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Учебно-методическое пособие
по дисциплине
«Иностранный язык в профессиональной деятельности»
для студентов 3 курса очной и заочной формы обучения специальности 08.02.05 Строительство и эксплуатация автомобильных дорог и аэродромов

Ставрополь, 2021

РАССМОТРЕНО
на заседании цикловой комиссии
общих гуманитарных и
социальных дисциплин
Протокол № 1
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Председатель цикловой комиссии
_____ /Л.В.Печалова/

РЕКОМЕНДОВАНО
к применению решением
Методического совета
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Учебно-методическое пособие по дисциплине «Иностранный язык». ГБПОУ «Ставропольский строительный техникум», 2021г. – 40 с.

Методическое пособие направлено на формирование лексических навыков профессиональной тематики, развитие навыков чтения и перевода текстов строительной тематики, умение практически использовать приобретённые знания в устной и письменной речи.

В пособие включены тексты по профессиональной направленности студентов. В этом раздел собраны тексты позволяющие расширить свои знания по данной тематике, закрепить выполнением заданий

Изучение лексического материала и текстов строительной тематики обеспечит эффективное достижение общеобразовательных и развивающих целей и создаст большие возможности для дальнейшего поддержания мотивации обучающихся.

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Пояснительная записка

Настоящее пособие предназначено для обучающихся строительных техникумов и написано в соответствии с требованиями программы по английскому языку для учащихся средних специальных учебных заведений. Настоящее учебно-методическое пособие предназначено для студентов 3 курса специальности 08.02.05 Строительство и эксплуатация автомобильных дорог и аэродромов

Цель пособия - подготовить обучающихся к чтению и переводу со словарем английского языка на русской оригинальной литературы средней трудности по строительству и архитектуре.

В текстах содержится лексика, которая позволит расширить знания по данной теме. К текстам даются упражнения, цель которых - закрепление лексического и грамматического материала. Система лексических упражнений предусматривает: 1) нахождение в текстах ответов на вопросы; 2) дополнение предложений по смыслу; 3)перевод словосочетаний; 4)перевод текстов со словарем.

Данное пособие рассчитано на тех, кто уже имеет базовую начальную подготовку по английскому языку: знает фонологическую систему, знаком с основными грамматическими категориями, владеет определенным объемом лексических единиц и речевыми моделями, которые позволяют вести общение в ситуациях социально-бытовой сферы.

Основной целью пособия является развитие речевой деятельности в профессиональной сфере общения речевые модели, формы, языковые средства дают возможность овладеть способами реализации таких интенций, как обоснование, аргументация, доказательство, выражение собственного мнения, описание и т.п.

В основу пособия положен принцип коммуникативно-деятельностного обучения, поэтому в центре внимания находится материал, направленный на формирование коммуникативной компетенции в сфере профессионального общения. Система упражнений способствует активному усвоению лексики грамматического материала. Это пособие можно использовать на практических занятиях по иностранному языку.

Упражнения для данного учебно-методического пособия взяты из различных источников и адаптированы для студентов 3 курса специальности 08.02.05 Строительство и эксплуатация автомобильных дорог и аэродромов

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Text 1. Tunnel

A tunnel is an underground passage. The definition of what constitutes a tunnel is not universally agreed upon. However, in general tunnels are at least twice as long as they are wide. In addition, they should be completely enclosed on all sides, save for the openings at each end. Some civic planners define a tunnel as 0.1 miles (0.16 km) in length or longer, while anything shorter than this should be called an underpass or a chute. For example, the underpass beneath Yahata Station in Kitakyushu, Japan is only 0.08 miles (0.13 km) long and therefore should not be considered a tunnel.

A tunnel may be for pedestrians or cyclists, for general road traffic, for motor vehicles only, for rail traffic, or for a canal. Some are aqueducts, constructed purely for carrying water — for consumption, for hydroelectric purposes or as sewers — while others carry other services such as telecommunications cables. There are even tunnels designed as wildlife crossings for European badgers and other endangered species. Some secret tunnels have also been made as a method of entrance or escape from an area, such as the Cu Chi Tunnels or the tunnels connecting the Gaza Strip to Egypt. Some tunnels are not for transport at all but are fortifications, for example Mittelwerk and Cheyenne Mountain.

Tunnels are dug in different kinds of grounds, from soft sand to hard rock. The way of digging is chosen by the type of ground. There are two additional ways of digging: quarry and "cut and cover". In quarry, the tunnel path is drilled in a horizontal way. This system requires a deep tunnel that is built in a firm rock. In the "cut and cover" system, a tunnel is dug in the ground and afterwards a roof is built above the tunnel. This system fits tunnels that are close to the ground like road tunnels and infrastructure.

Building tunnels is a large civil engineering project that could cost very high sums of money. The planning and building of a long tunnel may take many years. The longest canal tunnel is the Standedge Tunnel in the United Kingdom, over three miles (5 km) long.

In the United Kingdom a pedestrian tunnel or other underpass beneath a road is called a subway. This term was used in the United States, but now refers to underground rapid transit systems.

The central part of a rapid transit network is usually built in tunnels. To allow nonlevel crossings, some lines run in deeper tunnels than others. Rail Stations with much traffic usually provide pedestrian tunnels from one platform to another, though others use bridges.

The Channel Tunnel between France and England is one of the longest tunnels in the world. It is 50 kilometers long. The longest tunnel in the world, the Gotthard Base Tunnel, is being dug in Switzerland.

Motives to build a tunnel are:

- a subway is based on a network of tunnels that are dug underground so the trains won't disturb and won't be disturbed by the local transport;
- on the path of a railroad track or a road a tunnel is dug when the lane encounters an obstacle such as a mountain to avoid bypassing the obstacle;

- a tunnel is built sometimes to overcome a water obstacle as a replacement for building
- a bridge above it;
- a tunnel is built to connect between military posts so the movement between them won't be visible for the enemy;
- a tunnel is built for infrastructure like electricity cables, water, communication and sewerage to avoid damage and disruption above ground;
- some tunnels are used by prisoners to escape jail;
- sometimes tunnels are used by criminals to do a bank robbery (e.g. in Brazil, Summer 2005).

Ex. 1.1. Read and remember the words.
communication cable - коммуникационный кабель
electricity cable - электрический кабель
to dig - рыть, копать, выкапывать
soft ground - мягкая почва
hard rock - скальная порода
quarry - каменоломня, карьер
cut and cover - открытая разработка
to drill - сверлить, бурить
firm - твердый
to fit - подходить, соответствовать
to disturb - беспокоить, мешать
railroad - железная дорога
track - железнодорожная колея
to overcome - преодолевать
obstacle - препятствие
sewerage - канализация
to avoid - избегать
damage - повреждение
disruption - разрыв

Ex. 1.2. Match a word in A with a word in B.

A	B
electricity	passage
underground	posts
deep	sums of money
to cost	cable
to avoid	tunnels
military	damage
to escape	jail
	the obstacle

Ex. 1.3. Give the Russian equivalents to the following English words and combinations.
Communication cables; soft sand; hard rock; quarry; "cut and cover"; to drill; roof;

to be close to the ground; to fit; civil engineering project; network of tunnels; to overcome; to encounter an obstacle; sewerage; communication; disruption; to avoid damage; subway; to bypass; replacement.

Ex. 1.4. Give the English equivalents to the following Russian words and combinations.

Подземный проход (проезд); движение кораблей; рыть тоннель; мягкий песок; большие денежные суммы; инженерный проект; горизонтально; твердая скальная порода; дополнительный способ (метод) проходки тоннеля; проектирование и строительство; длиной 50 км; почва (грунт); коммуникационные кабели; строительство моста; во избежание (чтобы избежать); преодолевать; мешать движению; сталкиваться с препятствием.

Ex. 1.5. Answer the questions to the text.

1. What are tunnels built for?
2. What are they used for?
3. What kinds of grounds are the tunnels dug in?
4. Describe two additional ways of digging: quarry and “cut and cover”.
5. Why is tunneling considered to be a large civil engineering project?
6. Which is the longest tunnel in the world?
7. What motives for building a tunnel do you know? Speak on each of them.

Text 2. History of Tunneling

With more than six million kilometers of highways and 240,000 kilometers of railways snaking across the United States, life above ground has become increasingly congested.

Tunnels provide some of the last available space for cars and trains, water and sewage, even power and communication lines. Today, it’s safe to bore though mountains and burrow beneath oceans — but it was not always this way. In fact, it took engineers thousands of years to perfect the art of digging tunnels.

Before cars and trains, tunnels carried only water. Roman engineers created the most extensive network of tunnels in the ancient world. They built sloping structures, called aqueducts, to carry water from mountain springs to cities and villages. They carved underground chambers and built elegant arch structures not only to carry fresh water into the city, but to carry wastewater out.

By the 17th century, tunnels were being constructed for canals. Without roads or railways to transport raw materials from the country to the city, watery highways became the best way to haul freight over great distances.

With trains and cars came a tremendous expansion in tunnels construction. During the 19th and 20th centuries, the development of railroad and motor vehicle transportation led to bigger, better, and longer tunnels.

Today, not even mountains and oceans stand in the way. With the latest tunnel construction technology, engineers can bore through mountains, under rivers, and beneath bustling cities. Before carving a tunnel, engineers investigate ground conditions by analyzing soil and rock samples and drilling test holes.

There are three steps to a tunnel's success. Today, engineers know that there are three basic steps to building a stable tunnel. The first step is excavation: engineers dig through the earth with a reliable tool or technique. The second step is support: engineers must support any unstable ground around them while they dig. The final step is lining: engineers add the final touches, like the roadway and lights, when the tunnel is structurally sound.

Based on the setting, tunnels can be divided into three major types:

1. Soft-ground tunnels are typically shallow and are often used as subways, watersupply systems, and sewers. Because the ground is soft, a support structure, called a tunnel shield, must be used at the head of the tunnel to prevent it from collapsing.
2. Rock tunnels require little or no extra support during construction and are often used as railways or roadways through mountains. Years ago, engineers were forced to blast through mountains with dynamite. Today they rely on enormous rock-chewing contraptions called tunnel boring machines.
3. Underwater tunnels are particularly tricky to construct, as water must be held back while the tunnel is being built. Early engineers used pressurized excavation chambers to prevent water from gushing into tunnels. Today, prefabricated tunnel segments can be floated into position, sunk, and attached to other sections.

Ex. 2.1. Read and remember the words.

congested - переполненный, перегруженный
burrow - пустая порода, отвалы; рыть, копать
extensive - обширный, громадный
sloping - наклонный, покатый
spring - источник
to carve - высекать, вырезать
chamber - отсек, камера, полость
wastewater - сточные воды
haul - транспортировать, перемещать
freight - груз
bustling - шумный, суетливый
sample - образец
stable - постоянный
unstable - неустойчивый
setting - окружение
tunnel shield - проходческий щит
rock-chewing - камнедробильный
contraption - хитроумное изобретение, приспособление
tricky - «хитроумный»
tunnel-boring machine - тоннелепроходческая машина, комбайн
pressurized - прессованный
to gush - литься потоком, хлынуть
to float - плавать, держаться (поддерживать) на поверхности воды

Ex. 2.2. Give the Russian equivalents to the English words and combinations.
To snake; increasingly congested; available space; to bore through mountains; to burrow beneath; to perfect the art of building; network of tunnels; sloping structures chambers; arch structures; wastewater; raw materials; watery highways; to haul freight; tremendous expansion; bustling cities; investigate; rock samples; test holes; unstable ground; subway.

Ex. 2.3. Give the English equivalents to the Russian words and combinations.
Водоснабжающие системы; почва; поддерживающая структура; три основных типа; предотвращение обвала; проходческий щит; в начале туннеля; скальные туннели; дополнительная опора; вынуждать; взрывать; полагаться на что-то; бурильные машины; сложно сооружать; удерживать воду; экскавация камеры; под давлением; хлынуть в туннель; рыть под чем-либо; наклонная конструкция; пробные отверстия; неустойчивый грунт; перевозить грузы по воде; образцы скальной породы.

Ex. 2.4. Match a word in A with a word in B.

A	B
bustling	space
unstable	materials
watery	ground
test	cities
to haul	segments
rock	holes
raw	chambers
excavation	freight
available	samples
prefabricated	highways

Ex. 2.5. Answer the following questions according to the text.
1. Why has life above ground become increasingly congested?
2. What provides last available space for cars and trains, water and sewage, communication lines?
3. How much did it take engineers to perfect the art of digging tunnels?
4. Who created the most extensive network of tunnels in the ancient world?
5. What did the Roman engineers build to carry fresh water into the city and wastewater out?
6. What became the best way to haul freight over great distances?
7. What did a tremendous expansion in tunnel construction come with?
8. What led to bigger, better and longer tunnels?
9. What do engineers do before carving a tunnel?
10. What are 3 major types of tunnels? Speak of them.

Text 3. Tunnel construction methods

1. Tunnel construction by means of TBM. The key element of the tunnel construction shield technology is header, mobile cylindrical-shell-shaped temporary tunnel support allowing performing the necessary heading operations: ground cutting and loading, ground transportation, lining construction. Ground excavation is performed in the head part of the machine; lining is performed in tail of the shield.

The main sizes of tunneling shields depend on lining diameter, geological conditions and type of mechanized equipment. The heading speed depends on cross-section and type of tunneling shield; and when there are favourable conditions it can reach several metres per month. The constructions of tunneling shields are improved by means of unified cutting tools and loading buckets, spare parts development.

From the point of construction the shield is a metal shell consisting of 3 main parts. The front part with cutting tools works directly with face. In the central part there are adjustable jacks for shield moving along the perimeter of the shield. The tail of the shield is a cylindrical shell where another lining circle is raised. The lining construction is accompanied with veneer wall tie grouting which helps fill space between lining and ground surface.

The world record of heading speed — 1250 metres of tunnel per month — was set in 1981 with shield KT-1-5.6 on the section of Pionerskaya-Udelnaya of main line tunnel of St. Petersburg subway. In 70s and 80s these shields were considered to be the better ones in the world.

2. Laying of communications with a trenchless method, microtunneling.

Trenchless technologies allow performing underground construction without ground opening. Applying of trenchless technologies allows performing 90 % of work underground, that excludes:

- the necessity of reinstating the surface of motorway;
- disturbance of town-living practiced rhythm;
- traffic arteries closing;
- damaging of existing.

Trenchless technologies are economically (2.5—3 times) with traditional method, moreover laying of communications with a trenchless method doesn't damage the environment.

The recent tendency shows that public utilities of megapolises in different countries draw more and more attention to the issues concerning using of trenchless technologies for reconstruction and laying of water-line, drainage and other utility network; trenchless technologies are an alternative to traditional trench method of construction and reconstruction of pipes.

The problem of reconstruction and pipeline laying can be solved with wide use of trenchless technologies and special equipment. Currently the most promising equipment for these works is microshields, horizontal drilling rigs and pneumatic drifts. Each piece of equipment has its efficient sphere of application in terms of diameter, depth, distance, hole making accuracy, type of ground, communication appropriation, working conditions on the jobsite and many other factors.

For shallow run (up to 5 m) short (up to 50 m) engineering communication laying through traffic and railroads it is efficient to use pneumatic drifts.

The laying of communications through water barriers in given direction is performed by means of horizontally-directed drilling rigs. For this method special drilling rigs performing rough (pilot) drilling along precomputed pathway with further bore enlargement and pipe laying are applied. Underground communications up to 80 m deep and up to 1.5 km long with departure of 30 mm from project are laid in the cities by means of microshields. In this case two trenches, starting and receiving, are used; their depth matches the laying depth.

Powerful adjustable jack station where tunneling shield is placed is set in the starting trench. Moving of the shield in the ground is provided by means of adjustable jack. The assembling of pipes is performed with building up of pipe column, i.e. the heading to the receiving trench is carried out. The accuracy of heading is provided with computer operation complex with laser system positioning of shield.

Microtunneling technology allows laying pipelines in various ground — from unstable sand clay and water sand to the rock ground. The cutting attachment of header is chosen according to the type of ground that allows reaching optimal parameters of heading.

Microtunneling equipment are:

- microtunnel boring machines of all cut diameter with ground hydrotransport for laying of communications of various types;
- microtunnel boring machines with screw transportation of ground;
- microtunnel boring machines with pneumatic transportation of ground;
- puncture-drilling rigs (the ground is not excavated from the bore, but is pushed apart in radial direction with formation of consolidated zone around the bore);
- puncture rigs (the puncture is performed with small steel-channel-line-shaped dolly in the bore for cable laying with diameter up to 100 mm).

Pipes used for microtunneling. Polymer-concrete, reinforced concrete, ceramic, glass reinforced plastic and asbestos-cement pipes of all diameters are used for trenchless laying of the communications with microtunneling. For linkage of pipes special pump buckets are used in order to eliminate water entry through connection joints.

Trenchless technologies are used for the following works:

- laying of communications cables;
- oil-gas-heat pipelines laying;
- laying of canalization and water pipes;
- pile and pile structures formation; consolidation of crowns of underground construction;
- pipe replacement, destruction of old pipes with laying of the new ones.

3. Tunnel permanent lining construction. The basic materials for tunnel lining construction are cast-in-place concrete, cast-in-place and prefabricated reinforced concrete, cast iron and steel. These materials are chosen according to conditions of construction area and tunneling methods. The lining has permanent application as opposed to temporary lining (mine working support). The shape and size of lining

are defined by size, depth and function of the tunnel and sort of take up load (lock pressure, hydrostatical pressure, traffic load, etc).

Cast-in-place lining is mainly used for construction of tunnels with most complex structure and big cross-section. Precast lining is widely used for shield and erector-arm tunneling, mainly in subway tunnels. Technological production schemes of concreting for tunnel construction are defined according to hardness of rock, tunneling methods, depth, length and appropriation of tunnel and applied mechanic machines. The concreting of one section of Lagar-Aul tunnel in Amur region on the basis of factors above was performed after the following works were finished: excavation form was made as designed in the project, excavation consolidation by means of shotcreting; the installation of rock bolt support, film waterproofing and reinforcement cage; placing of formwork in permanent position and release material covering.

Various types of waterproofing materials are used in modern tunnel construction. Solid waterproofing is made of waterproof building organic or synthetic film filter materials, synthetic resinous materials, and steel sheets.

Cut-in-place tunnel lining, placed in stable rock ground, protected from water by means of external waterproof installed before lining construction. After that reinforced framework is performed.

Tunnel formwork “Saga Cogio” (Japan) is used for mechanization of cast-in-place concrete lining construction of single track railway tunnel, excavated to the full crosssection. The total length of formwork, 20.5 m, provides heading for 20 m. The width and height of the formwork are 5.6 m and 8.2 m respectively. Weight — 100 tones. Pneumatic motion engine capacity — 10.3 kW.

Tunnel formwork “Wortington” (Italy) is appropriate for mechanization of cast-inplace concrete lining construction of double track tunnel crown. Entrance size for traffic (finished): width — 3.6 m, height — 3.7 m. Formwork weight — 110 tones.

4. Tunnel construction by means of road headers. Performing underground mining in solid and standing ground the stage face method is used. In this case the face is opened for full section in two stages and after that the permanent lining is raised. Mining works are performed by means of heavy-duty mechanical appliances.

Roadheading tunnel construction technology with artificial production of ground is used in wide range of rocks.

In ground with coefficient of resistance f=6 according to Protodiakonov’s scale it is possible to use lower stage method when ground in the upper part is headed 30—50 m advanced as opposed to lower part. The ground in top and bottom faces is cut by means of tunnel boring machines (TBM) of selective action. In this case two independent faces are organized; there are TBM and devices for loading and transportation of excavated ground in each face. TBM is equipped with mechanized working attachment for ground cutting, bucketdevice system and conveyers which allow removing ground from the place and deliver it to the hauling unit. Ground transportation, temporary lining installation and formwork is performed on the analogy of mining method.

Using TBM instead of drill-and-blast method for tunneling prevents destabilization of rock mass due to decreased dynamic force. Moreover, the risk of falls and ground subsidence is minimized. TBM provides creating sharp tunnel outline with minimum excavation that results in decreasing of loading and transport operations and concrete consumption for formwork in comparison with drill-and-blast method.

5. Stage method of tunnel construction. This method is used for construction of tunnels with cross-section over 120—130 m2 and height over 10 m mainly in hard rock mass. This method differs to continuous face method from the point that tunnel section is divided in two parts and each part is headed differently in different height and time.

There are two variants of stage method: upper-stage and lower-stage methods.

Upper-stage method. At first lower part of profile is headed and then the heading of upper part is started to perform. This variant has a range of technological disadvantages and is rarely used.

Lower-stage method. This variant is widely used in tunneling, especially for construction of tunnels with vast section and height. At first the upper part of profile is headed and then the heading of lower part is started to perform.

In tunnel construction by means of lower-stage method first of all the upper part of cross-section is headed with the help of continuous face method. The height of upper part is to be more than 4 m according to the location conditions and heading equipment height. Then concreting (rock bolt support, shotcreting) are performed according to the project and tunnel construction conditions.

After heading and formwork of tunnel upper part the lower part is started to head with berms along the sides of excavation; the width of berms depends on crown pressure. Then sidepieces of lower part are headed and concreted as on a chess-board.

6. Shotcreting. The process of shotcreting (rock bolt support) consists of the following stages: preparation of underground working space surface, installation and assembling of support elements (anchors, arches, expended lath), cover lamination, cover protection, quality management.

For tunnel excavation consolidation in stiff natural-moisture-content clay continuously reinforced shotcrete with reinforcing fiber and steel bars are used. Steel bars are installed along the excavation crown and are fixed in face toothing on one side and between ground and shotcrete of previous heading on another side. It is recommended to apply admixture for acceleration of setting and hardening for shotcreting on water-bearing ground.

When shotcrete is sprayed on ground surface with the temperature below zero it is necessary to remove ice, blow the ground off with pressure air and sand-blasting machine if necessary in advance. The shotcrete can be sprayed immediately or step-by-step, which is defined by the project according to development rate of rock pressure and work technique features.

For shotcrete placing special cars are used, where by means of “dry” technology the mixture of cement, sand and gravel batched in equal proportions is

squeezed out with pressure air by means of flexible hose to the nozzle atomizer, where the mixture is moisturized with water. When the “wet” technology is used, prepared concrete is delivered to the machines.

Shotcreting has high strength properties; resistance of its extension is 10 per cent more in comparison with standard concrete. The cover of high strength, density and waterproofing capacity is formed thanks to impact laying. The other advantages of shotcreting are good adhesion to ground and reinforcement, manufacturability, reduction of cement consumption. Shotcrete application allows decreasing face thickness and out-turn, excluding the necessity of formwork and mechanizing the concrete work process totally. Moreover, manufacturing content decreases by 2 times, and lining cost reduces by 30—40 % in comparison with cast-in-place lining.

Ex. 3.1. Read and remember the words.
key element особенность; основной элемент
shield щит (при проходке туннеля)
header врубовая машина; щит для проходки
shell shaped имеющий форму раковины
temporary временный
heading штрек; горная выработка; туннель
cutting выемка грунта
loading погрузка
lining обшивка; облицовка
cross-section поперечный разрез; профиль
bucket ковш экскаватора
spare parts запасные части
attachment насадка
face наружная поверхность
adjustable регулируемый; передвижной
jack подъемник; домкрат
accompanied сопровождаемый; сопутствующий
veneer шпон; каменная облицовка стены
grouting заливка цементным раствором; цементация
trenchless method бестраншейный метод
to exclude удалять
reinstating восстановление
issue проблема; задача
drilling rig сверлильное устройство; буровая установка
drift сдвиг; смещение; отклонение
pneumatic воздушный; пневматический
accuracy точность
appropriation ассигнование
run зд.: отрезок пути
jobsite строительная площадка
rough черновой; грубый; неровный

departure отклонение; уход (от заданных параметров)
receiving trench приемная траншея
screw винтовая линия (шпиндель)
puncture-drilling точечное бурение
dolly транспортная тележка
rig устройство; оборудование
pump bucket - манжета
pile - свая
crown - верхняя часть
consolidation - укрепление

Ex. 3.2. Give the Russian equivalents to the following English words and combinations.
Key element; shield technology; temporary tunnel support; heading operations; ground cutting; lining construction; tail of the shield; geological conditions; crosssection; by means of; unified cutting tools; vast majority; heading speed; trenchless method; to reinstate the surface; public utilities; drainage; drilling rigs; sphere of application; hole making accuracy; pneumatic drifts; precomputed pathway; adjustable jack; microtunneling technology; cut diameter; screw transportation of ground; consolidated zone; cable laying; pump buckets; connection joints; tunnel lining construction; appropriation of tunnel; shotcreting; single track; stage face method; hauling unit; ground subsidence; concrete consumption.

Ex. 3.3. Give the English equivalents to the following Russian words and combinations.
Временная опора; срезка грунта; диаметр щита; погрузочные ковши; металлическая раковина; обивочный круг; регулируемый домкрат; бестраншейная технология; восстанавливать поверхность; приводить в прежнее положение; прокладка коммуникаций; коммунальная сеть; сверлильное оборудование; пневматические штреки; пробное сверление; сборка труб; режущее приспособление; буровые машины; радиальное направление; пробивное устройство; укрепление верха конструкции; свайные структуры; опалубка; потребление цемента для опалубки; давление свода; принимающая траншея; точечное бурение; свая; цементация.

Ex. 3.4. Match a word in A with a word in B.

A	B
vast	jack
lining	the surface
temporary	technology
key	speed
shield	pathway
heading	element
trenchless	method

ground	cutting
to reinstate	construction
precomputed	support
adjustable	majority

Ex. 3.5. Answer the questions to the text.
1. What is the key element of the tunnel construction shield technology?
2. What are the main construction technologies?
3. What do the main sizes of tunneling shield depend on?
4. Describe the shield from the point of construction.
5. Where was tunneling shield first used?
6. How were vast majority of subway tunnels in Moscow, St. Petersburg and other cities constructed?
7. What do trenchless technologies allow?
8. Why are trenchless technologies economically competitive with traditional method?
9. What are the most promising equipment for reconstruction and pipeline laying?
10. Speak on microtunneling technology.
11. Which are the basic materials for tunnel lining construction?
12. What are two types of lining?
13. Which waterproofing materials are used in modern tunnel construction?

Text 4. The Channel Tunnel

The Channel Tunnel, one of the world's most famous tunnels, is a 50 km (31 ml) tunnel under the English Channel linking Great Britain to France. This link consists of three parallel tunnels running for 39 km (24.2 ml) under the sea. Two Main Rail Tunnels, about 30 m (98 ft) apart, carry trains from the north and from the south. In between the two tunnels is the Channel Service Tunnel, which is connected by cross-passages to the main tunnels. This service tunnel allows maintenance workers to access the rail tunnels at regular intervals.

The contractor for the project, Transmanche-Link (TML) chose five Robbins TBMs to participate in boring the crossing. TBMs were deplayed at both the U.K. and France Terminals. The majority of the Channel Tunnel passes through Chalk Marl, much of it faulted. Below the Chalk Marl is a thin 2 m (6.5 ft) band of permeable Glauconitic Marl.

This rock is a weak sandstone with a stronger rock strength than the Chalk. The bottom of the tunnels pass through stiff clay with some swelling characteristics. The Chalk is much more faulted and prone to water inflows on the French side of the tunnels.

Robbins built five machines for this project, each designed for the geology of a specific length of tunnel. The high water pressures predicted in the folded chalk on the French side required the use of three Earth Pressure Balance machines (EPBMs). These machines featured sealed cutter chambers to withstand high water pressures and screw conveyors to carry the cut material from the face.

The undersea French side of the Channel Service Tunnel also required an EPBM. Two Double Shield TBMs were built for the U.K. terminal because fewer water inflows were predicted. Robbins designed these machines to withstand unstable and faulted rock conditions. The 8.36 m (27 ft) diameter machines included 13 inch (330 mm) cutters and 65,871 km (14,821,000 lb) of thrust. The machines generated a maximum 5,727,084 N/m of torque.

Machines were deployed on both sides of the tunnels in December 1987. The three French seaward TBMs encountered water inflows almost immediately, forcing the use of the sealed mode of operation much earlier than anticipated. The sealed cutterheads of the machines could withstand 10 bar (145 psi) of water pressure; however, additional measures were required to seal the remainder of the machines against water inflow.

The U.K. machines also experienced some difficult tunneling conditions at the outset. Unforeseen water inflows in a 3.2 km (2.0 ml) stretch caused the machines to slow their progress as each section of tunnel had to be grouted in advance of boring. After passing through this section of tunnel, the machines experienced no further difficulties and began averaging 149 m (490 ft) a week. The Robbins machines on the U.K. side averaged 873 m (2,864 ft) per month and set world records for a best day of 75,5 m (247.7 ft), a best week of 428 m (1,404 ft), and a best month of 1,719 m (5,640 ft) — all of which have yet to be beaten.

Muck transport on both sides of the tunnel was complicated but worked well. In the U.K. a rail system of 500 muck cars transported muck back to the access adit at Lower Shakespeare Cliff and fed it onto a high-speed conveyor. The conveyor then dumped the muck into lagoons behind sea walls in the English Channel. In all, about 4 million m3 (5.23 million cubic yards) of chalk were dumped at the site. The area, called Samphire Hoe, is now a popular park. On the French side muck was crushed and mixed with water in a chamber at the bottom of the Sangette access shaft. It was then pumped up the shaft and behind a 30.5 (100 ft) dammed reservoir.

In December 1990, the French and British TBMs met in the middle and completed the Channel Service Tunnel bore. In all of the tunnels the French TBM was dismantled while the U.K. TBM was turned aside and buried.

The Main Rail Tunnels met on May 22, 1991 and June 28, 1991. Both accomplishments were celebrated with breakthrough ceremonies to commemorate the building of one of the world’s longest and most ambitions undersea tunnels.

Ex. 4.1. Read and remember the words.

to link - связывать
parallel - параллельный, параллель
to run - простираться
apart - отдельно, врозь
cross-passage - вспомогательная штольня
maintenance - эксплуатация, техобслуживание
to access - иметь доступ
regular - равномерный

interval - расстояние, промежуток
contractor - подрядчик, подрядная организация
Robbins зд.: фирма «Роббинс» — производитель бурильной техники
TBM (tunnel boring machine) - проходческий комбайн для горизонтальной выработки
to deploy - использовать, употреблять
chalk marl - меловая глина, мергель
fault - сдвиг горной породы
band - зона, область, пояс
permeable - негерметичный, проницаемый
sandstone - песчаник
bottom - нижняя часть
stiff clay - среднепластичная глина
swelling characteristics - характеристика разбухания
prone - склонный, предрасположенный
to predict - прогнозировать
Earth Pressure Balance Machine - проходческая машина для компенсации давления горных пород
sealed - уплотненный, герметичный
to screw - завинчивать, закреплять болтами
conveyor - транспортер, конвейер
cut material - отбитый материал
main Rail Tunnel - главный железнодорожный туннель
cutterhead - рекордер, коронка (механический рыхлитель)
thrust - осевое давление
to torque - затягивать
Two Double Shield - TBM проходческий комбайн с двумя щитами
Unstable - нетвердый, зыбкий, сыпучий, неустойчивый
cutter - резак, фреза
seaward - выходящий к морю
to encounter столкнуться (с трудностями)
anticipate - предвидеть, предупреждать
bar - бар (единица давления)
remainder - остаток
muck - вынутый грунт
transport - транспортировка
muck car - вагонетка для транспортировки вынутого грунта
adit - вход, проход; штольня, подземная галерея
to dump - сваливать, выгружать
lagoon - отстойник
access shaft - вход в штольню (шахтная труба)
dammed reservoir - загруженный резервуар
dismantle - демонтировать
breakthrough - открытие, прорыв

Ex. 4.2. Complete the following sentences.
1. The Channel Tunnel, one of the world's most famous tunnels, is a…
2. In between the two tunnels is the Channel Service Tunnel, which…
3. This rock is a weak sandstone with…
4. The high water pressures predicted in the folded chalk on…
5. Robbins designed these machines to withstand…
6. Additional measures were required to seal…
7. Unforeseen water inflows in a 3.2 km stretch caused the machines to…
8. The conveyor then dumped the muck into…
9. On the French side muck was crushed and mixed with…
10. Both accomplishments were celebrated with breakthrough ceremonies to…

Ex. 4.3. Are the statements below true or false?
1. The Channel Tunnel, one of the world's most famous tunnels, is 50 km tunnel under the English Channel.
2. This link consists of two parallel tunnels running for 39 km under the sea.
3. Above the Chalk Marl is a thin 2 m band of permeable Glauconitic Marl.
4. The bottom of the tunnels pass through stiff clay with some swelling characteristics.
5. The Chalk is much more faulted and prone to water inflows on the English side of the tunnel.
6. Two Double Shield TBMs were built for the U.K. terminal because more water inflows were predicted.
7. Machines were deployed on both sides of the tunnels in December 1987.
8. The conveyor then dumped the muck into lagoons in front of sea walls in the English Channel.

Ex. 4.4. Read and translate the text "The Channel Tunnel".

Ex. 4.5. Ask and answer the questions on the text (work in pairs).
1. How long is the Channel Tunnel, one of the world's most famous tunnels?
2. What does this link consists of?
3. Where is the Channel Service Tunnel situated?
4. What does the service tunnel allow?
5. What did Robbins build for this project?
6. When were the machines deployed?
7. Which pressure could the sealed cutterheads of the machines withstand?
8. What did the U.K. machines also experience at the outset?
9. What caused the machines to slow their progress?
10. What world record did the Robbins machines on the U.K. side set?
11. When and where did the French and British TBM meet?

Ex. 4.6. Speak on the topic "The Channel Tunnel" using the above questions as a plan.

Text 5. Bridges Information

When New York City was consolidated in 1898, all the waterway bridges were placed under the jurisdiction of the Department of Bridges. In just over a decade, the Department designed, constructed, and opened 19 bridges throughout the City. Currently, the Division of Bridges, within New York City's Department of Transportation, owns, operates, and/or maintains 789 structures, including 758 non-movable bridges, 25 movable bridges, and six tunnels. While the Division is responsible for the capital rehabilitation of the 61 culverts in Staten Island, maintenance and inspection responsibilities remain with the New York City Department of Environmental Protection.

DOT is responsible for hundreds of bridges in New York City, including the four major East River crossings. But DOT does not oversee other major bridges or tunnels. Many bridges not under DOT Jurisdiction are the responsibility of the Metropolitan Transportation Authority or the Port Authority of New York and New Jersey. There are no tolls on bridges operated by New York City DOT.

The Division is comprised of six bureaus: Roadway bridges; East River Bridges/Movable Bridges/Tunnels; Engineering Review; Bridge Maintenance/Inspections /Operations; Specialty Engineering and Construction; and Management Support Services. While each of the bureaus functions independently, their interdependence provides for greater coordination of bridge design and construction projects within the Department of Transportation, and with other concerned agencies and parties.

While it is often assumed that bridges are massive structures, New York also has many small bridges. In addition, there are several different types of bridges, each built to serve a particular purpose. For example, Girder Span Bridges are used for short spans and may be simple or continuous. Examples include: the Hook Creek, Little Neck and Brooklyn Third Avenue bridges.

Steel Arch Bridges consist of either a single arch or a series of arches and are often economical to build. An example is the twin-arched Washington Bridge over the Harlem River at West 181 Street, in Manhattan. Swing Bridges are supported on a center pier in the middle of a waterway and are opened by rotating horizontally on wheels riding on a circular track. Examples include the Grand Street, Macombs Dam, Ship Canal, and City Island bridges.

Vertical Lift Bridges are movable bridges having roadways which may be raised in a manner similar to a building elevator by supporting end cables attached to rotating drums in towers on the sides of the stream. Examples include the 103rd Street Ward's Island Foot Bridge and the Roosevelt Island Bridge to Queens.

Retractile Bridges date back to medieval times. Although never a very popular design, they were used in the mid-19th century for narrow crossing where maximum horizontal clearance was required. Today the Carroll Street Bridge in Brooklyn and the Borden Avenue Bridge in Queens are the only remaining examples of this design and continue to provide excellent service.

Perhaps the most celebrated type of bridge, familiar to most, is the Suspension Bridge, including the Brooklyn, Manhattan and Williamsburg bridges. These are characterized as high level bridges with spans usually exceeding 1,500

feet. Large wire cables, firmly anchored to masses of concrete and passing over tall towers, support the roadway by means of vertical wire "ropes" suspended at regular intervals along the cable.

Ex. 5.1. Read and remember the words.
DOT - Нью-Йоркский департамент городского транспорта
Division of Bridges - отдел мостов
culvert - водопропускная труба, кульверт
toll - плата за проезд по мосту
girder - балка
girder bridge - балочный мост
twin-arched bridge - двуарочный мост
swing bridge - разводной мост
vertical lift bridge - вертикально-подъемный мост
retractile bridge - откатный мост
suspension bridge - подвесной, висячий мост
bridge deck - настил моста

Supplement.

Text 6. Bridges of St. Petersburg

The Big Obukhovsky Bridge is the newest (not taking into account the Blagoveshchensky Bridge rebuilt in 2007) bridge across the Neva River in Saint Petersburg, Russia. It is also the only bridge across the Neva which is not a drawbridge. It is located in Nevsky District, in the middle stream of the Neva. It connects Obukhovskaya Oborona Prospekt with Oktyabrskaya Embankment. It is a cable-stayed bridge; the steel wipe ropes are the key element of supporting construction. The bridge is located in a part of the Neva that is difficult to navigate as the Neva bends after it. The full length of the bridge passage is 2824 m, including 382 m long main span and ramps. The height of main span is 30 m. The first part of the bridge was opened on 15 December 2004. It is an important part of Saint Petersburg Ring Road. The bridge is named after the nearby Obukhovsky Okrug, considering that there is Obukhovsky Bridge in Saint Petersburg already. On 19th of October 2007 a "twin bridge" of Big Obukhovsky Bridge, the second 4-lane part of it, was opened.

The Blagoveshchensky Bridge is the first permanent bridge across the Neva River in Saint Petersburg, Russia. It connects Vasilievsky Island and the central part of the city (Admiralteysky Island). The bridge's length is 331 m and the width is 24 m. The original name of the bridge was Nevsky Bridge, later renamed to Blagoveshchensky Bridge, after the death of Tsar Nicholas I to Nikolaevsky Bridge, and in 1918 to Lieutenant Schmidt Bridge. In 1727 a temporary bridge was built at the location of the modern bridge. The place was chosen by

Menshikov whose palace is located at the opposite bank. This bridge, named Issakievsky, existed until the current bridge was built, at which time it was moved to the location of where Palace Bridge is located today. The bridge was built in 1843—1850. It was designed by Stanislaw Kierbedz, a Polish engineer working in Russia. The architect Alexander Brullov participated in the decoration. The construction was a cast iron bridge with a bascule section. At the time, it was the longest bridge in Europe.

The Alexander Nevsky Bridge in St. Petersburg, Russia is named after the legendary Russian military commander and politician Alexander Nevsky. The bridge connects Alexander Nevsky Square and Zanevsky prospect thus linking the southern and the northern parts of the city. Until 2004, when the Big Obukhovsky Bridge was built, the Alexander Nevsky bridge was the longest bridge across the Neva River in Saint Petersburg. Its length is 905.7 m, and it is 35 m wide. The bridge was built from 1960 to 1965 under the working name of Old Neva Bridge. Designed by the group of architects — A. Zhuk, S. Mayofis and Y. Sinitsa — the bridge has complemented the look of adjacent buildings in surrounding area. The project was led by a team of engineers of the "Lengiprotransmost" institute. Proof-testing was done by means of a column of army tanks. On November 5, 1965 the bridge was open for traffic. For the period of summer navigation a number of bridges on the rivers of Saint Petersburg including the Alexander Nevsky Bridge are opened to allow ships to pass. The bridge consists of seven bridge spans and the central span of 50 m can be opened in two minutes.

Palace Bridge is a road traffic and foot bascule bridge spanning the Neva River in Saint Petersburg between Palace Square and Vasilievsky Island. Like every other Neva bridge (except for Big Obukhovsky Bridge), it is drawn by night, making foot travel between various parts of the city virtually impossible. The total length of Palace Bridge is 260.1 meters, width is 27.8 m. It is actually composed of five spans, the southernmost joining Palace Embankment between Winter Palace and Admiralty and leading to Palace Square. The design was subject to strict controls so as to prevent the bridge from obstructing the view from Palace Embankment towards Kunstkammer, Imperial Academy of Arts, and other structures on Vasilievsky Island. A year after its inauguration, the bridge was renamed Republican Bridge, but the original name was restored in 1944. Various improvements and embellishments of the structure continued well into the Soviet times. In 1967, the bridge was repaired. The tramway tracks were removed in 1998.

Peter the Great Bridge also known as Bolsheokhtinsky Bridge or as Okhtinsky Bridge, is a bridge across the Neva River in Saint Petersburg, Russia. The bridge's length is 334 m, the width is 23 m. The bridge features only three spans, the central one can be drawn. The first idea to build a bridge near the Okhta river was circulated in 1829. Even before the Saint Petersburg was founded, there were settlements in the Okhta region, and with the raise of the city, it quickly grew to become big industrial center. Powder factories and shipyards existed here. However, in XIX century, Okhta district wasn't officially part of Saint Petersburg. The bridge was essential for the developing industry, and Nicholas I approved the

bridge as part of strategic city development plan. However, at that time the necessary funds were not found. Next time the possibility of building a bridge was, raised in 1860th, when the Emperor approved the decision to join the Okhta district to Saint Petersburg. The city Duma organized international contest. There were total of 16 projects submitted including projects from France, Germany, Austria, Spain and USA. There also were three projects submitted out of contest. And one of the out of contest projects was declared winner. That was the project by professor of Nikolaevskaya engineering academy Krivoshein and military engineer Apyshkov. The ceremony of bridge founding took place on June 26, 1909 —exactly two hundred years from the Battle of Poltava. Hence the bridge was named after the triumphator of that battle — Emperor Peter the Great Bridge. The bridge was open for traffic on October 26, 1911. In 1956 the bridge was renamed Bolsheokhtinsky after the Big Okhta river, but in 2004 the original name was partially restored.

Text 7. DESIGNING AN ARCHED BRIDGE IN PETERSBURG

The history of Russian literature, art, science and technique proves that talented Russian people belonging to lower classes of society were able to master theoretical and practical knowledge of the day, to make great inventions and to design engineering constructions which had never been undertaken before.

Such was Kulibin, one of the most talented self-taught engineers at the court of Catherine II. From his early childhood Kulibin showed a keen interest to all kinds of mechanical devices and liked to build models of water mills and different machine details. While boy he saw a clock on the wall of a friend's house, and s few days later managed to make a similar clock out of the wood. He realized that in order to master the secret of mechanism it was necessary to study mathematics and physics. The books he needed were very difficult to obtain; the instruments necessary for the work of a mechanic were not to be got in Nizni Novgorod where he lived. But in spite (не смотря на) of all that he succeeded in getting to Petersburg where he was appointed mechanic to the Academy of Science and since then spent all his free time and all his money on new inventions.

In Petersburg Kulibin undertook a very difficult engineering problem – to design a bridge across the Neva as there was not a single permanent bridge in the city to provide a crossing at any season of the year. Temporary pontoon bridges had to be taken to pieces at high water.

Kulibin was the first to think of building an arched bridge. According to his plan the bridge was to have a single span leaving free water for ships and barges. Arched bridges of similar construction had not built before, but no engineer dared even to think of construction a bridge with a three hundred meter span. Working at three models in succession he tried each time to improve his design.

The test of the first model was quite successful, but the construction did not satisfy Kulibin. He constructed a second model, which did not satisfy him

either. He set to work at his third design. This one differed from the first two from the architectural and structural point of view, having a much lighter central part. The arch was designed 298 meters long and the bridge was supposed to consist of latticed trusses, and the roadway were to be horizontal. This was a construction which even now is used in modern bridge building. After the model was completed it was submitted to a special commission set up by the Academy of science, which was invaded by the foreign scientists and specialists at that time.

Most of the academicians were sure that the final testing of the bridge would be a failure, but the testing of the model proved to be a success. No failure resulted even with a weight much greater than the maximum load. In spite of the favourable conclusion of the commission no practical result followed. Catherine II ordered the model to be set up in the grounds of the Taurida Palace for public inspection where it gradually destructed.

In 1772 the London Academy started a competition for a design of an arched bridge, whereas Kulibin had completed his design much earlier. But he did not send his project to London. Though having a family of 12 children and being in a great want, he remained a true son of his country who found unnatural to have the work of his life realized in foreign lands.

prove	доказывать, оказаться
belong	принадлежать
invent (invention)	изобретать (изобретение)
self-taught	самоучка
device	устройство
keen	сильный
water mill	водяная мельница
manage	удаваться
wood	ветряная мельница
to obtain	получать, доставать
succeed (success, successful)	удаваться (успех, успешный)
to appoint	назначать
undertake (undertook)	предпринимать
temporary	временный
similar	похожий
span	пролет
dare	осмеливаться
in succession	подряд, один за другим
careful	тщательный
satisfy	удовлетворять
point of view	точка зрения
light	легкий
latticed trusses	решетчатая ферма
complete	заканчивать
submit	представлять
set up	создавать
failure	неудача, неуспех

load	нагрузка
conclusion	вывод
order	приказывать
destruct	разрушать
want	нужда
remain	оставаться
land	земля, страна

УПРАЖНЕНИЯ К ТЕКСТУ "DESIGNING AN ARCHED BRIDGE IN PETERSBURG"

I. К каждой паре данных слов вспомните русское слово с тем же корнем, что и английское:

Образец: realize – понимать, осознавать (реализовать)

technique	техника
design	проектировать
engineering constructions	технические сооружения
mechanical	механический
detail	подробность
realize	понимать
master	овладеть
crossing	переправа, перекресток
permanent	постоянный
limit	ограничивать
construction	строительство
structural	строительный
academician	академик
final testing	последнее испытание
result	происходить в результате
public inspection	осмотр народом
unnatural	неестественный

Text 8. TWO BRIDGES

1. Прочитайте и переведите текст, обращая внимание на слова и выражения после текста

1. A bridge across the Amur river, a structure on the Baikal-Amur railway in the East of our country is reported to be the first of its size in the world to have the foundations for its piers built without caissons. Indeed, during the construction of bridges in this railway Russian specialists had to solve technical problems not encountered in world practice.

The route of the Baikal-Amur railway crosses about 3,200 water barriers, the rivers being turbulent with flows of up to 4.5 m/sec. In winter, ice thickness reaches 3 m; in spring there are excessive floods. Even small rivers transform into torrents twice a year.

Bridge builders also have to consider the characteristics of permafrost. It is necessary to ensure that bridge piers stand firm in winter when the soil is ice-bound and therefore hard and in summer when it transforms into a mass with a zero load bearing capacity.

2. The bridge across the Amur River near the city of Komsomolsk is 1,450 m long and is said to be the most complex structure not only because of its size and large volume of work but also because the local conditions are quite unusual.

The difference of water levels in the Amur River in winter and summer reaches 8m. Ice-drifting periods occur twice every year in spring and in autumn, each continuing for month. Added to this is a water depth of 20 m, a rapid flow, heavy frosts and strong wind.

This combination of conditions demanded investigations of quite new technical solutions to make. For example, to avoid the need sealed caissons, concrete hollow tubes several meters long lowered vertically to the river bottom.

In the permafrost areas along the route the bridges are designed with large spans so as to reduce the number of piers because of the difficulties of constructing foundations.

3. The Yukon River, one of the largest in North America, springs from the snows of the mountains of British Columbia, and flows through Alaska to the Bering Sea. This waterway has long been an important transportation artery. At the end of the century, prospectors and miners used the river to reach rich Alaskan and Canadian gold-fields. Until recently, the Yukon River was a major obstacle in constructing a roadway to the oil-rich North Slope.

But that obstacle was overcome when the first bridge across the Yukon River in Alaska was opened to traffic. This new crossing is located 80 km south of Arctic Circle. Now a person can drive from Florida to the shores of the Arctic Ocean without a single ferryboat.

The new bridge is an integral part of the Alaskan Pipeline project and a major link in Alaska transportation system to the Arctic Ocean and the oil-fields near Prudhoe Bay.

4. It was a remarkable engineering problem. The bridge site’s remote location, extremely cold climate, and other environmental factors called for unusual design and construction.

Twin steel girders support a 9.1 m wide roadway. Later, the bridge will carry two 48 m crude oil pipelines and possibly, a large diameter gas pipelines.

In this huge river, a flow rate at the bridge site is over 1 million ft 1/secm water depths are 20-25 m. Winter ice on the river riches thickness 1.5 m, ice near the shore can be as much as 3 m thick. Therefore special protection was used for the piers of the bridge which will provide assurance against unknown movements of the ice.

5. Although earthquakes magnitudes in this locality are minor compared with active areas near South Alaska coast seismic requirements for the pipeline are very strict. And since the bridge will be carrying the pipeline the same strict seismic requirement were applied to the bridge. The bridge was designed for a Richter Magnitude 7.5 earthquake.

Because of the very low temperatures at this site (average annual minimum temperature -60o F) fracture was of great concern. Exceptionally tough steel was used in all main tension areas of supports.

The design will have a reserve for vehicles to cross the bridge even if one of the girders is fractured. The design was complicated by the addition of the 1220 mm oil pipeline on each side of the bridge, with one or both pipes full.

1. encounter	встречаться, столкнуться
1. turbulent	бурный
2. thick(ness)	толстый (толщина)
3. torrent	поток
4. consider	считать, полагать
5. soil	почва
6. permafrost	вечная мерзлота
7. enormous	огромный
8. volume	объем
9. demand	требовать, требование
10.lower	опускать
11.reduce	уменьшать
12.spring	весна, родник; возникать
13.mountains	горы
14.prospector	изыскатель, старатель
15.miner	шахтер, горняк
16.field	месторождение
17.overcome	преодолеть
18.remote	отдаленный
19.twin	двойной, сдвоенный, спаренный
20.girder	ферма (моста)
21.assurance	гарантия, страхование
22.movement	движение
23.earthquake	землетрясение
24.minor	незначительный
25.carry	нести, перевозить
26.strict	строгий
27.requirement	требование
28.apply	применять
29.fracture	разрыв, трещина, перелом; образовывать трещины
30.concern	внимание
31.provide	обеспечивать
32.complicate	сложный
33.add(ition)	добавлять (добавление)

УПРАЖНЕНИЯ К ТЕКСТУ "TWO BRIDGES"

I. К каждой паре данных слов вспомните русское слово с тем же корнем, что и английское:

Образец: realize – понимать, осознавать (реализовать)

1. across	через	8.transportation	транспорт
1. construction	строительство	9.crossing	переправа

2. turbulent	бурный	10.person	человек
3. characteristics	характерные особенности	11.extremely	чрезвычайно
		12.protection	защита
4. complex	сложный	13.design	проектировать
5. local	местный	14.reserve	запас
6. combination	сочетание	15. integral	неотъемлемый

II. Подберите русские эквиваленты к следующим английским выражения:

1. excessive flood	герметически закрытые кессоны
1. soil ice-bound	сильные морозы
2. load bearing capacity	главное препятствие
3. complex installation	глубина воды
4. water level	дно реки
5. ice-drifting	пустотелые бетонные трубы
6. rapid flow	сильные наводнения
7. heavy frosts	прочная сталь
8. strong wind	уровень воды
9. sealed caissons	трубопроводы с сырой нефтью
10. concrete hollow tubes	грузоподъемность
11. river bottom	сложная установка
12. a major obstacle	части опор под напряжением (растяжением)
13. engineering problem	скорость течения
14. flow rate	почва, скованная льдом
15. water depth	дрейфование льда
16. crude pipelines	сильные ветра
17. tough steel	техническая (строительная) проблема
18. tension areas of support	быстрое течение

Text 9. TUNNELS AND BRIDGES

1. Прочитайте и переведите текст, обращая внимание на слова и выражения после текста

1. The construction of tunnels presents the civil engineers with some of his most difficult problems.

The tunnel construction dates back to 1857, when French and Italian engineers combined to undertake the gigantic task of building the Mont Ceris tunnel. This carries the main railway lines from south-eastern France to north-western Italy. The tunnel is nearly 8 miles long and is of great technical interest, because air compressor and rock drills operated by compressed air were first used on this work. It was also the first large project on which dynamite was employed for breaking the rock. But when it was started, drilling was done by hand. Black gunpowder was used for breaking the rock. At first progress was very slowly. In fact for the first 4 years the tunnel advanced only

9 inch a day on each side and if it had continued at the initial rate, it would have taken 75 years to complete. With the introduction of compressed air drills and dynamite, progress went ahead and was accelerated to 6 ft a day.

Traffic Tunnels

2. When the proposed path of a road or railway is obstructed by a hill, a waterway, or some form construction, the engineer designing the project has to decide to construct a tunnel through or under the obstacles. In making decision, he has not only to consider the economic aspect, but must also weigh up all the constructional advantages and disadvantages of tunneling or the alternative method of passing around or over the obstacle. In practice costly tunneling proves to be less expensive than any other alternative system.

3. The inability of the existing road system of many large towns to cope with modern traffic requirements has made tunnel construction a possibility. Flyovers and underpasses, being the first steps to speed up and divert traffic, have eased the situation, but the problem can be solved by underground railway networks.

Many of larger cities of the world have been successfully served by underground railways for years, and most of them are still extending their network thus reducing excessive traffic congestion.

Bridge or Tunnel?

4. Should a motorway pass under or over a large waterway? For a narrow waterway there is no a problem, the water is always bridged. Until recently only two alternatives have been existed, bridging over or tunneling under the water, but a third choice is available, the immersed tube is made by lowering pipes of great length into a trench in the bed of the sea or river, and joining them under water.

The main consideration in the decision are now generally traffic capacity, gradient, obstruction of shipping, costs of construction and maintenance, speed of completion, possible later widening and so on.

The choice often falls on a bridge because it can carry more vehicles per hour and its capacity is more easily extended by widening or by adding a deck.

One of the largest bridges in the world, with twelve traffic lanes, six on each of its decks, is the Verrazano-Narrows Bridge in New York. For many years the United States Army engineers had not allowed a bridge to be reconstructed at this site because its destruction in war time could block the harbour, and they insisted on building a tunnel. But after the first atomic bombs had been exploded, the US Army saw that it was purposeless to continue to insist on a tunnel.

In the eightieth of the 19 century, also for military reasons, the British government did not allow further work on the tunnel under the English channel to France although the preliminary work was by then so advanced that lengths of 1 km of pilot tunnel of some 2 m diameter had already been driven from each shore. These lengths were still in perfect condition when inspected eighty years later, because they had been driven through a chalk rock which is ideal for tunneling, being fairly watertight and just strong enough.

The increasing motor traffic needs a growing number of highways, which will have to cross waterways. In several cases tunnels will not only be the cheapest solution, but also the best with regard to weather conditions (no ice, or

snow, no wind or rain), maintenance, danger of collision with a ship, aesthetic reasons, etc.

Bridge/tunnel combinations form the best solution for crossings of great length.

It is easy to predict that in the next decades an increasing number of important and interesting tunnels –submerged or bored – will be built, and that the existing methods of building, sinking, etc. will be improved and perfected and new techniques will be developed.

1. undertake	1. предпринять
1. carry	1. нести перевозить
2. initial	2. первоначальный
3. use =employ	3. использовать применять
4. advance	4. продвигаться вперед
5. ahead	5. вперед, впереди
6. propose	6. предлагать
7. path	7. путь, дорога, тропа
8. obstruct	8. препятствовать
9. obstacle	9. препятствие
10. weigh up	10. взвешивать
11. costly=expensive	11. дорогостоящий, дорогой
12. inability	12. невозможность, невыполнимость
13. worth	13. стоящий, заслуживающий
14. divert	14. отводить
15. ease	15. ослаблять, облегчать, легкость
16. network	16. сеть (железнодорожная и т.п.)
17. extend	17. удлинять, расширять
18. excessive	18. чрезмерный
19. congestion	19. перегруженность
20. over	20. над, через, сверх, свыше
21. choice	21. выбор
22. vehicle	22. любое транспортное средство передвижения
23. exist	23. существовать
24. immerse	24. погружать, окунать
25. lower	25. опускать
26. join	26. соединять, присоединять к,
27. lane	27. полоса движения
28. deck	28. настил, покрытие моста
29. explode	29. взрывать, взрываться
30. purposeless	30. бесполезный
31. insist	31. настаивать
32. drive	32. двигать, забивать, вбивать, тянуть
33. fairly	33. довольно, весьма
34. tight	34. непроницаемый, плотный
35. increase	35. увеличивать(ся)
36. attractive	36. привлекательный, притягательный
37. obvious	37. очевидный, ясный
38. predict	38. предсказывать

39. bore — 39. бурить, сверлить, просверленное отверстие
40. sink — 40. опускать(ся), топить, погружать, тонуть

УПРАЖНЕНИЯ К ТЕКСТУ “TUNNELLS AND BRIDGES”

I. К каждой паре данных слов вспомните русское слово с тем же корнем, что и английское:

Образец: realize – понимать, осознавать (реализовать)

1. date back — датировать, относить к определенному времени
1. gigantic — большой, огромный
2. operate — работать, действовать, функционировать
3. rock — природный камень
4. progress — продвижение, развитие, успехи; продвигаться вперед, делать успехи
5. accelerate — ускорять, убыстрять
6. form — вид; составлять, строить, создавать
7. construction — строительство
8. economic — экономический
9. constructional — строительный
10. alternative — выбор, возможность; взаимоисключающий
11. aspect — вид, подход, сторона
12. tunnel — прокладывать туннель
13. military — военный
14. block — глыба, строительный блок, квартал города; преграждать, препятствовать
15. perfect — совершенный, законченный; завершать, выполнять
16. condition — условие
17. technique — техника, технология , техническое оснащение

II. Подберите русские эквиваленты к следующим английским выражения:

1. air compressor — 1. экспериментальный тоннель
1. rock drill — 1. добавить ярус (настил) моста
2. compressed air drills — 2. бурильная машина
3. gun powder — 3. полоса уличного движения
4. form of construction — 4. препятствие для судов
5. make decision — 5. число (количество) дорог
6. both … and.. — 6. эстакады и тоннели
7. traffic requirement — 7. скорость завершения
8. road system — 8. как … так и …
9. flyovers and underpasses — 9. по отношению к
10. underground railway network — 10. порох
11. the bed of the river — 11. воздушный компрессор
12. speed of completion — 12. пневматическое сверло
13. traffic capacity — 13. принимать решение
14. obstruction of shipping — 14. ограничение движения
15. to add a deck — 15. дорожная сеть
16. traffic lane — 16. дно реки

17. pilot tunnel	17. сеть подземных железных дорог
18. number of highways	18. форма конструкции
19. with regard to	пропускная способность

III. Назовите слова, от которых образованы следующие производные слова и переведите их:

Excessively, environmental, assurance, strictly, attractive, explosion, obviously, tightly, obstruction, immensely, insistent, firmly, immersion, initially, diversion, predictor.

IV. Выберите соответствующий перевод следующих английских слов:

1. assurance – уверенность; уверять; уверенный
2. attraction - притягивать; притяжение; притягательный
3. excessive - избыточно; избыточность; избыточность
4. firmly - твёрдо; твёрдость; твёрдый
5. obstruction – препятствовать; препятствующий; препятствие
6. obvious - очевидно; очевидный; очевидность
7. prediction - предсказывать; предсказание; предсказатель
8. tightly - плотность; плотно; уплотнять

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Dictionary

A

adit - вход, проход; штольня, подземная галерея
add(ition) - добавлять
adjustable - регулируемый; передвижной
advance - продвигаться вперед, впереди
access - иметь доступ
access shaft - вход в штольню (шахтная труба)
accompanied - сопровождаемый; сопутствующий
accuracy - точность
ahead - впереди
anticipate - предвидеть, предупреждать
apart - отдельно, врозь
apply - применять
appoint - назначать
appropriation - ассигнование
assurance - гарантия, страхование
attachment - насадка
attractive - привлекательный
avoid - избегать

B

band - зона, область, пояс
bar - бар (единица давления)
belong - принадлежать
bore - бурить, сверлить
bottom - нижняя часть
breakthrough - открытие, прорыв
bridge deck - настил моста
bucket - ковш экскаватора
burrow - пустая порода, отвалы; рыть, копать
bustling - шумный, суетливый

C

careful - тщательный
carry – нести, перевозить
carve - высекать, вырезать
chalk marl - меловая глина, мергель
chamber - отсек, камера, полость
choice - выбор
communication cable - коммуникационный кабель
complete - заканчивать
complicate - сложный
concern - внимание
conclusion - вывод
congested - переполненный, перегруженный
contractor - подрядчик, подрядная организация

contraption - хитроумное изобретение, приспособление
consider – считать, полагать
consolidation - укрепление
conveyor - транспортер, конвейер
costly - дорогостоящий
cross-section - поперечный разрез; профиль
crown - верхняя часть
culvert - водопропускная труба, кульверт
cut and cover - открытая разработка
cut material - отбитый материал
cutting - выемка грунта

D

dammed reservoir - загруженный резервуар
damage - повреждение
dare - осмеливаться
deck - настил, покрытие моста
demand - требовать
deploy - использовать, употреблять
departure - отклонение; уход (от заданных параметров)
destruct - разрушать
device - приспособление, устройство
dig - рыть, копать, выкапывать
dismantle - демонтировать
disturb - беспокоить, мешать
disruption - разрыв
divert - отводить
Division of Bridges - отдел мостов
Dolly - транспортная тележка
DOT - Нью-Йоркский департамент городского транспорта
drill - сверлить, бурить
drilling rig - сверлильное устройство; буровая установка
drift - сдвиг; смещение; отклонение

E

Earth Pressure Balance Machine - проходческая машина для компенсации давления горных пород
earthquake - землетрясение
ease - ослаблять, облегчать, легкость
electricity cable - электрический кабель
encounter - столкнуться (с трудностями)
enormous - огромный
exist - существовать
excessive -чрезмерный
exclude - удалять
explode - взрывать
extend - удлинять

extensive - обширный, громадный

F

face - наружная поверхность
failure - неудача, неуспех
fairly - довольно, весьма
fault - сдвиг горной породы
field - месторождение
firm - твердый
fit - подходить, соответствовать
float - плавать, держаться (поддерживать) на поверхности воды
fracture - разрыв, трещина, перелом
freight - груз

G

gush - литься потоком, хлынуть
girder - балка, ферма (моста)
girder bridge - балочный мост
grouting - заливка цементным раствором; цементация

H

hard rock - скальная порода
haul - транспортировать, перемещать
heading - штрек; горная выработка; туннель

I

immerse - погружать, окунать
inability - невозможность
increase - увеличивать
initial - первоначальный
insist - настаивать
invent (invention) - изобретать (изобретение)
in succession - подряд, один за другим
issue - проблема; задача

J

jack - подъемник; домкрат
jobsite - строительная площадка
join - соединять, присоединяться

K

keen -сильный
key element - особенность; основной элемент

L

lagoon - отстойник
lane - полоса движения
land - земля
latticed trusses - решетчатая ферма
light - легкий

lining - обшивка; облицовка
link - связывать
load - нагрузка
loading - погрузка
lower - опускать

M

maintenance - эксплуатация, техобслуживание
manage - удаваться
miner - шахтер
minor - незначительный
mountains - горы
movement - движение
muck - вынутый грунт
muck car - вагонетка для транспортировки вынутого грунта

N

network - сеть (железнодорожная)

O

obstacle - препятствие
obstruct - препятствовать
obtain - получать
obvious - очевидный, ясный
order - приказывать
over -над, через, сверх
overcome - преодолевать

P

path - путь, дорога
parallel - параллельный, параллель
permeable - негерметичный, проницаемый
permafrost - вечная мерзлота
pile - свая
pneumatic - воздушный; пневматический
point of view - точка зрения
pressurized - прессованный
predict - прогнозировать
propose - предлагать
prospector - изыскатель, старатель
prone - склонный, предрасположенный
prove - доказывать
provide - обеспечивать
pump bucket - манжета
puncture-drilling - точечное бурение
purposeless - беспелезный

Q

quarry - каменоломня, карьер

R

railroad - железная дорога
receiving trench - приемная траншея
reinstating - восстановление
regular - равномерный
reduce - уменьшать
remain - оставаться
remainder - остаток
remote - отдаленный
retractile bridge - откатный мост
requirement - требование
rig устройство- оборудование
rock-chewing - камнедробильный
rough - черновой; грубый; неровный
run зд - отрезок пути
run - простираться

S

sample - образец
satisfy - удовлетворять
sealed - уплотненный, герметичный
seaward - выходящий к морю
self-taught - самоучка
setting - окружение
set up - создавать
sewerage - канализация
screw - завинчивать, закреплять болтами
screw - винтовая линия (шпиндель)
shell shaped - имеющий форму раковины
shield - щит (при проходке туннеля)
similar - похожий
sink - опускаться, тонуть
soft ground - мягкая почва
soil - почва
sloping - наклонный, покатый
span - пролет
spare parts - запасные части
spring - источник, весна
stable - постоянный
stiff clay - среднепластичная глина
strict - строгий
succeed (success, successful) - удаваться (успех, успешный)
submit - представлять

suspension bridge - подвесной, висячий мост
swelling characteristics - характеристика разбухания
swing bridge - разводной мост

T

Temporary - временный
TBM (tunnel boring machine) - проходческий комбайн для горизонтальной выработки
thrust - осевое давление
tight - плотный, непроницаемый
toll - плата за проезд по мосту
torque - затягивать
torrent - поток
track - железнодорожная колея
transport - транспортировка
trenchless method - бестраншейный метод
tricky - «хитроумный»
tunnel-boring machine - тоннелепроходческая машина, комбайн
tunnel shield - проходческий щит
turbulent - бурный
thick(ness) - толстый
Two Double Shield - TBM проходческий комбайн с двумя щитами
twin-arched bridge - двуарочный мост
twin - двойной, сдвоенный

U

unstable - неустойчивый
undertake (undertook) - предпринимать
use - применять, использовать

V

vehicle - любое транспортное средство передвижения
veneer - шпон; каменная облицовка стены
vertical lift bridge - вертикально-подъемный мост
volume - обьем

W

want - нужда
wastewater - сточные воды
water mill - водяная мельница
weigh up - взвешивать
worth - стоящий, заслуживающий