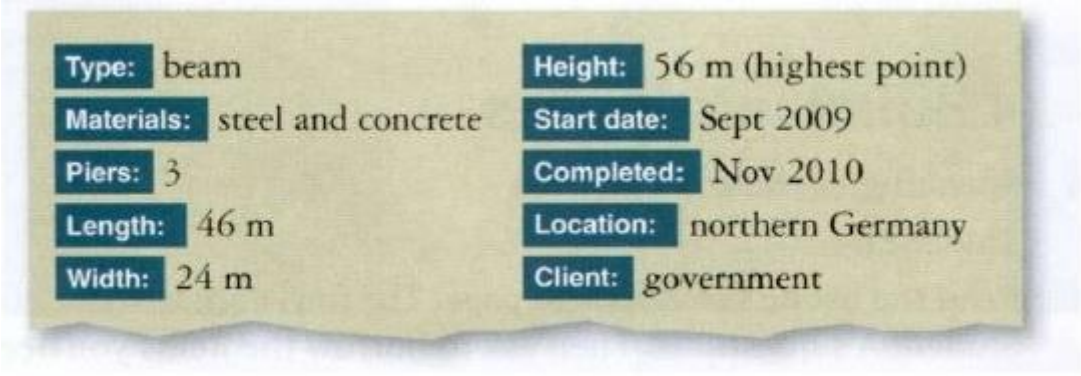
___ foundations
___ pier construction
___ superstructure
_1_ design
___ deck
___ site preparations
___ opening ceremony

4. Translate the sentences from Russian into English using the vocabulary list of Unit 2.

1. Мост Миллениум, находящийся в Казани, является примером вантового моста.
2. Преимуществом висячих мостов является отсутствие промежуточных опор.
3. Пролетные строения могут быть разрезными, неразрезными, консольными и т.д.

4. Арочные мосты могут быть с ездой поверху и понизу.
5. Пролетные строения балочных мостов выполняются из стали, дерева или железобетона.
6. Ферма состоит из элементов, образующие треугольные детали.
7. Мост со сквозными фермами выдерживает силу сжатия и натяжения.
8. Ферма Пратта содержит элементы решетки фермы, которые образуют V-образную форму.
9. Арочные мосты могут быть бесшарнирные и шарнирные.
10. Висячие мосты используются в случае большой длины моста, невозможности или опасности установки промежуточных опор.

5. Read this information about a bridge project and present your own project about it. Draw and label a diagram with the dimensions.



6. Find and present the information about the bridge which you consider the most beautiful. You should mention: *1) the name of the bridge; 2) the type of the bridge; 3) where it was constructed; 4) when it was constructed; 5) who it was designed by; 6) construction materials which were used; 7) how long, wide, high it is; 8) some interesting facts connected with this bridge*
9) why you consider it to be most beautiful

UNIT 3: STAGES OF BRIDGE CONSTRUCTION

1. Before you start.

- How do you think what you should start from when you are building a bridge?
- What aspects should you consider?
- What resources will you need?

2. Read the words and learn them by heart.

1. to determine – решать, определять
2. to aid – помогать
3. ravine – ущелье, овраг
4. inspection – контроль качества
5. legwork – пеший обход
6. to break ground – начинать экскаваторные работы
7. surveyor – геодезист, землемер
8. filling – заполнение
9. measuring device – измерительный прибор
10. upkeep costs – эксплуатационные расходы
11. map – карта, план местности
12. to pour – заливать
13. to make calculations – делать расчеты
14. concrete – бетон
15. steel – сталь, арматура железобетонных конструкций
16. to assemble – собирать
17. placement – размещение
18. to ship – доставлять
19. design – проектирование
20. anchor – анкерный зажим

21. to take into account (consideration) – принимать во внимание
22. tinker toys – детский конструктор
23. traffic load – транспортная нагрузка
24. nuts and bolts – детали
25. steel design manual – руководство по проектированию стальных конструкций
26. paving machine – асфальтоукладчик/бетоноукладчик
27. engineered – специализированный
28. replacement costs – издержки на замену деталей
29. composite material – композиционный материал
30. corrosion – ржавление, коррозия
31. to resist – противостоять
32. to pave – мостить
33. decking – проезжая часть моста

3. Read the text, translate it and compare your ideas in ex.1 with the facts.

Eight steps of bridge construction

1. Determine what type of bridge you need for the situation. The common types are arch, suspension, truss, cable-stayed and beam types. If you're crossing a short span, you probably only need to build a beam or a small truss bridge. If you're crossing a deep ravine, an arch bridge might be the best choice. A bridge to span an ocean bay requires the very expensive suspension bridge.

http://www.rusmost.ru/news/press/2010/04/19/news_160.html

2. Identify an ideal place to build the bridge. A lot of legwork goes into determining the ideal site to build anything, and when you're talking about something as expensive as a bridge, engineers are even more careful. The engineering team will send out surveyors, people who use electronic measuring devices to make a map of the general area. From this map, they will make calculations and determine the length and placement of the bridge.
3. Design the bridge. The engineer will take into account the potential traffic load of the bridge and use steel design manual and computer programmes to aid in the bridge designing process. The materials chosen should also take into consideration the inspection and upkeep costs after the bridge is built.
4. Break ground. Once the design has been finalized and stamped with approval, the actual building can begin. This will involve excavation or filling the banks on either side, stabilizing the ground where the supports will be placed and, depending on what type of bridge is going to be built, pouring concrete.
5. Assemble the steel. Some bridges are built on site and some are put together in pieces small enough to ship to the location and then assembled. Using the anchors placed in the concrete, the steel units are put together like tinker toys using nuts and bolts.

http://www.crec.cn/ecrpcec/tabid/1421/InfoID/16049/frtid/1374/Default.aspx

6. Build the decking for the bridge. This is usually concrete, but can also be aluminium and new engineered composite materials which resist corrosion, decreasing bridge replacement costs.
7. Pave the new bridge. This is done with paving machines. The government agency sponsoring the project might also include a repaving of the surrounding roadway as well.

8. Have the ribbon cutting ceremony. Building a bridge is a tremendous accomplishment. After months or possibly years of building this bridge the dust can settle and the public can finally use it.

Source: http://www.ehow.com/how_2045959_build-bridge.html

4. Answer the following questions.

1. What type of bridge should you chose if you want to cross a short span?
2. Is it easy to find a good site for a bridge?
3. What specialists and equipment will you need for it?
4. What aspects should be considered for correct bridge design?
5. What does the first step of building operations include?
6. What are the two ways of assembling a bridge?
7. What decking is usually used for bridges?
8. What type of decking can reduce bridge replacement costs?
9. What equipment is used for paving a bridge?
10. In what approximate period of time will people be able to use the bridge?

5. Say if the sentences concerning Text 3A are true or false.

1. If the ravine you need to cross is shallow and short you need to use a beam or small truss bridge.
2. Engineers should be careful when choosing a place for bridge construction.
3. Crane operators usually make a map of the general area.
4. The map is necessary for not to get lost at the construction site.
5. When designing a bridge engineers pay special attention to people needs and conservation of nature around.
6. To start building a bridge it is necessary the design to be stamped with approval.
7. Where supports are to be placed deep holes must be dug.
8. It is impossible to assemble the units of a bridge beforehand.

9. Engineered composite materials can resist corrosion better than concrete.
10. A bridge is paved with the help of concrete pavers.

6. Give English equivalents of the following words and word combinations.

Анкерный зажим, транспортная нагрузка, издержки на замену деталей, противостоять, асфальтоукладчик, проезжая часть моста, план местности, строительная площадка, геодезист, эксплуатационные расходы, проектирование, ржавление, композиционный материал, размещение, длина, собирать, контроль качества, заполнение, измерительный прибор.

7. Using the vocabulary of Unit 3 match the words to get the correct word combinations.

1. to resist	**a.** metal
2. building materials	**b.** costs
3. to assemble	**c.** a support
4. corrosion of	**d.** tension
5. to make	**e.** bridge
6. to ship	**f.** decking
7. replacement	**g.** inspection
8. to place	**h.** calculations
9. aluminium	**i.** a house
10. to pave	**j.** units

8. Discuss with the group the following topics:

- ✓ What other stages of bridge construction would you point out? Why?
- ✓ What is the most difficult stage in your opinion?

FINAL TASKS

1. Fill in the gaps using the words below:

Replacement cost, corrosion, ship, measuring equipment, ravines, surveyors, to determine, to pour, break ground, map.

1. To measure tensile strength you need to use _____.
2. To fix supports concrete is usually _____ on the site.
3. _____ aid project managers to create the map of the general area.
4. A _____ gives us information about the construction site.
5. _____ can be decreased if we use aluminium decking.
6. Before building a bridge you need to _____ what type of bridge you are going to use.
7. It is possible to _____ only when all formal procedures are settled.
8. Lorries _____ prefabricated units to the construction site.
9. Bridges are used to cross _____.
10. _____ can be caused by bad weather conditions, especially rains.

2. Translate the sentences from Russian into English using the vocabulary list of Unit 3.

1. Количество опор зависит от предполагаемой длины моста.
2. Бетон – один из необходимых материалов при строительстве моста.
3. Транспортная нагрузка в больших городах очень велика.
4. При строительстве моста необходимо учитывать и эксплуатационные расходы.
5. Пеший обход строительной площадки очень важен для составления плана местности.
6. Анкерные зажимы фиксируют арматуру железобетонной конструкции.

7. Проектирование моста это сложный и трудоемкий процесс.
8. Использование современных композиционных материалов в строительстве мостов позволяет снизить издержки на замену деталей.
9. Принимая во внимание размещение будущего моста, выбирается его тип.
10. Чтобы правильно построить мост, нужно следовать руководству по проектированию стальных конструкций.

3. Tell your groupmates about one particular bridge construction process. Discuss it together.

UNIT 4: TUNNEL CONSTRUCRION

1. Before you start.

- Are there many tunnels in your country?
- What is the difference between tunnels and bridges?

2. Read the words and learn them by heart.

1. sewer – водосточная труба
2. vicinity – окрестность
3. hostile – неблагоприятный
4. march – поход
5. harsh terrain – труднопроходимая местность
6. workforce – рабочая сила
7. ventilation shaft – вентиляционная шахта

8. footprint – земля, отчужденная под строительство
9. tide – морской прилив и отлив
10. shipping – судоходство

3. Read and translate the text to learn more about a tunnel and its history.

History of tunnels

A tunnel is an underground or underwater passage that is primarily horizontal. A tunnel may be for foot or vehicle traffic, for rail traffic, or for a canal. Some tunnels are aqueducts to supply water for consumption or for hydroelectric stations or are sewers. A tunnel is relatively long and narrow; the length is often much greater than twice the diameter.

Some 3000 years ago, when our ancestors started discovering techniques of building stable and strong bridges, they also discovered new way of connecting two points of land – tunnels. This discovery was initially used not for transport of goods and people across harsh terrains, but for defensive purposes in the vicinities of important military or royal posts (tunnels below castles). Babylonian and Persian architects were the first who saw the potential of large underground networks of tunnels called kareez. These irrigation tunnels were used to transport water underground trough deserts, enabling life in some of the most hostile lands on planet. In Babylonia, royal families enjoyed fresh water from Euphrates that was

http://samoe-samaya.ru/wp-content/uploads/2012/08/samyi-dlinnyi-avtomobilnyi-tonnel-v-mire.jpg

delivered to them through incredibly built 900m long tunnel that was lined with bricks.

Greeks and Romans took all the knowledge of Babylon and Ancient Egypt, and improved it. With tunnels they were able to transform marches, transport water through mountains, and create pedestrian tunnels trough very harsh terrains. To this day historians wonder how much workforce was involved in the construction tunnel between Naples and Pozzuoli that was created around 36 BC. This incredible structure was 4800 foot long, 25 foot wide and 30 foot high, and it even had ventilation shafts. Less than 100 years later in 41 AD, Romans used around 30,000 workers to build even larger tunnel that was 5.6 km long.

In European Middle Ages, tunnels were almost exclusively used for mining or for military. After public transportation they finally started to grow under the influence of Renaissance and trading with distant lands. Hundreds of smaller tunnels were created between mid-1600s and 19th century, but by then new driving force of tunnel construction came – railroads. This new form of transport soon enabled spreading of tunnels across entire world.

Choice of tunnels vs. bridges

Bridges usually require a larger footprint on each shore than tunnels. In areas with expensive real estate, such as Manhattan and urban Hong Kong, this is a strong factor in tunnels' favor. Boston's Big Dig project replaced elevated roadways with a tunnel system to increase traffic capacity, hide traffic, redecorate.

Other reasons for choosing a tunnel instead of a bridge include avoiding difficulties with tides, weather and shipping during construction, aesthetic reasons (preserving landscape and scenery).

However, there are particular hazards with tunnels, especially from vehicle fires when combustion gases can asphyxiate users, as happened at the Gotthard Road Tunnel in Switzerland in 2001.

4. Answer the following questions.

1. What is a tunnel?
2. Is the length or diameter of a tunnel greater?
3. When were tunnels discovered?
4. What were tunnels initially used for?
5. Who was the first to notice the potential of tunnels?
6. What was the function of irrigation tunnels?
7. What was the function of tunnels in Middle Ages?
8. What form of transport enabled spreading of tunnels across the world?
9. What are the main reasons for choosing tunnels instead of bridges?
10. What hazards are there with tunnels?

5. Say if the sentences concerning Text 4A are true or false.

1. A tunnel is an underground or underwater passage that is primarily vertical.
2. Greeks were the first to see the potential of large underground networks of tunnels.
3. Some tunnels are aqueducts to supply water for consumption or hydroelectric stations.
4. Tunnels were initially used for transport of goods and people.
5. Irrigation tunnels were used to transport water though desserts.
6. Due to tunnels Greeks and Romans could transforms marches and create pedestrian tunnels trough very harsh terrains.
7. In Middle Ages tunnels were used only for mining or military.
8. Railroads contributed to spreading of tunnels across the world.
9. Tunnels usually require a larger footprint on each shore than bridges.
10. Reasons for choosing a tunnel instead of a bridge include avoiding difficulties with tides, weather and shipping during construction, aesthetic reasons.

6. Match the synonyms.

1. supply	**a.** link
2. entire	**b.** impact
3. defensive	**c.** originally
4. vicinity	**d.** unbelievable
5. relatively	**e.** transfer
6. connect	**f.** protective
7. influence	**g.** deliver
8. transport	**h.** comparatively
9. initially	**i.** surroundings
10. incredible	**j.** whole

7. Give English equivalents of the following words and word combinations.

Гидроэлектростанции, пешеходное движение или движение транспортных средств, дорогая недвижимость, железные дороги, поставлять воду, водосточные трубы, для оборонительных целей, перевозка товаров, распространение тоннелей, средние века, рабочая сила, пешеходные тоннели, тоннели через труднопроходимые местности, торговля с далекими краями, ирригационный тоннель.

8. Find information about one ancient tunnel and describe it.

1. Before you start.

- Do you know how a tunnel is built?
- What are the purposes of tunnel construction?

2. Read the words and learn them by heart.

1. tunnel drive – проходка тоннеля
2. drill and blast method – буровзрывной способ
3. blast hole – скважина для взрывных работ
4. bored tunnel – тоннель, сооруженный щитовым способом
5. cutter head – буровая (режущая) головка
6. lining of the tunnel – обделка тоннеля
7. rear end – задняя часть
8. shaft – шахта
9. shallow tunnel – тоннель мелкого заложения
10. trench – котлован
11. tunnel boring machine – бурильная установка для проходки тоннелей
12. cut-and-cover tunnel – тоннель, сооруженный открытым способом
13. shield – щит
14. immersed tube tunnels – подводный тоннель из опускных секций

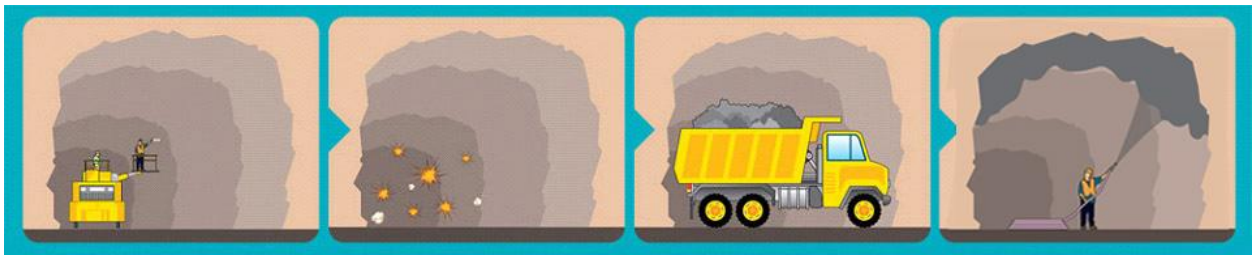
3. Read and translate the text to learn more about the ways of tunnel construction.

Methods of tunnel construction

The method of tunnel construction depends on such factors as the ground conditions, the ground water conditions, the length and diameter of the tunnel drive, the depth of the tunnel, the final use and shape of the tunnel.

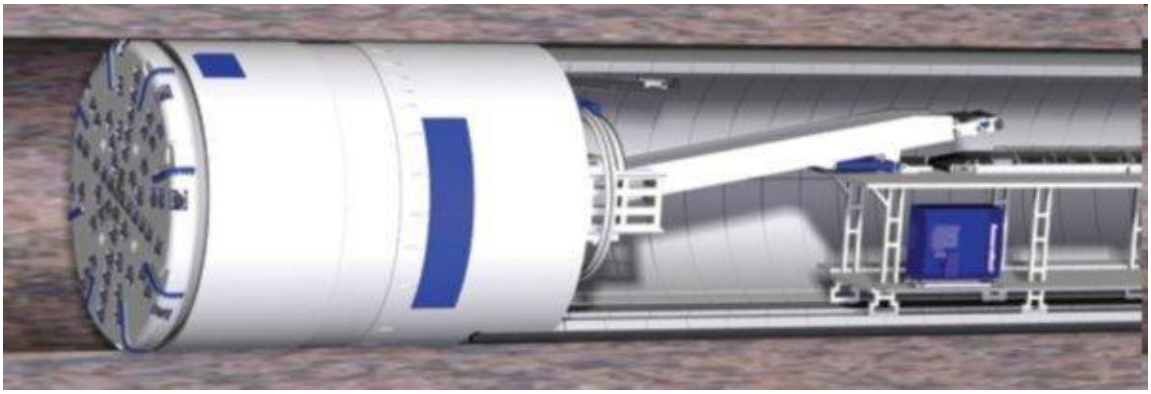
Drill and Blast is one of the most widely used tunneling methods. It is used when the tunnels are in rock and involves the use of explosives. Explosives and

timed detonators are placed in the blast holes. Once blasting is carried out, waste rocks and soils are transported out of the tunnel before further blasting.



http://www.mtr-shatincentrallink.hk/en/construction/construction-methods.html

Bored tunneling by using a Tunnel Boring Machine (TBM) is often used for excavating long tunnels. Tunnel Boring Machine (TBM) is specially designed for constructing tunnels which could perform different functions during tunneling works. With a large rotating steel cutter head at the front of the shield, TBMs can pass through different types of soil, rock or mixture of both. The TBM can excavate and remove excavated materials and at the same time install the reinforced concrete lining of the tunnel as it progresses. The use of TBM requires relatively less works area, thus minimizing the impact to the traffic of nearby area.



http://www.directindustry.com/prod/the-robbins-company/tunnel-boring-machines-double-shield-tbm-59089-385084.html

A shaft is built for delivering the components of the TBM from ground level to the tunnel level for assembly. As the TBM pushes forward, the excavated materials will be transported to the rear end of the TBM for removal through the vertical shaft.

Shallow tunnels are often of the cut-and-cover type, while deep tunnels are excavated often using a tunneling shield. For intermediate levels, both methods are possible.

Cut-and-cover is a simple method of construction for shallow tunnels where a trench is excavated and roofed over to carry the load of what is to be built above the tunnel. Strong supporting beams are necessary to avoid the danger of the tunnel collapsing.

http://www.gautrain.co.za/construction/2008/10/tunnel-excavation-methods/

There are also several approaches to underwater tunnels, the two most common being bored tunnels or immersed tubes.

Immersed tube construction of underwater tunnels will have its elements built separately in a dry dock or shipyard. These elements are then taken to the site where a trench has already been made under the water to receive them. The segments are then immersed in the water and then joined to each other to form the tunnel.

Costs for immersed tube tunnels are considerably lower than those involved in boring a tunnel beneath the water. The speed of construction is also greater, mainly because activities are simultaneously carried out for almost the entire length of the tunnel.

Source: http://www.mtr-shatincentrallink.hk/en/construction/construction-methods.html

4. Answer the following questions.

1. What are the main factors on which methods of tunnel construction depend?
2. What method is applied when tunnel is in rock?
3. What method is preferred for excavating long tunnels?
4. What does drill and blast method use?
5. What is the function of a tunnel boring machine?
6. Where is cut-and-cover method applied?
7. Why are supporting beams necessary in the case of cut-and-cover method?
8. What are the peculiarities of an immersed-tube method?

5. Say if the sentences concerning Text 4B are true or false.

1. The two most common methods of underwater tunneling are cut-and-cover and drill and blast.
2. The elements of immersed tube construction are built in the shipyard.
3. Cut-and-cover method uses explosives in the process of tunneling.
4. Tunnel boring machines can pass through both rock and soil.
5. For intermediate level of depth cut-and-cover method is applicable.
6. The main function of a shaft is delivering the components of the tunnel boring machine from ground level to the tunnel level.
7. Tunneling shield is used for the construction of shallow tunnels.
8. In the case of immersed tube tunnels activities are simultaneously carried out for almost the entire length of the tunnel.

6. Give English equivalents of the following words and word combinations.

Выполнять различные функции, для сборки, тоннель мелкого заложения, скважина для взрывных работ, железобетонная обделка тоннеля, минимизировать воздействие, оба метода, задняя часть бурильной установки, глубокие тоннели, использование взрывчатки, опорные балки, разрушение

тоннеля, подводный тоннель из опускных секций, одновременно, доставка компонентов, котлован, различные типы почвы, относительно, простой метод строительства, извлеченный грунт, избегать опасность, несколько подходов, значительно ниже.

7. Using the vocabulary of Unit 4 and the text match the words to get the correct word combinations.

1. tunnel	**a.** hole
2. ground	**b.** construction
3. rear	**c.** drive
4. nearby	**d.** level
5. blast	**e.** tube
6. reinforced	**f.** shaft
7. immersed	**g.** water
8. intermediate	**h.** area
9. speed of	**i.** end
10. vertical	**j.** concrete

8. Put the steps of cut-and-cover construction in the right order.

a. Services like water pipes and electricity and communication cables are moved away from the tunnel route.
b. The tunnel is opened to traffic.
c. Surveyors mark out the route the tunnel will take and, in particular, the lines the tunnel walls will take.
d. Cranes and excavators arrive on site and build the walls of the tunnel.
e. The floor of the tunnel is built, and anchored into the bedrock below.
f. Excavators remove the dirt and rock from between the walls.

g. The tunnel services are installed including lights, fire protection systems, emergency exits and ventilation fans.
h. The roof beams are installed between the walls to hold them in place.

9. Discuss the methods of tunnel construction and find the examples to each method.

FINAL TASKS

1. Fill in the gaps using the words below:

Cut-and-cover, hard rock, blast, tunnel boring machines, trench, immersed tube tunnel, ground, shafts, underwater, sizeable.

1. Before building a tunnel it is important to examine the conditions and type of _____ and groundwater.
2. Tunnels are dug in types of materials varying from soft clay to _____.
3. A _____ is excavated with ground support as necessary and the tunnel is constructed in it.
4. _____ are the main entrance in and out of the tunnel until the project is completed.
5. The world's oldest _____ tunnel is the Terelek kaya tüneli under Kızıl River in Turkey.
6. Seven _____ will be used to construct the tunnels for SCL project.
7. A 1.3km SCL cross-harbour tunnel across Victoria Harbour will be built by using _____.

8. _____ is a method of tunnel construction where a trench is excavated and roofed over.
9. The first _____ tunnel in soft ground was the Tronquoy tunnel on the St Quentin canal in France in 1803.
10. Before the advent of tunnel boring machines, drill and _____ was the only economical way of excavating long tunnels through hard rock, where digging is not possible.

2. Translate the sentences from Russian into English using the vocabulary list of Unit 4.

1. Тоннели строятся как для пешеходов, так и для транспортных средств.
2. До начала строительства тоннелей важно исследовать грунтовые воды и тип почвы.
3. В 1826 – 1830 в Великобритании на участке Ливерпуль – Манчестер был построен первый в мире железнодорожный тоннель.
4. Тоннель является одним из древнейших изобретений человечества, наряду с мостом.
5. Буровзрывной метод строительства тоннелей использовался еще до появления буровых машин.
6. Существуют также так называемые экологические тоннели, которые прокладываются под автомобильными или железными дорогами, чтобы животные могли безопасно перемещаться.
7. В раннее Средневековье тоннели строились редко и, в основном, в военных целях.
8. Основная часть метро также проложена в виде тоннелей.
9. Самым длинным автомобильным тоннелем в России является Гимринский тоннель (4303 м), расположенный в Дагестане.

10. Тоннели играют важную роль в развитии инфраструктуры современных городов, но в то же время они являются зоной опасности.
11. Тоннели под водой часто строят вместо мостов там, где мосты мешают проходу судов.
12. Обделка является важнейшим элементом тоннеля, которая обеспечивает гидроизоляцию тоннеля.
13. Проходка тоннелей является одним из самых сложных видов строительных работ.

3. Find information about a modern tunnel and describe it.

CHAPTER IV.
ROAD BUILDING MACHINERY

UNIT 1: MACHINERY FOR CLEARING THE SITE

1. Before you start.

- What is the purpose of using machinery in road construction?
- What machinery for road construction do you know?

2. Read the words and learn them by heart.

1. incredible – невероятный
2. advancement – прогресс, совершенствование
3. to direct – направить
4. to ensure – обеспечивать
5. to pave – мостить
6. to require – требовать
7. sequence – последовательность
8. sub grade – грунт земляного полотна
9. embankment – насыпь
10. cutting – выемка
11. rolling – укатка
12. compaction – уплотнение
13. surfacing – покрытие
14. ripper – рыхлительные зубья
15. angle dozer – бульдозер с поворотным отвалом

3. Read and translate the text to learn more about road construction equipment.

Machinery used in road construction

Equipment used in road construction is an important economic and design factor in road location and subsequent design. Road Construction equipment has gone through incredible advancements in recent decades and all of them have been directed towards improving speed, quality, ensure safe work sites and benefit of every worker. The main advantage is that today's machines pave a lot more road in less time, and they do a better job of it. This turn has also helped to cut costs down when the costs are of course factored for inflation.

Type of road construction equipment is used to construct not only highways but bridges, airports and even multi-story buildings. In project different machinery is required for different types of jobs. The sequence of job operations is:

1. Clearing the site.
2. Formation of sub grade (embankment or cutting).
3. Spreading of material.
4. Rolling or compaction.
5. Surfacing.

Machinery used for clearing the site. For site clearance the following machinery can be used: dozer – bull dozer, angle dozer; ripper; tractor; scraper.

Source: http://www.heavyequipment.com/heavy-equipment/road-highways

4. Answer the following questions.

1. What are the main directions of using road construction equipment?
2. What are the main advantages of road construction machinery?
3. What is machinery used to construct besides a road?
4. What is the sequence of job operations?
5. What machinery is used for clearing the site?

5. Say if the sentences concerning Text 1A are true or false.

1. Road construction machinery is unimportant economic factor in road location.
2. Paving using concrete or asphalt has evolved significantly over the years, and today's machines can produce large quantities of paved surfaces in record time.
3. There are 4 job operations in road construction.
4. Due to machinery speed and quality of construction are increased and safe work sites are ensured.
5. Different types of tractors, dozers and scrapers are used on the site.

6. Put the following words in the right column.

Equipment, bridge, use, following, different, subsequent, operation, material, scraper, pave, improve, advantage, ensure, economic, incredible, quality, cost, sub grade, compaction, dozer, scraper, construct, help, direct, cut, job, formation, ripper.

NOUN	VERB	ADJECTIVE	ADVERB

7. Give English equivalents of the following words and word combinations.

Оборудование для дорожного строительства, в последние десятилетия, основное преимущество, обеспечить безопасную работу на строительной площадке, сегодняшние машины, даже многоэтажные здания, различные

типы работ, последовательность выполнения работ, невероятный прогресс, формирование грунта земляного полотна.

8. Using the information from the text give general information about road construction equipment.

1. Before you start.

- What is the function of bulldozers in road construction?
- Do you know what the scraper is?

2. Read the words and learn them by heart.

1. crawler – машина на гусеничном ходу
2. blade – отвал
3. rubble – щебень
4. at the rear – в задней части
5. to loosen – разрыхлить
6. capability – способность
7. substantial – массивный
8. muddy – илистый
9. metal plate – металлическая пластина
10. densely compacted – компактно уплотненный
11. tracked – на гусеничном ходу
12. rough – неровный
13. to sink – тонуть
14. to evolve – развиваться
15. tree dozer – бульдозер-корчеватель, бульдозер-древовал

16. attachment – приспособление
17. hauling – перемещение
18. rubber – резина
19. tires – колеса
20. bowl – ковш
21. apron – заслонка
22. ejector – устройство для разгрузки грунта
23. elevating scraper – скрепер с элеваторной загрузкой
24. elevator – подъемник
25. crossbars – поперечные перекладины
26. pull-type scraper – прицепной скрепер

3. Read and translate the text to learn more about dozers and scrapers used for clearing the site.

Dozers and scrapers

A bulldozer is a crawler equipped with a substantial metal plate (known as a blade) used to push large quantities of soil, sand, rubble, and other materials during construction work and typically equipped at the rear with a ripper to loosen densely compacted materials.

http://www.heavyequipment.com/heavy-equipment/road-highways

Bulldozers can be found on a wide range of sites, including road construction site. Most often bulldozers are large and powerful tracked heavy equipment. The tracks give them excellent ground holding capability and mobility through very rough terrain. Wide tracks help distribute the bulldozer's weight over a large area, thus preventing it from sinking in sandy or muddy ground. The bulldozer's primary tools are the blade and the ripper.

Bulldozers have been further modified over time to evolve into new machines which can work in ways that the original bulldozer cannot.

In an angledozer the blade can be pushed forward at one end to make it easier to push material away to the side.

Another modification is a tree dozer which is an attachment for a tractor or bulldozer consisting of metal bars and a cutting blade, used to clear bushes and small trees.

http://www.heavyequipment.com/heavy-equipment/road-highways

Scrapers are large motorized machines used for digging, hauling and leveling out materials in a variety of construction jobs. Running on massive rubber tires, motorized scrapers quickly move large quantities of earth around a construction site.

Motor scraper

A standard motor scraper is comprised of a bowl, an apron to drop down over a load of material in order to retain it, and an ejector to push out the load hydraulically. Due to its hydraulic system, these components can all function independently.

http://www.heavyequipment.com/heavy-equipment/road-highways

Elevating

Instead of an apron, these scrapers include a hydraulically- or electrically-driven elevator made of two chains equipped with a series of crossbars. The elevator's purpose is to aid in loading material into the scraper's elevating bowl.

http://www.heavyequipment.com/heavy-equipment/road-

Pull type

Pull scrapers are able to move in soft, wet soils, as well as sand. Unlike the motor scraper, pull scrapers are not motorized and must therefore be pulled by another vehicle.

Source: http://www.heavyequipment.com/heavy-equipment/road-highways

4. Answer the following questions.

1. What is a bulldozer?
2. What is the function of wide tracks?
3. What are the primary tools of a bulldozer?
4. What is the angledozer?
5. Where is a tree dozer used?
6. What is a scraper?
7. What does motor scraper consist of?
8. What is the difference between motor and elevating scraper?
9. Where are pull scrapers used?
10. Where can bulldozers be found?

5. Say if the sentences concerning Text 1B are true or false.

1. Bulldozers can be motor, elevating, pull type.
2. A bulldozer is equipped with a blade and chains.
3. Bulldozers are large and powerful tracked heavy equipment.
4. An angle dozer is used to clear bushes and small trees.
5. Wide tracks prevent a bulldozer from sinking in sandy or muddy ground.
6. Scrapers are used for digging, hauling and leveling out materials.
7. Motorized scrapers quickly move large quantities of trees and rubber around a construction site.
8. Motor scraper consists of a bowl, apron and ejector.

9. Pull type scrapers have elevators.
10. Elevating scrapers can move in soft soils and sand.

6. Circle the odd word.

1.	ripper	blade	rubble	track
2.	tree dozer	scraper	angle dozer	terrain
3.	soil	sand	quantity	rubble
4.	bowl	site	apron	ejector
5.	weight	pull-type	elevating	motor

7. Give English equivalents of the following words and word combinations.

Распределять вес бульдозера, основные приспособления, металлические балки, прицеп трактора или бульдозера, большие количества земли, гидравлическая система, неровный грунт, разрыхлить компактно уплотненные материалы, тяжелая техника, ряд поперечных перекладин.

8. Are there any other types of bulldozers and scrapers? (Use the Internet for additional information)

1. Before you start.

- What is the purpose of using tractors in road construction?
- Where are tractors used apart from construction?

2. Read the words and learn them by heart.

1. to haul – перемещать

2. load carrying platform – грузовая, несущая платформа

3. wheeled-type tractor – колесный трактор

4. track-laying tractor – гусеничный трактор

5. power unit –двигатель, силовая установка

6. auxiliary device – вспомогательное устройство

7. fan – вентилятор

8. starter device – пусковой аппарат

9. fuel tank – бак горючего

10. pump – насос

11. transmission – трансмиссия, коробка передач

12. clutch – сцепление

13. speed control unit – регулятор скорости

14. universal joint – карданный вал

15. gearing mechanism – коробка передач

16. shaft – вал

17. steering mechanism – рулевой механизм

18. final drive – бортовая передача

19. axles – оси

20. steering unit – рулевой механизм

21. tractor frame – рама трактора

22. internal combustion engine – двигатель внутреннего сгорания

23. wire rope – металлический кабель

3. Read and translate the text to learn more about tractors used for clearing the site.

Tractors

Nowadays tractors are widely used in agriculture and industry. In different branches of industry tractors are used as road transport tractors hauling heavy loads. Tractors may be agricultural, special and road transport tractors.

Road transport tractors are equipped with a load carrying platform. Special tractors are usually equipped with auxiliary devices. Tractors may belong either to wheeled-type tractors or to track-laying type tractors.

The construction of a tractor includes the following main units:

1. Power unit which includes the engine with all auxiliary devices – a radiator, a fan, a starter device, a fuel tank, a pump, etc.

2. Transmission which consists of a clutch, a speed control unit, universal joints, gearing mechanisms, shafts, steering mechanisms, a final drive, axles.

3. Driver which includes driving, supporting and controlling mechanisms.

4. A steering unit.

5. The tractor frame.

6. Working and auxiliary equipment.

http://www.heavyequipment.com/heavy-equipment/road-highways

Tractor engines have internal combustion engines as the source of power. Tractor engines requirements differ considerably from the requirements of the automotive engines. Automotive engines are generally unsuitable for tractors.

A cable tractor is widely used in clearing the site. It is a machine used for pulling cables which either can be an electrical cable or wire ropes.

Source: http://www.heavyequipment.com/heavy-equipment/road-highways

4. Answer the following questions.

1. Where are tractors widely used?
2. What is the function of tractors?
3. How many classes of tractors are distinguished? What are they?
4. What are road transport tractors equipped with?

5. What are special tractors usually equipped with?
6. What type may tractors belong to?
7. What are the main units of a tractor?
8. Are automotive engines suitable for tractors?

5. Say if the sentences concerning Text 1C are true or false.

1. Power unit which includes a clutch, speed control unit, universal joints, gearing mechanisms, shafts, steering mechanisms, a final drive, axles.
2. Tractors may be either wheeled-type or track-laying type.
3. Tractor engines have automotive engines.
4. Tractor engines have a frame as the source of power.
5. Tractors may be agricultural, special and road transport tractors.
6. Road transport tractors are equipped with a load carrying platform.
7. A fan and fuel tank are elements of a power unit.
8. A cable tractor is used for pulling cables.

6. Match the words in the left column with the definitions on the right.

1. track-laying tractor	**a.** an endless metal belt on which tracked vehicles move over the ground
2. equip	**b.** available to provide extra help, power, etc.
3. final drive	**c.** a device that starts an internal-combustion engine without a need for cranking by hand
4. wheel	**d.** one of the round parts underneath a car, wagon, etc., that rolls and allows something to move
5. auxiliary	**e.** the means for transmitting power from the propeller shaft to the rear axle in an automotive vehicle
6. engine	**f.** a machine that converts energy into mechanical force
7. starter device	**g.** to provide with necessary materials or supplies

7. Give English equivalents of the following words and word combinations.

Двигатель внутреннего сгорания, рабочее и вспомогательное оборудование, электрический кабель, металлический кабель, сельскохозяйственный тракторы, тяжелый груз, рулевой механизм, вспомогательное устройство, коробка передач, пусковой аппарат.

8. Describe the main types and components of tractor.

FINAL TASKS

1. Fill in the gaps using the words from the box:

Power source, subgrade, bulldozer, heavy equipment, earthwork operations, scraper, four-wheel, cable tractor, tree dozer, tractor.

1. Some historians consider that an American named Benjamin Holt invented the first _____ in 1904, and originally called it a “caterpillar” or a crawler tractor.
2. _____ is a machine for moving earth over short distances (up to about two miles) over relatively smooth areas.
3. A _____ is an engineering vehicle specifically designed to deliver a high tractive effort at slow speeds, for the purposes of hauling a trailer or machinery used in agriculture or construction.
4. _____ drive tractors began to appear in the 1960s.
5. _____ refers to heavy-duty vehicles, specially designed for executing construction tasks, most frequently ones involving _____.

6. A machine consists of a _____ and a power transmission system, which provides controlled use of the power.
7. _____ is the native material underneath a constructed road, pavement or railway track.
8. _____ is used to clear bushes and small trees.
9. A _____ is used for pulling cables.

2. Translate the sentences from Russian into English using the vocabulary list of Unit 1.

1. Бульдозер – это гусеничный или колесный трактор, оснащенный отвалом.
2. Тракторы делятся на гусеничные и колесные.
3. Скрепер состоит из ковша, заслонки и устройства для разгрузки грунта.
4. Часто прицепные скреперы используются вместе с базовыми гусеничными тракторами.
5. Источником силы является двигатель внутреннего сгорания.
6. Оборудование для дорожного строительства обеспечивает высокую скорость и качество строительства.
7. Бульдозеры могут оснащаться вспомогательным оборудованием, к примеру, рыхлительными зубьями, которые повышают эффективность работы.
8. Скреперы перемещают огромное количество земли.
9. Гусеничные бульдозеры могут перемещаться по неровным поверхностям и не тонут в песке.
10. Дорожный трактор оснащен двигателем, трансмиссией, коровкой передач, рулевым механизмом, рамой, баком горючего и т.д.

3. Imagine that you are going to clear the site for road construction. Describe the place of the future road, the main steps and say what machine you will use for each step.

UNIT 2: MACHINERY FOR SUBGRADE FORMATION

1. Before you start.

- Have you ever seen graders or shovels?
- What is their function?

2. Read the words and learn them by heart.

1. flat – плоский
2. dirt roads – грунтовые дороги
3. base course – слой основания
4. fragmented rock – обломочная порода
5. mineral extraction – добыча минеральных полезных ископаемых
6. electric mining shovel – карьерный экскаватор
7. bucket – ковш
8. revolving deck – поворотная платформа
9. power plant – двигатель
10. counterweight – центровочный груз
11. boom – стрела
12. to crowd – проталкиваться
13. dipper – ковш
14. bank – насыпь
15. to hoist – поднимать

16. to retract – возвращать
17. swinging – поворот, вращение
18. dump height – высота подъема
19. haul unit – тяговая единица
20. dumping – выгрузка
21. dipper door – откидное днище ковша
22. tuck position – группировка
23. dragline excavator – канатно-скребковый экскаватор, драглайн
24. surface mining – открытый карьер
25. pile driving rig – оборудование для забивки свай
26. specimen – образец
27. to suspend – вешать, подвешивать
28. hoist rope – подъемный канат
29. coupler – соединительный прибор
30. drag rope – тяговой канат

3. Read and translate the text to learn more about the equipment used for formation of a subgrade.

Grader, shovel, dragline

To form the subgrade earth digging equipment is also used such as drag line, shovel, etc. For preparing the sub grade the following machinery is used:

- Tractor
- Dozer
- Grader
- Shovel
- Drag line

http://www.heavyequipment.com/heavy-equipment/road-highways

- Trucks
- Rollers, etc.

A *grader*, also commonly referred to as a road grader, a blade or a motor grader, is a construction machine with a long blade used to create a flat surface during the grading process. Graders are commonly used in the construction and maintenance of dirt roads and gravel roads. In the construction of paved roads they are used to prepare the base course to create a wide flat surface for the asphalt to be placed on.

A *shovel* is used for digging and loading earth or fragmented rock and for mineral extraction.

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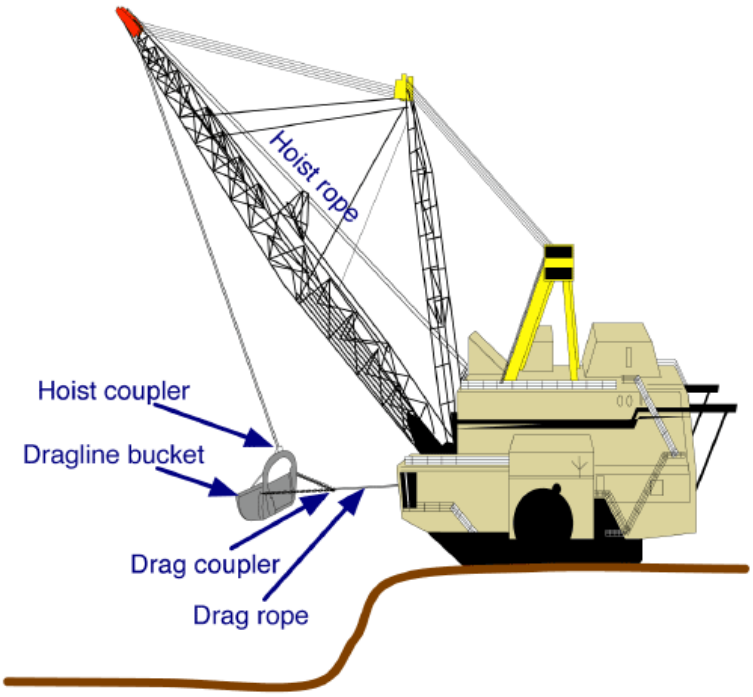
An electric mining shovel is a bucket-equipped machine consisting of a revolving deck with a power plant, tracks, a counterweight, and a front attachment, such as a boom. The digging phase consists of crowding the dipper into the bank, hoisting the dipper to fill it, then, retracting the full dipper from the bank. The swinging phase occurs once the dipper is clear of the bank both vertically and horizontally. The operator controls the dipper through a planned swing path and dump height until it is suitably positioned over the haul unit. Dumping involves opening the dipper door to dump the load, while maintaining the correct dump height. Returning is when the dipper swings back to the bank, and involves lowering the dipper into the tuck position to close the dipper door.

http://www.heavyequipment.com/heavy-equipment/road-highways

The hydraulic mining shovel has been widely used for coal and rock loading since the 1970s.

A *dragline* excavator is a piece of equipment used in civil engineering and surface mining. In civil engineering the smaller types are used as pile driving rigs. Draglines are one the largest mobile equipment ever built on land, and weigh nearly 2000 metric tons, though specimens weighing up to 13,000 metric tons have also been constructed.

A dragline bucket system consists of a large bucket which is suspended from a boom with wire ropes. The bucket is maneuvered by means of a number of ropes and chains. The hoist rope, powered by large diesel or electric motors, supports the bucket and hoist coupler assembly from the boom. The drag rope is used to draw the bucket assembly horizontally. By skillful maneuver of the hoist and the drag ropes the bucket is controlled for various operations.



http://www.heavyequipment.com/heavy-equipment/road-highways

Source: http://www.heavyequipment.com/heavy-equipment/road-highways

4. Answer the following questions.

1. What machinery is used for preparing the sub grade?
2. Where are graders used?
3. What is the function of a grader in the construction of paved roads?

4. What is the function of a shovel?
5. What dosed an electric mining shovel consist of?
6. What does the digging phase consist of?
7. Where is a dragline used?
8. What does a dragline bucket system consist of?
9. Where has a hydraulic mining shovel been used?
10. What is the function of a drag rope?

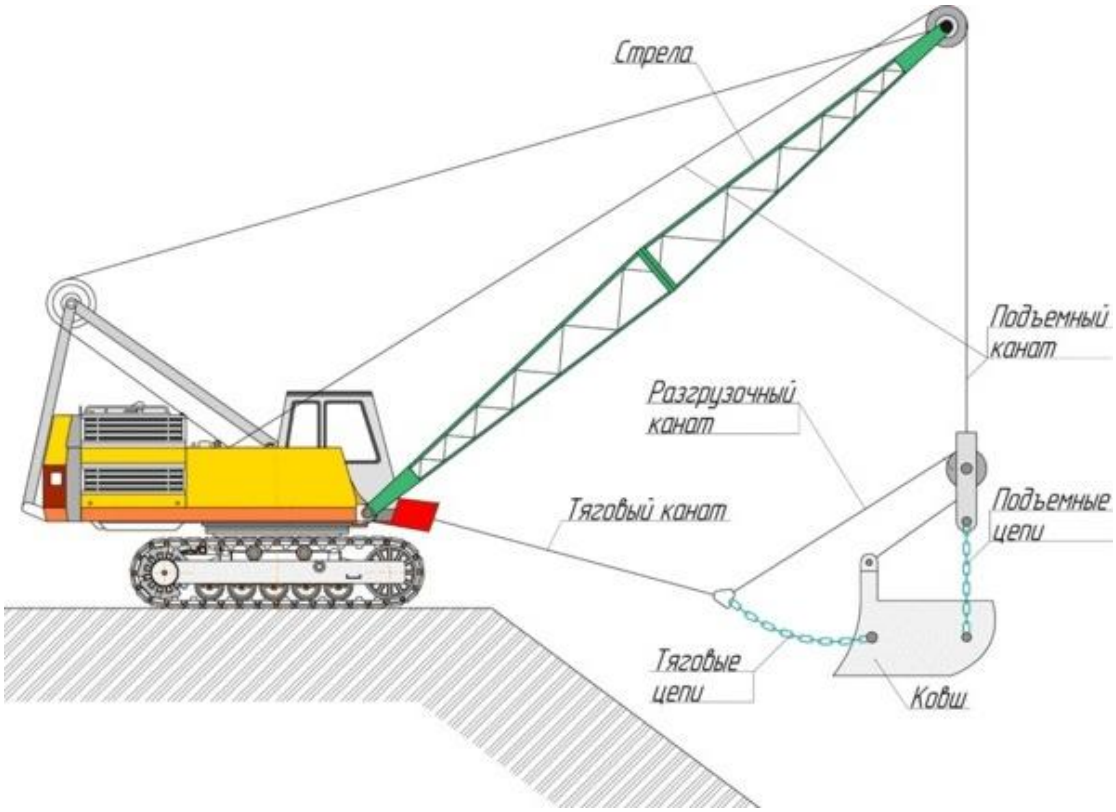
5. Say if the sentences concerning Text 2A are true or false.

1. A grader is used for digging and loading earth or fragmented rock and for mineral extraction.
2. In road construction graders are used to prepare the subbase course.
3. Shovel is a bucket-equipped machine.
4. Boom is the element of a grader.
5. Electric mining shovel performs digging, swinging, dumping and returning phases.
6. A hydraulic mining shovel is used for coal and rock loading.
7. Dragline is also used in surface mining.
8. Draglines are one of the largest mobile equipments.
9. A dragline bucket is maneuvered by ropes and pile driving rigs.
10. The drag rope is used to draw the bucket assembly vertically.

6. Give English equivalents of the following words and word combinations.

В течение процесса выравнивания, грунтовые дороги, загрузка земли, оснащенная ковшом машина, поворотная платформа, фаза поворота, траектория поворота, выгрузить груз, погрузка угля и щебня, оборудование для забивки свай, блестящий (искусный) маневр.

7. Find the English equivalents for the following elements of a dragline.



8. Describe one of the following machines:

- ✓ *grader*
- ✓ *shovel*
- ✓ *dragline*

1. Before you start.

- What do you know about rollers and trucks?
- What is their function?

2. Read the words and learn them by heart.

1. dump truck – самосвал
2. open-box bed – открытый кузов

3. hydraulic piston – гидравлический поршень
4. hydraulic line – гидролиния
5. off-highway dump truck – внедорожный самосвал
6. rigid frame – жесткая рама
7. articulating frame – шарнирно-сочлененная рама
8. articulated hauler – сочлененный самосвал
9. all-wheel drive – полноприводный
10. low center of gravity – низкий цент тяжести
11. water truck – автоцистерна для орошения дорог
12. loader – погрузчик
13. log – бревно
14. track loader – гусеничный погрузчик
15. company' fleets – парк транспортных средств, принадлежащих компании
16. vibratory roller compactor – вибрационный дорожный каток
17. to compact (syn. compress) – уплотнять
18. to roll – трамбовать катком
19. density – плотность
20. pneumatic tired roller –каток на пневматических шинах, пневмокаток
21. granular base materials – сыпучие материалы
22. bridging effect – перекрывающие действие

3. Read and translate the text to learn more about trucks and rollers used for formation of a subgrade.

Trucks, loaders, rollers

A *dump truck* (UK dumper truck) is a truck used for transporting material (such as sand, gravel or dirt) for construction. A typical dump truck is equipped with an open-box bed, which has hydraulic pistons to lift the front, allowing the

material in the bed to be dumped on the ground behind the truck at the site of delivery.

http://www.heavyequipment.com/heavy-equipment/road-highways

A *transfer dump* is a standard dump truck which pulls a separate trailer which can also be loaded with gravel, sand, asphalt, etc. The second aggregate container, on the trailer, is powered by either an electric, pneumatic motor or hydraulic line. Transfer dumps are typically seen in the western United States because of the peculiar weight restrictions on western highways.

Off-highway dump trucks are heavy construction equipment. Bigger off-highway dump trucks are used strictly off-road for mining. There are two primary forms: rigid frame and articulating frame.

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An articulated dumper is an all-wheel drive, off-road dump truck. Together with all-wheel drive and low center of gravity, it is highly adaptable to rough terrain. Major manufacturers include Volvo CE, Terex, John Deere and Caterpillar.

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Water trucks are used for compaction and dust control.

A *loader* is a machine often used in construction, primarily used to load material (dirt, snow, gravel, logs, etc.) into or onto another type of machine, such as a dump truck.

http://www.heavyequipment.com/heavy-equipment/road-highways

A *tracked loader* is an engineering vehicle consisting of a tracked chassis with a loader for digging and loading material. The

ability of a track loader to perform almost every task on a site is why it remains a part of many companies' fleets.

Vibratory roller is used to compact soil, gravel, concrete, or asphalt in the construction of roads and foundations. It is widely used to compress the surface being rolled to ensure a smooth, even surface. Vibratory rollers are widely used for compacting asphalt pavements because they achieve the required densities faster.

Pneumatic tire rollers are used on small to medium size compaction jobs, primarily on granular base materials. One advantage that pneumatic compactors have is that there is little bridging effect between the tires. Therefore, they seek out soft spots which may exist in the fill. Another advantage is that pneumatic rollers can be used on both soil and asphalt so a road building contractor can save by having one compactor for both stages of construction – base and asphalt.

http://www.heavyequipment.com/heavy-equipment/road-highways

Source: http://www.heavyequipment.com/heavy-equipment/road-highways

4. Answer the following questions.

1. What is dump truck?
2. What is the difference between a usual and transfer dump trucks?
3. Where are transfer dump trucks usually met?
4. What are off-highway dump trucks used for?
5. What are the characteristics of an articulated dumper?
6. What is the function of a loader?
7. Why is a tracked loader used by companies?

8. Why are vibratory rollers used for compacting asphalt pavements?
9. Where are pneumatic tire rollers used?
10. What are the advantages of pneumatic tire rollers?

5. Say if the sentences concerning Text 2B are true or false.

1. A loader is equipped with an open-box bed, which has hydraulic pistons to lift the front, allowing the material in the bed to be dumped on the ground behind the truck at the site of delivery.
2. A pneumatic tire roller is used for transporting material for construction.
3. Transfer dumps are seen in the eastern United States because of the peculiar weight restrictions on highways.
4. Bigger off-highway dump trucks are used strictly off-road for mining.
5. Water trucks are used only for compaction.
6. A tracked loader is used for digging and loading material.
7. Vibratory rollers are used on small to medium size compaction jobs, primarily on granular base materials.
8. Pneumatic rollers can be used on both soil and asphalt.
9. A tracked loader can perform almost every task on the site.
10. An articulated dumper is all-wheel drive truck.

6. Find in the text synonyms to the following words and word-combinations.

Soil, uneven, search out, places, plus, first of all, phases, compact, reach, needed, producer, contain, main, to raise.

7. Give English equivalents of the following words and word combinations.

Полноприводный внедорожный самосвал, неровная почва (грунт), ограничения по весу, гусеничные шасси, выполнять практически любое задание, основные производители, для транспортировки материала,

выгружать на землю, контроль запыленности, ровная поверхность, экономить, обе стадии строительства, парк принадлежащих компании транспортных средств, загружать материал, для уплотнения асфальтного дорожного покрытия.

8. Are there any other types of trucks, loader and rollers? (Use the Internet for additional information)

FINAL TASKS

1. Fill in the gaps using the words from the box:

Short distances, vehicle, deliver, to produce, an articulated dumper, terrain, digging, unchanged, weight, horizontal ground.

1. A roller is an engineering _____ used to compact soil, gravel, concrete, or asphalt in the construction of roads and foundations.
2. Road rollers use the _____ of the vehicle to compress the surface being rolled or use mechanical advantage.
3. _____ a very large heavy duty type of dump truck used to transport loads over rough _____.
4. A loader is not the most efficient machine for _____ as it cannot dig very deep below the level of its wheels.
5. If the truck is not parked on relatively _____, the sudden change of weight and balance due to lifting of the skip (откидывающийся кузов) and dumping of the material can cause the truck to slide.

6. Draglines, unlike most equipment used in earth-moving, have remained relatively _____ in design and control systems for almost 100 years.
7. In some countries graders are used _____ drainage ditches with shallow V-shaped cross-sections on either side of highways.
8. In construction areas loaders are also used to transport building materials – such as bricks, pipe, metal bars, and digging tools – over _____.
9. Some water trucks _____ water to construction sites to be used for soil compaction or to cities that use water trucks for street washing or sewer flushing.

2. Translate the sentences from Russian into English using the vocabulary list of Unit 2.

1. Грейдер используется для создания ровной поверхности.
2. Карьерный экскаватор оснащен ковшом, стрелой и поворотной платформой.
3. Для подготовки грунта земляного полотна используются тракторы, бульдозеры, грейдеры, драглайны, грузовики, катки и т.д.
4. Карьерные экскаваторы подразделяются на электрические и гидравлические.
5. Драглайн является одним из самых мобильных оборудований.
6. Ковш подвешен на стрелу при помощи металлического кабеля.
7. Самосвал – это грузовик, используемый для транспортировки материала на строительную площадку.
8. Самосвал с шарнирно-сочлененной рамой является полноприводным и легко адаптируется к неровному грунту.
9. Автоцистерна для орошения дорог часто применяется в дорожном строительстве.

10. Гусеничный погрузчик погрузил древесину, щебень и песок на самосвал.
11. Каток утрамбовывает гравий и песок при строительстве дорог и обеспечивает ровную поверхность.
12. Подрядчик может сэкономить, т.к. пневмоколесный каток используется в нескольких стадиях строительства.

3. Imagine that you are going to buy equipment for the formation of the subgrade. Compare foreign and Russian manufacturers of this equipment and say which of them is more advantageous. Make a list of advantages and disadvantages.

UNIT 3: MACHINERY FOR ASPHALT PAVING

1. Before you start.

- Do you remember the stages of road construction? What equipment is used at the beginning of the process?
- What companies produce road building machines?

2. Read the words and learn them by heart.

1. crusher – дробильная установка, дробилка
2. rock – скальная порода, скальный грунт
3. gravel – гравий
4. rock dust – каменная пыль
5. waste materials – вынутый грунт, отходы
6. to dispose of – избавляться, удалять (отходы)
7. to recycle – перерабатывать

8. solid – твердый
9. inch – дюйм
10. to deposit – наносить
11. to haul – передвигать, транспортировать
12. bitumen boiler – битумный котел
13. to melt – таять
14. compound – химическое соединение
15. material transfer unit – асфальтоперегружатель, трейлер для доставки и хранения асфальта
16. paver – асфальто/бетоноукладчик
17. compaction – уплотнение, прессование
18. hopper – бункер, дозаторный бак
19. auger – шенк
20. stockpile – штабель, порция
21. screed – трамбующий брус, ровняльная доска
22. width – ширина
23. free floating screen – выглаживающая плита
24. smooth – гладкий, ровный
25. consistent – систематический
26. mat – *здесь:* слой
27. mineral aggregate – каменный остов, минеральный заполнитель

3. Read the text, translate it and compare your ideas in ex.1 with the facts.

Machinery for asphalt paving

Asphalt (specifically, asphalt concrete) has been widely used since the 1920s. The viscous nature of the bitumen binder allows asphalt concrete to sustain significant plastic deformation, although fatigue from repeated loading over time is the most common failure mechanism.

As asphalt consists of mineral aggregate bound together with bitumen, and then laid in layers, and compacted for its manufacturing and spreading following equipment is required: crushers, trucks, aggregate distributors. We will pay special attention to crushers.

A crusher is a machine designed to reduce large rocks into smaller rocks, gravel, or rock dust.

http://dstmarket.ru/rabota_c_chebnem

Crushers may be used to reduce the size, or change the form, of waste materials so they can be more easily disposed of or recycled, or to reduce the size of a solid mix of raw materials, so that pieces of different composition can be differentiated.

Each crusher is designed to work with a certain maximum size of raw material, and often delivers its output to a screening machine which sorts and directs the product for further processing.

Some crushers are mobile and can crush rocks as large as 60 inches. In a mobile road operation, these crushed rocks are directly combined with concrete and asphalt which are then deposited on to a road surface. This removes the need for hauling over-sized material to a stationary crusher and then back to the road surface.

For bituminous surfacing following equipment is required: bitumen boiler, bitumen sprayer, pavers, rollers and others. We will describe some of them.

http://www.indiamart.com/gemini-engineering-industry/customised-fabrication-services.html

Bitumen boilers are melting down a bituminous compound into a liquid state, prior to application. The boilers in which you place the bitumen are heated to very high temperatures that should never exceed above 260ºc.

Paver is a piece of construction equipment used to lay asphalt on roads, bridges, parking lots and other such places. It lays the asphalt flat and provides minor compaction before it is compacted by a roller.

The asphalt is added from a dump truck or material transfer unit into the paver's hopper. The conveyor then carries the asphalt from the hopper to the auger. The auger places a stockpile of material in front of the screed. The screed takes the stockpile of material and spreads it over the width of the road and provides initial compaction.

The paver should provide a smooth uniform surface behind the screed. In order to provide a smooth surface a free floating screen is used.

To conform to the elevation changes for the final grade of the road modern pavers use automatic screed controls, which generally control the screed's angle of attack from information gathered from a grade sensor.

In order to provide a smooth surface the paver should proceed at a constant speed and have a consistent stockpile of material in front of the screed. Increase in material stockpile or paver speed will cause the screed to rise resulting in more asphalt being placed therefore a thicker mat of asphalt and an uneven final surface. Alternatively a decrease in material or a drop in speed will cause the screed to fall and the mat to be thinner.

The need for constant speed and material supply is one of the reasons for using a material transfer unit in combination with a paver. A material transfer unit allows for constant material feed to the paver without contact, providing a better end surface. When a dump truck is used to fill the hopper of the paver, it can make contact with the paver or cause it to change speed and affect the screed height.

Source: http://en.wikipedia.org/wiki/

1. Answer the following questions.

1. When did asphalt become especially popular for road paving?
2. What are its advantages?

3. What does asphalt consist of?
4. What is a crusher?
5. What is its function?
6. Is crusher only stationary equipment?
7. What do bitumen boilers do?
8. What temperature shouldn’t be exceeded in bitumen boiler?
9. What is a paver?
10. What parts of a paver do you know?

5. Say if the sentences concerning Text 3A are true or false.

1. Asphalt concrete can sustain tensile stress.
2. Asphalt concrete has no disadvantages.
3. Crusher is used to reduce size of aggregates.
4. Crushers are universal: it is possible to use any type of crusher in any situation.
5. For road building stationary crushers are more convenient.
6. Bitumen boilers make bituminous mixture solid.
7. Asphalt from the dump truck is put into the hopper.
8. Smooth surface is provided by the screed.
9. For the surface to be smooth and flat a paver should work at different speeds.
10. Constant speed and material supply is one of the reasons for using a material transfer unit in combination with a paver.

6. Using vocabulary in ex.2 give Russian equivalents to the following words.

Отходы, избавляться, передвигать, штабель, химическое соединение, таять, дюйм, наносить, слой, каменный остов, ширина, скальная порода, передвигать, уплотнение, систематический, ровный, асфальтоперегружатель.

7. Using the vocabulary of Unit 3 match the words with the pictures.

Hopper, dump truck, roller, paver, auger, screed, free floating screen, material transfer unit, gravel.

1

http://www.trucksale.ru/catalog

2

*http://roadflot.ru/asphaltstacker_caterpillar_voegele_*

3

http://td-stt.ru/news/106/

4

http://dom.ngs.ru/do/advert/?id=3014228

5

http://ind-techno.om.ua/ru/cat/56/1290/169642

6

http:/dstmarket.ru/rabotacchebnem

7

http://weber.5koleso.ru/content/caterpillar-mashiny-dlya-horoshih-dorog/?id=3014228

8

http://supersadovod.ru/landshaftnyiy-dizayn/yaponskiy-sad/materialyi-yaponskogo-sada/priobretenie-graviya/

9

http://www.indiamart.com/messrs-caterpillar/products.html

8. Discuss with the group the following topic:

- ✓ What road building equipment is better Russian or foreign? Why?

FINAL TASKS

1. Fill in the gaps using the words given below:

Recycle, melting, consistent, crusher, gravel, paver, roller, inches, dump truck, mat.

1. You need a _____ to break large pieces of rock into smaller ones.
2. For your production to be environmentally friendly it is necessary to _____ all waste materials.
3. _____ is smaller than crushed stone (щебень).
4. The thickness of the layer is measured in _____.
5. Under some particular temperature bitumen starts _____.
6. _____ is used for asphalt compaction.
7. _____ carries asphalt to the construction site.
8. When paving asphalt provision must be _____.
9. Asphalt is the upper _____ of a road.
10. To obtain flat and smooth surface _____ is used.

2. Translate the sentences from Russian into English using the vocabulary list of Unit 3.

1. Самосвалы используются, чтобы транспортировать асфальт на строительную площадку.
2. При строительстве дорог дробилка нужна для измельчения скалистой породы для ее дальнейшего использования в изготовлении асфальта.

3. В битумном котле битум тает и его можно использовать для изготовления асфальта.
4. Асфальтоперегружатель позволяет асфальтоукладчику работать без снижения скорости.
5. Вынутые материалы должны быть переработаны или вывезены с площадки.
6. Уплотнение асфальта осуществляется трамбующим брусом.
7. Выглаживающая плита делает покрытие ровным по всей ширине дороги.
8. Бетон – это соединение, которое состоит из цемента, воды, песка и минерального наполнителя.
9. Систематический контроль выполнения работ способствует улучшению их качества.
10. Толщина слоя асфальтного покрытия может измеряться в дюймах.

3. Discuss with your groupmates modern companies producing road building machinery. Make a presentation about one of the companies and create a new commercial for it.

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