НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ БІОРЕСУРСІВ і
ПРИРОДОКОРИСТУВАННЯ УКРАЇНИ

ПРАКТИКУМ

з англійської мови для студентів ОКР "Бакалавр" будівельних спеціальностей"

Київ-2013

Для студентів ОКР «Бакалавр» з будівельних спеціальності .

У посібнику наведено два блоки: тексти для роботи в аудиторії та тексти для самостійного читання, які охоплюють лексичні та граматичні теми, передбачені навчальним планом для засвоєння студентами ОКР «Бакалавр» І-ІІ курсу.

Рекомендовано Вченою Радою Національного університету біоресурсів і природокористування України.

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TEXT № 1

Before-Reading

1. ***Discuss the following:***

- What is cultural heritage?
- Is it important for us to know our cultural heritage? Why?
  What is a role of architecture in our life?
  What is architecture?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- structural principles
- art of building
- basic factors in architecture
- architectural design
- aesthetic appearance of buildings
- sufficient knowledge of engineering
- theory of architecture
- building materials
- philosophers
- historians
- harmonious

3. ***Make up your own sentences with the following words:***

Architecture (архитектура), ***economic requirements*** (экономические потребности), ***nations and generations*** (нации и поколения), ***historical background*** (историческое происхождение), ***cultural heritage*** (культурное наследие), ***sufficient knowledge of engineering*** (достаточные знания инженерии), ***creative imagination*** (творческое воображение).

While-Reading

1. ***Reading for general understanding. Skim read the text. Think of a good title for it. Compare it with other students' titles.***

2. ***Read and translate the third paragraph from the text:***

The science of building is Architecture. Any engineer cannot take a form of the building without consideration of structural principles, materials, social and economic requirements. So a building cannot be considered as a work of architecture. From the very beginning architecture of many skills, systems and theories have been used for the construction of the buildings that men have housed in all their essential activities. The coexistence of change and survival is evident in all phases of the human story. This change and repetition is clearly illustrated in any architectural style. The historical background of architecture is the value of our cultural heritage. The heritage of the past cannot be ignored. Such recognition of continuity does not imply repetition or imitation. It ust be expressed in contemporary terminology.

Writing on architecture is almost as old as writing itself. There are a lot of books on the theory of architecture, on the art of a building and on the aesthetic appearance of buildings. The oldest book is a work of Marcus Vitruvius Pollio, written in the first century B.C. Nearly two thousand years ago the Roman architect Vitruvius set the

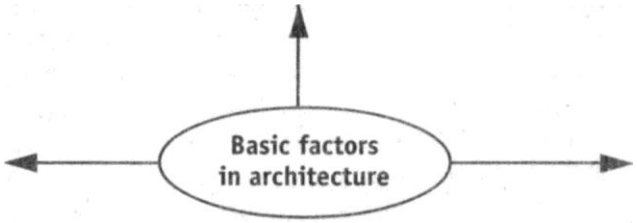
principles upon which buildings should be designed and aims to guide the architect. He was the first who listed three basic factors in architecture — "convenience, strength and beauty". The sequence of these three basic aims — "convenience, strength and beauty" — has its own significance. These three factors are always present and are always interrelated in the best structures. It is impossible for a true architect to think of one of them without considering the other two as well. Thus architectural design entails a consideration of the constant interaction of these factors. At last we can say that every element in a building has a triple implication. At the same time its contemporary expression must be creative and consequently new.

Architecture is an art. The triple nature of architectural design is one of the reasons why architecture is a difficult art. The architect does not first plan a building from the point of view of convenience, then designs around his plan a strong construction to shelter it, and finally adjusts and decorates the whole to make it pretty. It takes him a special type of imagination as well as long years of training and experience to produce a designer capable of making the requisite in the light of these three factors — "use, construction, aesthetic effect" — simultaneously. First of all, the designer must have sufficient knowledge of engineering, building materials to enable him to create economically. I see, any building is built because of some definite human need. The use problem — "convenience" — is therefore primary. In addition, the designer must possess the creative imagination which will enable him to integrate the plan and the construction into one harmonious whole. The architect's feeling of satisfaction in achieving such as integration is one of his greatest rewards.

3. ***Read the text again and find the main idea of each paragraph.***

4. ***Read the text once more and complete the spidergram:***

5. ***Read the text again and complete the following sentences:***



- Architecture is art...
- ...finds little place...
- ...in any architectural style.
- ...change and repetition is clearly illustrated...
- Nearly two thousand years ago...
- ...in all phases of the human story.
- The designer must have a...
- ...have taken great pains...
- ...is one of his greatest rewards.
- The heritage of the past...

6. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- The historical background of nineteenth-century architecture finds little place in this article.
- The heritage of the past cannot be ignored.
- This triple nature of architectural design.
- Nearly five thousand years ago the Roman architect Vitruvius listed three basic factors in architecture.
- The designer must have a sufficient knowledge.
- Architecture is the sport.
- Paradox of change and repetition is clearly illustrated in any architectural style.
- The architect's feeling of love is one of his greatest rewards.

- Of any truly great building we can say that every element in it has a triple implication.
- It is impossible for the true architect.

After-Reading

int _grat_ on, _ rchit_ ct _ral, d_si_ n, c__str_cti_n, ae_th_ti_, e_f_ct, _on_eni__ce, st__ng_h, be__ty, st_u_tu_al, pr_nc_pl_s, m_ter_als, so_ial, _con_mi_, re_uir_m__ts, es_e_ti_l, a_ti_it_es.

2. Make the following sentences negative and put into the interrogative form:

- Architecture is the art and the science of building.
- Books on the theory of architecture, on the art of a building, and on the aesthetic appearance of buildings exist in fair number.
- The designer must have sufficient knowledge of engineering and of building materials.
- Architecture is a difficult art.
- The architect's feeling of satisfaction in achieving such as integration is one of his greatest rewards.

3. ***Find all the sentences where the professional terminology is used, read and translate them. Write the professional terminology.***

4. ***Write down all the nouns from the text in plural.***

5. ***Write down all irregular verbs and their three forms.***

6. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

1. Complete the table (pay attention to degrees of comparison):

structural		
special		
difficult		
sufficient		
		the greatest
strong		
creative		
true		
essential		
architectural		

Get-talking

1. ***Make up a plan to the text.***

2. ***Imagine you are a future skilled engineer. Say some words about basic factors in architecture. Your talk should last a minute.***

TEXT № 2

DESIGN AND BUILD

Before-Reading

1. ***Discuss the following:***

- What do you know about various cultures?
- What is their cultural heritage?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- monument
- building
- structure
- civil engineering
- various cultures
- mobile
- infrastructure
- architect
- pyramids
- conception
- industrial revolution
- design
- final structure
- selection of materials
- type
- size
- mechanical design

3. ***Make up your own sentences with the words from Ex 1.***

While-Reading

1. ***Reading for general understanding. Read the text and answer the following questions to the text:***

- Have various cultures left their imprint on history through their great or small monuments and buildings?
- Great architect and engineers followed an integrated process of conception, design and construction, didn't they?
- Did this integrated construction process persist through the end of the nineteenth century?
- What is the structural design?
- What does engineering of stationary objects such as buildings and bridges imply?

We can not ignore the heritage of the past. There are different styles and kinds of architecture in the past around the world. It is not a secret, that various cultures have left their imprint on history through their great monuments and buildings, great castles and cathedrals. The oldest monuments which are met within architecture are great structures such as Egyptian pyramids, the Parthenon in Athens, the Roman Pantheon, and Hagia Sophia in the "New Rome", Constantinople, great castles and cathedrals of the Middle Ages, the palaces of the Renaissance and the civil engineering infrastructure of the industrial revolution. Great architects and engineers followed an integrated process of conception, design and construction. This integrated construction process persisted through the end of the nineteenth century, when the Roebling family (John, Washington, and Emily) designed and built the Brooklyn Bridge.

It is necessary to select materials, a type, a size and a configuration to carry loads in a safe and serviceable fashion. The architects and engineers mobilize the resources needed to realize the final structure. This classical approach is used to build. In general, structural design implies engineering of stationary objects such as buildings and bridges, objects that may be mobile but have a rigid shape such as ship hulls and aircraft frames. But it is an area of mechanical design, to which devices are generally assigned. These are devices with parts planned to move with relation to each other.

2. ***Read and translate the first paragraph from the text.***

Read the text again and complete the following sentences:

Various cultures have left
These great structures were
This classical approach was used
This integrated construction process persisted
Devices with parts planned to move with

4. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- Various cultures have left their imprint on history.
- This classical approach was used to build the great stadiums.
- Great architects and engineers followed an integrated process of conception, design, and construction.
- This integrated construction process persisted through the end of the first century.
- The selection of materials and member type, size and configuration to carry loads in a safe and serviceable fashion.

After-Reading

Grammar focus

1. ***Complete the following words from the text:***

mon _me_t, s_le_tio_, m__eri_l, str_ct__e, s_ze, _onf_gu__tion, me__an_cal, _nd_str_al, rev_lut_on, c_nstru__ion, f_sh__n.

2. ***Write down all the nouns from the text in plural.***

3. ***Make the following sentences negative and put into the interrogative form:***

- These great structures were by "master building or monument".

- Great architects and engineers followed an integrated process of conception, design, and construction.
- The selection of materials and a type, a size and configuration to carry loads in a safe and serviceable fashion is necessary.

4. ***Find all the sentences from the text with the forms of the verb "tobe". Copy them in your exercise-books.***

5. ***Translate from Russian into English:***

- Различные культуры оставили след в истории.
- Это большие памятники и здания, египетские пирами-ы: Парфенон в Афинах, римском Пантеоне и Хагии Софии в «Новом Риме», Константинополе.
- Мы не вправе игнорировать наследие прошлого.
- Архитекторам и инженерам необходимо использовать все ресурсы, нужные для завершения постройки.

Get talking

1. ***Imagine you are a future skilled engineer. Say some words about structural design. Your talk should last a minute.***

2. ***Prepare reports about great monuments and buildings of Russian architects and engineers. A report should include 2000—3000 words.***

TEXT № 3

THE EGYPTIAN PYRAMIDS

Before-Reading

1. ***Discuss the following:***

- What the oldest monuments of architecture do you know?
- What pyramids do you know?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- sort of material
- different styles
- triangular buildings
- colossal pyramids
- civilization
- ancient Egypt

3. ***Make up your own sentences with the words from Ex.1.***

While-Reading

1. ***Reading for general understanding. Read the text and answer the following questions to the text:***

- What problems did the Egyptian architects have?
- What materials were for construction of pyramids used?
- What is an Egyptian pyramid?
- What interesting facts do you know about the Egyptian pyramids?
- What do they tell us about civilization?

It was mentioned, that Architecture is the science of building. A man who designs buildings and makes the plans for them is called an architect. First of all, an architect has to think what he wants to build. He must not forget what it is to be used for. He must not forget the sort of material to be used in the building. It may be stone, a brick, wood or steel and concrete.

We know that Architecture is the art, which makes buildings beautiful to look at. There were many different styles or kinds of architecture in the past. Now they tell us about advanced civilization of ancient countries. One of the oldest monuments, constructed about 6.000 years ago, are the colossal pyramids of Egyptian. The pyramids are large triangular buildings which were placed over the tombs of Egyptian kings. The best known of the pyramids are a group of three built at Giza south of Cairo. The largest of these is 482 feet high. There are many building of different styles today in different parts of the world, which are much spoken about in our days.

2. ***Read and translate the text.***

3. ***End and translate all the sentences containing the following words:***

- Different styles
- triangular buildings

- a sort of material
- an advanced civilization
- make the plans, kinds of architecture

4. ***Read the text again and complete the sentences:***

- ...many different styles or kinds...
- ...the sort of material to be used...
- ...are a group of three built at...
- ...which are met within architecture...
- ...man who designs...
- They tell us of the advanced...
- He must not forget...
- Architecture is the art...
- ...to think not only of what...
- The largest of these is...
- ...the colossal pyramids...

5. ***Read the statements and say whether they are true or false. Correct the false statements:***

- The oldest monuments were constructed about 4,000 years ago.
- A man who designs buildings and makes the plans for them is called the singers.
- The pyramids are large square buildings.
- Architect must not forget the sort of material to be used in the building.
- The largest of pyramids is 582 feet high.
- Architecture is the art which makes buildings beautiful to tell at as well as useful.
- The best known of the pyramids are a group of three built at Giza south of Cairo.
- Architect thinking about the sort of material to be used in the building.
- Architect has to think not only of what he wants the building to look like when it is finished, but also what it is to be used for.
- Monuments which are met within architecture are the colossal pyramids of Egyptian.

After-Reading

Grammar focus

1. ***Write all the following nouns in plural:***

a day, a civilization, a group, a king, a tomb, a year, a pyramid, a monument, a world, a kind, a style, a concrete, steel, wood, a brick,, a stone, a material, a sort, a plan, a building, an art, an architecture.

2. ***Complete the table (pay attention to degrees of comparison):***

useful		
different		
		the oldest
colossal		
		the most
large		the largest
triangular		
		the best
high		
ancient		

3. ***Write the words in the correct order to make sentences and translate them into Russian:***

- Is, architecture, art, the.
- The, of, past, have, in, been, different, kinds, there, or, architecture, styles, many.
- Large, are, triangular, pyramids, the, buildings?
- He, of, the, not, the, be, sort, material, must, forget, to, used, in, building.
- Stone, this, and, be, brick, wood, may, or, concrete, steel.

4. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

5. ***Translate from Russian into English:***

Архитектор — человек, проектирующий здание. Архитектор должен позаботиться как о внешнем виде здания, так и о его пригодности к использованию. Строительными материалами могут быть камни, кирпичи, сталь и др. Один из древнейших памятников архитектуры — Египетские пирамиды. Они (пирамиды) могут рассказать нам о многих загадках прошлых цивилизаций. Около Каира расположены три самые известные пирамиды.

Get talking

1. ***Make up a dialogue about the Egyptian pyramids. It should include 20 phrases.***

2. Prepare reports about great colossal pyramids of Egypt. A report should include 2000-3000 words.

TEXT № 4

FORMS AND FUNCTIONS OF ARCHITECTURE

Before-Reading

1. ***Discuss the following:***

- What do you know about a work of a real architect?
- What do you think about the value of true architecture?
- What forms of architecture do you know?
- There are some who claim that architecture is not a fine art at all. Do you agree or disagree?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- value of true architecture
- physical structure
- variations of plane, colour, shade
- escalator
- elevator
- hall
- corridor
- human activities
- to create a work of architecture
- adequate structure
- civilization
  - decorative elements
  - drawing
  - design
  - actual building

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Read the text again and translate the first paragraph:***

First of all, the value of true architecture lies in the direct effect of the structure itself. It depends on many reasons. One of them is a drawing. Drawings are works of architecture. An architect uses drawings to achieve his objective. In fact, drawings can represent buildings only on paper. It is called "paper architecture". We mean the result of architect's thinking of drawings. But , there is a danger of "paper architecture". The architect mustn't forget that many elements which look well on a drawing may be either completely ineffective or definitely harmful in the actual building. For example, it is electric architecture. Electric buildings are full of decorative elements which look well on the drawing. Perhaps even seem necessary on the drawing. But in the actual buildings they are completely meaningless. An architect is able to see variations of a plan, of color and a shade. Each of these variations is due to the effects of light on the building materials employed. The architect must always study each detail from the viewpoints of both use and appearance as well as from that of

construction. He must not see it as an isolated detail but as an individual note in a great composition. A work of an architect exists only when it stands a complete, concrete object for all to see or to use.

The architect must project an integration of the whole in order to create a work of architecture. He must remember about the

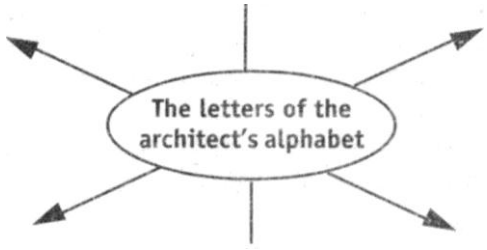
architect's alphabet. Knowledge of this alphabet is as essential to him as knowledge of words to the writer or of notes to the musician. The letters of the architect's alphabet are such elements as walls and openings, supports and ceilings, enclosed areas or rooms. We enter the building and our attention meets the same complexity of elements. They are doors to allow ingress and egress; windows to admit light and air; walls for shelter or support; roofs to keep out the rain, snow, cold, and sometimes sun. A partition separates space from space. There may be stairs, escalators, or elevators to allow progress from level to level and halls or corridors to permit easy circulators from part to part. Finally there may be all sorts of interior spaces for definite human activities — rooms both public and private — to take care of the varying functions of human living. No building can exist without some of them.

Any true architectural design is no mere fantasy, no unreal dream. It contemplates an actual building. There must be adequate structure for a building to exist. Then we observe the physical structure of a building outside. Next, "strength" becomes the second necessity for the construction. A true construction must stand up solidly.

Finally, mankind has always realized that buildings to be complete must have not only "convenience" and "strength", but also "beauty". Some people think that architecture is not a fine art at all. For such people the world of fine arts is something entirely set apart from ordinary living and that its single purpose should be satisfying of physical necessities. At the same time architecture is a matter of pictures or sculpture, poems or music. The architect has the task of being an artist as well as an inventive engineer. The expression of the purpose of buildings would seem to call for additional thought on this point. The emotions are evoked by beauty. It may be theaters, churches, dwellings and buildings, which always differ from one another. Yet a separate consideration of an individual building is a very real artificial sense.

3. Read the text again and find the main idea of each paragraph

4. ***Read the text once more and complete the spidergram:***



5. ***Read the text again and complete the following sentences:***

- The value of true architecture...
- ...must always study each detail...
- We enter the building...
- ...on the building materials employed.
- A knowledge of this alphabet...
- ...must be a true...
- ...as things in themselves.
- ...uses drawings to achieve...
- The danger of...
- ...to point out...
- ...in the actual building.

- Paper architecture...
- ...is the result of thinking...
- ...they are completely meaningless.
- A valid criticism against...

6. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- The value of true architecture lies in the direct effect of the structure itself.
- Inside we observe the physical structure.
- We see variations of plane, of color and shade.
- The architect must never study each detail.
- Any building exists for some particular purpose.
- For such people, the world of fine arts is something negative.
- The engineer has the task of being an artist as well as an inventive architect.
- The construction of any object must be a true construction.
- There are doors to allow ingress and egress.

After-Reading

Grammar focus

1. ***Find all the sentences where the professional terminology is used, read and translate them. Write the professional terminology.***

2. ***Make the following sentences negative and put into the interrogative form:***

- A partition separates space from space.
- The value of true architecture lies in the direct effect of the structure itself.
- The architect must always study each detail from the viewpoints of both use and appearance.
- He must continuously see it not as an isolated detail but as individual note in a great composition.
- The architect has the task of being an artist as well as an inventive engineer.
- The sequence of these three basic aims — "convenience, strength and beauty" — has its own significance.
- The expression of the purpose of buildings would seem to call for additional thought on this point.
- Any true architectural design is mere fantasy, unreal dream, but contemplates an actual building.
- For a building to exist there must be adequate structure.
- Such elements — walls and openings, supports and ceilings, enclosed areas or rooms — are the letters of the architect's alphabet.
- There are doors to allow ingress and egress; windows to admit light and air; walls for shelter or support, or both; roofs to keep out the rain, snow, cold, and sometimes sun.
- The architect uses drawings to achieve his objective.
- A work of architecture exists only when it stands complete.
- The dangers of "paper architecture" are very small.
- Paper architecture is the result of thinking of engineers.
- In fact, drawings can't represent buildings only symbolically.

3. ***Find all the sentences containing modal verbs "must", "can". Copy them in your copy-books.***

4. ***Find alt the sentences from the text with the forms of the verb "to be". Copy them in your exercise-books.***

5. Write down all irregular verbs and their three forms.

Get talking

6. Complete the table (pay attention to degrees of comparison):

strict		
adequate		
fine		
human		
physical		
magnificent		
political		
harmful		
separate		
economic		

7. ***Write down all the nouns from the text in plural.***

1. ***Make up a plan to the text.***

2. ***Work in pairs. Discuss: a) forms of architecture;***
b) functions of architecture.
Your dialogues should include 20 phrases.

TEXT № 5
EMERGENCE OF DESIGN PROFESSIONALS

Before-Reading

1. ***Discuss the following:***

- How many societies representing the building design professions do you know?
- What architects of the Renaissance do you know?

2. Try to guess the meaning of the following words. Use the dictionary if you need:

- regulation
- role
- process
- mathematical models in building
- professionalism
- nation building codes
- model of licensed professions
- discipline

3. ***Make up your own sentences with the following words:***

New building types (новые проекты зданий), ***a building science*** (наука о строительстве), ***licensed professional*** (лицензированныйпрофессионал), ***a rise of professionalism*** (рост профессионализма), ***responsibility of an architect*** (обязанность архитектора), ***an industrial age*** (век индустриализации), ***large-scale buildings*** (крупномасштабные здания).

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Reading for specific information. Read the text and answer the following questions to the text:***

- When was a major change in the role of the architect?
- What was the response of the architect?
- One of the first buildings for which the architect and engineer were separate persons was the Granary in Paris, wasn't it?
- Were old societies representing the building or writing design professions found?

We have mentioned that architecture is a science of building. On one hand, coming of a building science also marked a major change in the role of an architect. The response of the architect was to develop a new role of licensed professional, on the model of licensed professions such as law and medicine. I t meant a bewildering range of new building types. On the other hand, with coming of a building science, there was a further division of labour in the design process. Some new disciplines appeared to teach engineers and architects. One of them was structural engineering as a separate discipline specializing in the application.

We know that for building an architect and an engineer are needed. One of the first buildings for which an architect and an engineer were separate persons was the Granary (1811) in Paris. The building design professions were founded, including the Institute of Civil Engineers (1818) and the Royal Institute of British Architects (1834), both in London, and the American Institute of Architects (1857). Official government licensing of architects and engineers was not realized until beginning with the Illinois Architects Act of 1897. With the rise of professionalism was the development of government regulation, which took the form of detailed municipal and nation a building codes specifying both prescriptive and performance requirements for buildings.

3. ***Find and translate all the sentences containing the following words:***

- coming of a building science
- structural engineering
- building design professions
- building codes

4. ***Read the text again and complete the following sentences:***

- Coming of the industrial age also...
- The response of the architect was...
- One of the first buildings...
- With the rise...
- On the other hand, with the coming of a building science...
- Official government licensing of...

5. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- Coming of the renaissance age also marked a major change in the role of the engineer.
- Two of the first buildings for which the architect and engineer was separate person were the Granary (1800) in Paris.
- Societies representing the building design professions were not founded.
- We know that for building an architect and an engineer are needed.
- One of them was structural engineering as a separate discipline specializing in the application.

After-Reading

S_ien_e, gov__nme_t, r_spon_e, co_mi__ion, des__n, m_di_ine, reg_la__on, ma_ket, inst_tut_, of_ici_l, p_tron, di_cipl_ne, s_c_ety, div_si_n, labo_r, demo_ra_y.

2. ***Find all the sentences where the professional terminology is used, read and translate them. Write the professional terminology.***

3. ***Find all the sentences where the dates are used, read them and translate. Write the dates in letters.***

4. ***Write down all the nouns from the text in plural.***

5. Put "was" or "were" in.

- The response of the architect to develop the new role of licensed professional on the model of licensed professions such as law and medicine.
- Concurrent with the rise of professionalism the development of government regulation, which took the form of detailed municipal and nation building codes specifying both prescriptive and performance requirements for buildings.
- There a further division of labour in the design process.
- Societies representing the building design professions founded, including the Institute of Civil Engineers (1818) and the Royal Institute of British Architects (1834), both in London, and the American Institute of Architects (1857).
- One of the first buildings for which the architect and engineer separate persons the Granary (1811) in Paris.
- Official government licensing of architects and engineers, goal of these societies, not realized until much later, beginning with the Illinois Architects Act of 1897.

6. ***Translate from Russian into English:***

Главные архитекторы Ренессанса находились под двойным контролем церкви и государства, от которых зависели их полномочия. В растущей индустриальной демократии, зависящей от рынка, возрастало количество зданий, достойных внимания архитекторов, а заказчики требовали, чтобы диапазон новых зданий расширятся. Кроме того, с приходом науки о зданиях происходило дальнейшее разделение в дизайнерском процессе: структурное инженерное искусство появилось как разделение дисциплин, специализирующихся на приложении математических моделей в строительстве. Одним из первых зданий, для которых произошло разделение функций архитектора и инженера, было Granary в Париже.

Get talking

1. ***Discuss in pairs. Make up a dialogue about «A major change in the role of the architects". It should include 20 phrases.***

2. ***Prepare reports about well-known large-scale buildings in the world. A report should include 2000-3000 words.***

TEXT № 6
A CONTRACT BETWEEN THE CLIENT AND THE CONTRACTOR

Before-Reading

1. ***Discuss the following:***

- What do you know about a contract?
- Have you signed any contract?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- commission for a building
- client
- preliminary plans
- building contractors
- correct any defects
- exact dimension of every part of the building
- final design

While-Reading

1. ***Reading for general understanding. Skim read the text. Think of a good title for it. Compare it with other students' titles.***

2. ***Reading for general understanding. Read the text, choose a right word.***

After receiving *(commission, a plan, money)* for a building, an architect meets a *(client, friend, relative)* and discusses his requirements. After visiting the site, the architect draws up a preliminary plan. Then the architect submits the *(cost, price, money)* to the client for his approval. If the client suggests anything, the architect incorporates them into the final design. Only the final design shows the exact dimension of every part of the building. At this *(stage, level)* several building contractors are invited to bid for the job of constructing the building. When they submit their lenders or prices, the architect assists his client in selecting the best one and helps him to draw up a *(contract, picture)* between the client and the contractor.

Then a work starts on the *(building, lesson).* The architect makes periodic inspections to make sure that the building is being constructed according to his plans and that the *(materials, instruments)* specified in the contract are being used. The client pays the *(bills, work)* from the contractor during the building period. At the end of the building the contractor completes the *(building, work, and lesson)* and the client occupies it. After completing there is a *(period, time)* known as the "defects liability period". During this period the *(contractor, client)* must correct any defects that have appeared in the fabric of the building. Finally, when all the defects have been corrected, the client takes full *(possession, work)* of the building.

3. ***Read and translate the second paragraph from the text.***

4. ***Reading for general understanding. Read the text again and answer the following questions to the text:***

- When does an architect meet the client?
- When does an architect draw up preliminary plans?
- When are building contractors invited?

- When does an architect make periodic inspection?
- What is the "defects liability period"?

- When does the client take full possession of the building?

5. ***Now find a word or an expression in the passage which means:***

- to be given the job of designing a building
- to offer to a client for his consideration
- to offer to do some work at a certain price
- to look at the building work in detail at regular intervals
- an interval of time after the building has been finished
- a contractor is responsible for correcting any faults in it
- to have complete ownership of the building

After-Reading

Grammar focus

1. ***Write all the following nouns in plural:***

An architect, a commission, a building, a client, a cost, a dimension, a price, a lender, a contract, a material, a period,
a defect.

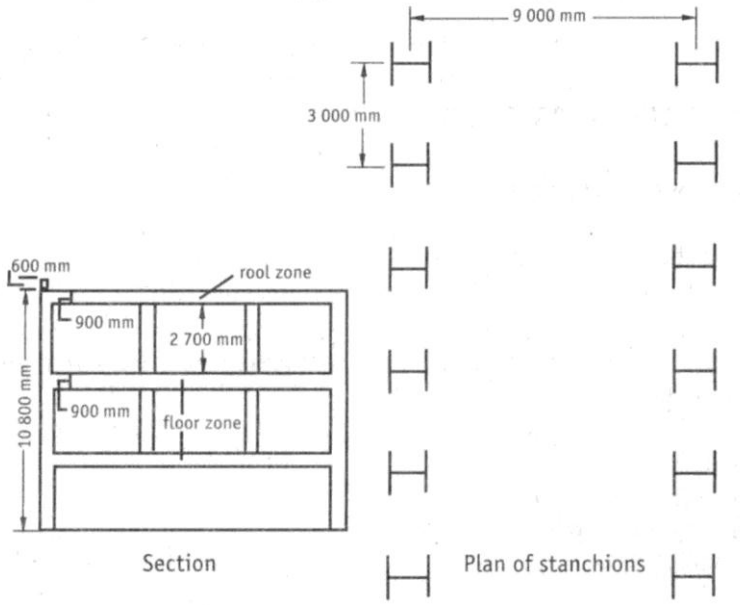
2. ***Write the following words in correct order to make sentences and translate them:***

- An, meets, the, architect, his, requirements, and, client, discusses.
- The, draws, architect, plans, up, preliminary.
- The, takes, of, possession, the, building, full, client, the building.
- The, occupies, contractor, and, completes, it, building, client, the.
- The, work, building, now, starts, on.

3. ***Find all the sentences from the text with the forms of the verb "to be". Copy them in your exercise-books.***

4. ***Look at these drawings of the same building. Make up sentences saying what the dimensions marked on the drawings are:***

Example: The floor to ceiling height is 2 700 mm.



Get talking

1. ***Imagine you are a future skilled architect. Say some words about "A contract between the client and the contractor". Your talk should last a minute.***

TEXT № 7
THE ARCHITECTURAL ENGINEERING

Before-Reading

1. ***Discuss the following:***

- What are technological aspects of buildings?
- Do you want to be an architectural engineer?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- technical detail
- building material
- illumination
- master builder
- to wall construction
- wall line
- structural design
- architectural engineering
- technological aspect
- environmental system
- communication
- monument
- mechanical code
- construction techniques in buildings

3. ***Match the following words with their Russian equivalents:***

- fire protection
- fair conditioning
- storm drainage
- architectural engineering
- a monument
- construction management
- a castle
- a cathedral
- a load
- a ship's hull
- управление строительством
- корпус судна
- памятник
- инженер-архитектор
- собор

- пожарная безопасность
- штурмовать дренаж
- груз
- замок
- кондиционирование

While-Reading

1. ***Reading for general understanding. Skim read the text. Think of a good title for it. Compare it with other students' titles.***

Engineering is a complex discipline, including a lot of fields. One of them is an architectural engineering. It is a discipline that deals with the technological aspects of buildings. They are the properties and behavior of building materials and their components, foundation design, structural analysis and design, construction management, and building operation. Besides architectural engineering deals with environmental system analysis and design. Every engineer knows an environmental system, which may account for 45—70% of a building's cost, includes heating, ventilating and air conditioning, illumination, building power system, plumbing and piping, storm drainage, building communications, acoustic, vertical and horizontal transportation, fire protection, alternate energy sources, heat recovery, and energy conservation. In addition, it is necessary to help protect everybody from unnecessary risk. That's why architectural engineers must know and be familiar with the various building codes, plumbing, electrical and mechanical codes, and the Life Safety Code. The latter code is designed to require planning and construction techniques in buildings which will minimize possible hazards to the occupants.

2. ***Reading for specific information. Read the text again and answer the following questions to the text:***

- What is the architectural engineering?
- May environmental system account for 45—70%?
- For what must architectural engineers be familiar with the various building codes?

3. ***Find and translate all the sentences containing the following words:***

- to storm drainage
- the Life Safety Code
- to mobilize the resources
- civil engineering infrastructure
- to contain desirable interior environmental conditions

4. ***Read the text again and complete the following sentences:***

- Environmental system, which may...
- The latter code is ...
- ... A discipline that deals with the...
- In addition, ...
- ...architectural engineering.

5. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- Environmental systems, with may account for 35-90% of a building's cost, don't include heating.

A discipline that deals with the technological aspects of buildings, including the properties is an architectural engineering.

- The latter code is designed to require planning and construction technologies in buildings which will minimize possible hazards to the occupants.
- Including the properties and behavior of building materials and components, foundation design, structural analysis and design, environmental system analysis and design, construction management, and building operation.
- Engineering is a simple discipline.
- That's why architectural engineers must not know and be familiar with the various building codes.
- Every engineer does not know an environmental system.

After-Reading

Grammar focus

ar__itect_ral, eng_ne_r_ng, te__nolo__cal, te__ni_ue, il__min_ti_n, m_nag_me_t, p_bli_, min_mi_e, aco_sti_s, en__gy.

2. Find all the sentences where the professional terminology is used, read and translate them. Write the professional terminology.

3. ***Write down all irregular verbs and their three forms.***

4. ***Translate from Russian into English:***

Архитектурная инженерия — дисциплина, которая имеет дело с технологическими аспектами зданий:

1) учитывает свойства и поведение строительных материалов и их компонентов;
2) проектирует фонд основания;
3) проводит структурный анализ проекта.

Get talking

1. ***Prepare reports about Great Russian architects and engineers. A report should include 2000—3000 words.***

TEXT № 8

BUILDING CONSTRACTION

Before-reading

1. ***Discuss the following:***

- Can you imagine Building Construction of the first men's houses?
- Do you know anything about the first building materials?
- What is your own point of view about the present state of building construction?

2. ***Try to guess the meaning of the following words. Use the dictionaryif you need:***

- functional
- human
- a wide variety of climates
- long periods
- ceremony
- symbolic
- history of building
- natural materials
- synthetic materials
- coordinate a work
- construction management
- quality control

3. ***Match the following words with their Russian equivalents:***

- building constructions
- construction progress
- quality control
- building materials
- synthetic materials
- a development of stronger materials
- construction management
- строительные материалы
- контроль качества
- развитие крепких материалов
- строительные конструкции
- строительный прогресс
- строительный менеджмент

- синтетические материапы

While-Reading

1. ***Read the text and find new words from the text.***

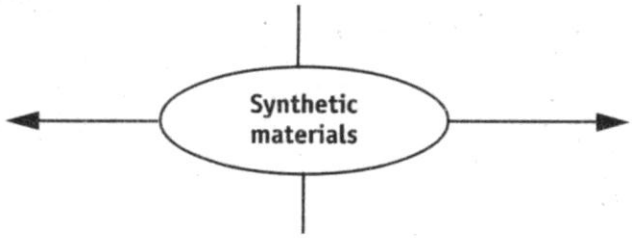
2. ***Reading for general understanding. Skim read the text. Think of a good title for it. Compare it with other students' titles.***

3. ***Read and translate the third paragraph from the text:***

One of the ancient human activities is building construction. That began with a purely functional need for a controlled environment to moderate the effects of climate. Human shelters were constructed to adapt human beings to a wide variety of climates and become a global species. But temporary structures were used only a few days or months. Over time were they evolved into such a highly refined form as the igloo. After adventing agriculture, people began to stay in one place for long periods. That's why more durable structures began to appear. The first human shelters were very simple. The first shelters were dwellings. But later they were used for other functions, such as food storage and ceremony. Some structures began to have symbolic as well as functional value, marking the beginning of the distinction between architecture and building. Building construction has its own history, which is marked by a number of trends. Let's describe some of them. One of these trends is increasing durability of the materials. The first building materials were perishable. We mention leaves, branches and animal hides. Later people began to use more durable natural materials such as clay, stone, timber. Finally, synthetic materials such as bricks, concrete, metals, plastics were used in building. Another trend is quest for buildings of greater height and span. It was possible by the development of stronger building materials and by knowledge of how materials behave and how to exploit them to greater advantage. The third trend involves the degree of control exercised over the interior environment of buildings: increasingly precise regulation of air temperature, light and sound levels, humidity, air speed. All factors that affect human comfort become possible. A modern trend is change in energy of the construction progress, starting with human muscle power and developing toward the powerful machinery.

The present state of building construction is complex. There is a wide range of products and systems which are aimed primarily at groups of building types. We know about a great role of the design process for buildings. It draws upon research establishments that study material properties and performance, code officials. Last ones adopt and enforce safety standards and design professionals who determine user's needs and design a building to meet those needs. It proves that the design process for buildings is highly organized. The construction progress is also highly organized. It includes the manufacturers of building products and systems. On the building site craftsmen assemble themselves. A work of the craftsmen is employed and coordinated by contractors. There are also consultants
who specialize in such aspects as construction management, quality control and insurance. We must mention about complexity and measure of mastery of natural forces, which can produce a widely varied built environment to serve the needs of society. In conclusion, modern building construction is a significant part of an industrial culture.

4. ***Read the text again and find the main idea of each paragraph.***



5. ***Read the text again and complete the following sentences:***

- One of these trends is the increasing...
- ...building construction...
- Human shelters were...
- ...is market by a number of trends.
- Over time temporary structures...

6. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- One of the ancient human activities is building construction.
- The present state of building construction is simple.
- In conclusion, modern building construction is a unimportant part of an industrial culture.
- Over time they evolved into such highly refined forms as the igloo.
- It draws upon research establishments that study clothes and performance, code officials.

After-Reading

Grammar focus

1. ***Write the words in the correct order to make sentences and translate them into Russian:***

- shelters, the, dwelling, first, were.
- building, is, of, culture, industrial, construction, significant, part, today.
- for, is, another, buildings, guest.
- gradually, began, durable, more, structures, began, to, appear.
- trend, degree, involves, the, a, major, third, degree, control, over, of, exercised, environment, the, interior, buildings, of.

2. ***Write down all the nouns from the text in plural.***

3. ***Write down all irregular verbs and their three forms.***

4. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

TEXT № 9

ARCHITTECTURAL DESIGN OF A BUILDING

Before Reading

1. ***Discuss the following:***

- Why do we have to design a house in the building?
- What considerations will affect the design?
- What problem is met during the whole period of construction on the building site?

2. ***Match the words with their Russian equivalents:***

- orientation and surveying
- soil
- transportation
- styling of a building
- footing and foundation
- to erect
- excavation

- sewerage line
- exterior
- ceiling height
- electric power line
- location and levels of existing sewer and water mains
- water supply line
- опора и фундамент
- канализация
- экстерьер
- проектировка здания
- перевозка
- раскопки
- связь и уровни канализации и водоотведения
- предельная высота
- геодезическая съемка
- почва
- водосток
- воздвигать, сооружать

- линия электропередачи

3. ***Make up your own sentences with the following words:***

an exterior (экстерьер), ***to erect*** (воздвигать), ***an electric power line*** (линия электропередачи), ***an excavation*** (раскопки экскаватором), ***a transportation*** (транспортировка).

While-Reading

1. ***Find and translate all the sentences, containing the followingwords:***

- sufficient depth
- exterior
- foundations
- water supply line
- transportation
- style
- soil

2. ***Reading for specific information. Read the text, choose a right word.***

Orientation and surveying of the Building. Before beginning the *(construction, work)* of any building it is necessary to consider several *(problems, ideas)* closely connected with the lot where the *(building, monument)* is to be erected. Some of these problems are as follows:

Soil. (*Soil, land)* is a very important problem in the building of any house. The land may have a sufficient *(depth, high)* of rich top soil, but beneath may be a ledge of soil rock. In this way the excavation of the basement is very expensive, especially in climates where the footings must be carried down below the *(frost, rain, sun)* line.

Transportation. The problem of *(transportation, soil)* is the most important during the whole period of *(construction, time)* on the building site. One must see whether there are sufficient means of erecting ways for bringing up the *(materials, people)* and men for a building site. One must also see if there is a sewerage line,water supply line, *(gas, water)* line, electric power line. The most important thing is how all of them can be used.

Surveying. A survey is a piece of land's plan, showing its exact dimensions and *(level, range)* of existing sewer and water mains, electric light, gas services, etc.

Styling of a building. When all the things have been carefully considered, another *(point, idea)* must be kept in mind. This is the "style" which the building is to be planned in. We mention its *(exterior, interior).* If we have to design a house, there is a number of practical considerations which will affect the *(design, picture).* Here are some of them: 1. Height of the first floor above ground. 2. Ceiling heights. The height of the ceiling is a matter to be determined by the designer.

Footing and foundations. Now we shall consider separate parts of a building, beginning with *(footing, style)* and foundations. The extra of the wall at the bottom can be obtained by making the wall thicker. It depends below the ground *(surface,level).*

3. ***Reading for specific information Read the text and answer the following questions to the text:***

- Is soil a very important problem in the building?
- What are the functions of the foundations and walls?
- How does soil influence on the building of any house?
- What is surveying and styling of the building?
- Why may the excavation of the basement be very expensive?

4. ***Read the text again and complete the spidergram:***

5. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- The transportation isn't problem during the whole period of construction on the building site.
- Before beginning the construction of any building you should to consider several problems which connected with the lot where the building is to be erected.
- The land may have a ledge of soil rock, which will make the excavation of the basement very easy.
- The land may have a sufficient depth of rich top soil.
- Exterior is the "style" which the building is to be planned in.

6. ***Read the text again and complete the following sentences:***

- The height of the ceiling that is clear height from floor to ceiling is...
- Now we... with footing and foundations.
- ...is the most important during the whole period of construction on the building site.
- ...is a plan of a piece of land showing it's exact dimensions and levels.... electric light,...
- When all the things ...

After-Reading

Grammar Focus

1. ***Complete the following words from the text:***

Or __ntat __ n, s o l , n e e s a r y , t r n s p ____ tation, f o u d t i o n , s u f i ent, b o t o m , xcavtion, _are_ul_y, desi _ er, g r u n d , s_____ fa_e, pr_cti_al, _on_ider_tion, s ve_, d_men_ion.

2. ***Write all the following nouns in plural:***

A construction, a building, water, a plan, a problem, a land, a style, a foundation, a wall, a level, a floor, soil, a man, a rock, a ceiling, thickness, a bottom, a line, gas, power.

3. ***Find all the sentences from the text with the forms of the verb "to be". Copy them in your exercise-books.***

4. ***Make the following sentences negative and put into the interrogative form:***

- Soil is a very important problem in the building of any house.
- This is the "style" which the building is to be planned in, in other words, its exterior.
- There is a number of practical considerations, which will affect the design.
- Now we shall consider the separate parts of a building.
- Beneath may be a ledge of soil rock.

5. ***Translate from Russian into English:***

- Земля может иметь достаточную глубину плодородной почвы, под слоем которой может быть слой скалистой почвы, что является причиной дорогих раскопок под основания зданий.

- Проблема транспортировки существует на протяжении всего периода строительства.
- При строительстве необходимо учитывать, есть ли канализация, проведена ли вода, газ и электричество, и как можно их использовать.
- Обзорный план участка земли показывает точный размер коллектора и наличие воды, света и газа.
- Дополнительная толщина стены в основании может быть достигнута за счет утолщения основания.

Get talking

1. ***Imagine you are a future skilled engineer. Give a summary of the text" Architectural Design of a Building" in 150 words.***

2. ***Work in pairs. Discuss: a) Architectural Design of a Building.***
Your dialogue should include 20 phrases.

TEXT № 10 FOUNDATION

Before-Reading

1. ***Discuss the following:***

- What is a role of building's foundations?
- What do you think about the problems involved in laying building's foundations?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- builders
- building's foundations
- stable
- mechanics
- foundation engineer
- hollow concrete box
- ventilating plants

While-Reading

1. ***Read the text and find new words from the text.***

2. Find and translate all the sentences containing the following words:

- a tall modern structure
- solid shafts

- building's foundations
- heating and ventilating plants
- weight of a building
- a separate solid block
- pouring in the concrete

3. ***Read the text again and translate it.***

We have mentioned about some problems connected with building. One of them is a foundation. Architects and engineers are aware of the problems involved in laying building's foundations. They do not always realize to what extent the earth can be pressed down by the weight of a building. Too little allowance has sometimes been made for the possibility of a heavy structure's sinking unevenly. There are a lot of examples of foundations' problems. One of them is the Leaning Tower of Pisa. Why did the Leaning Tower of Pisa lean? The answer is that its foundations were not soundly laid. Though the Leaning Tower is 14 feet out of the perpendicular, it has never toppled. But there is a way out. As the building began to lean over, the builders altered the design of the tipper stories to balance it. At the same time as one side of it sank into the ground, the earth beneath was compressed until it became dense enough to prevent further movement.

That's why a foundation engineer has a lot of work. But in a tall modern structure the load may be very heavy indeed. I N this way the foundation engineer has an extremely important job to do. To begin with, he must have thorough understanding of soil mechanics, which entails a scientific study of the ground to see what load it can be without dangerous movement. WE know that trial pits, holes can be. So the engineer must collect undisturbed samples of earth from various depths. By examining this, the engineer can forecast the probable shifts in the earth during and after building, according to the sort of the foundation he designs. Thus he comes to the most important decision of all in the building's construction. He decides whether the earth is a type that can best support each column on a separate solid block, or whether he must aim at lightness.

It is important for the foundation engineer to know about different types of the ground. If it is a firm ground at great depth, the foundation engineer may use piles. These are solid shafts made either by driving reinforced, concrete deep into the ground, or by boring holes in the earth and pouring in the concrete. Each pile supports its load in one, or two ways. It may serve as a column with its foot driven into solid earth. At the same time it may stand firm because friction along its sides "grips" the column and prevents it from sinking.

But it may be a question of building's floating. In this way the foundations take the form of a vast, hollow concrete box. This box is divided into chambers. These ones will be house heating and ventilating plants as well as provide garage and storage space for the building.

The situations may be different. There are no problems at all or few of them. It can be if the earth is stable. Buildings stand on hard rock like granite or ironstone. For them neither piles nor need flotation be used. It is the best time for those foundation engineers whose buildings stand on the foundations possessing few problems.

4. ***Reading for specific information. Read the text and answer the following questions:***

- What has been done to prevent the Leaning Tower of Pisa from toppling down?
- What is the most important for the foundation that an engineer must know?
- What must engineer learn before deciding what type of foundation is necessary for that soil?
- What types of foundations are mentioned in the article?
-

5. ***Read the text again and find the main idea of each paragraph.***

6. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- For them neither piles nor need flotation be used.
- These are solid shafts made either only by driving reinforced.
- This box is divided into chambers.
- Architects and engineers are aware of the problems involved in laying a building's foundations.
- If firm ground has been found only at great depth, the foundation engineer may use piles.
- If the earth is stable, laying the foundations of small buildings possess few problems.
- Each pile supports its load in three ways.

After-Reading

Grammar Focus

1. ***Complete the table (pay attention to degrees of comparison):***

		the earliest
heavy		
stable		
little		
small		
tall		
modern		
scientific		
		the most important
dangerous		

2. ***Write down all the nouns from the text in plural.***

3. ***Make the following sentences negative and put into the interrogative form:***

- Architects and engineers have been aware of the problems involved in laying a building's foundations.
- These are solid shafts.
- This box is divided into chambers.
- He must have thorough understanding of soil mechanics.
- We know that trial pits, holes can be.
- The engineer can forecast the probable shifts in the earth during and after building.

4. ***Write the following words in the correct order to make sentences and translate them into Russian:***

- Construction, the, he, all, to, of, most, comes, in, decision, the, building's, important.
- May, foundation, use, the, piles, engineer.
- Were, laid, foundations, soundly, not.
- The, if, stable, is, earth.
- Its, in, load, each, supports, one, both, two, or, pile, ways, of.

5. ***Write down all irregular verbs and their three forms.***

Get talking

1. ***Work in pairs. Discuss "The problems involved in laying a building's foundations". Your talk should last a minute.***

2. ***Imagine you are a future skilled engineer. Give a summary of the text "Foundation" in 150 words.***

TEXT № 1 1

THE GRAVITATIONAL FORCE

Before-Reading

1. ***Discuss the following:***

- What types of natural forces do you know?
- How can you explain a "factor of safety"?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- gravitational force on a structure
- variable and movable
- magnitude of all the forces
- strength of the structure
- "safety factor"

While-Reading

1. ***Reading for general understanding. Skim read the text. Think of a good title for it.*** **Compare it with other students' titles.**

2. Reading for specific information. Read the text, choose a right word.

There are different forces influencing on building. One of them is a gravitational force. The gravitational *(force, power)* on a
structure can be divided into dead loads and live loads. It is important for engineers to know about dead loads and live loads. Dead loads can be calculated accurately because they rarely change with time and are usually fixed in one (*place, way).* Live loads are always variable and movable, so no exaot *(figures, plans)* can be calculated for these forces. Structures must also resist other types of forces, such as *(wind, water)* or earthquakes, which are extremely variable. It is impossible to predict accurately the *(magnitude, engineer)* of all the forces that act on a structure during its life. We can only predict from past experience the probable magnitude and frequency of the loads.

All this information must be used in building. *(Engineers, workers)* never design a structure so that the applied loads exactly equal the *(strength, length)* of the structure. This *(condition, idea)* is too dangerous because we can never know the exact value of the applied loads or the strength of the structure. All engineers must not forget about a "factor of safety". The "safety factor" is defined as the *(ratio, problem)* of the probable strength of the structure and the probable loads on the structure. This *(factor, place)* may range from 1 (where there is little uncertainty) to perhaps 5 or 10 (where there is great uncertainty).

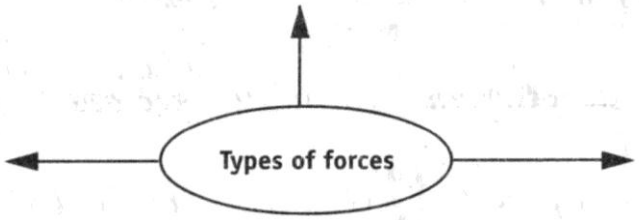
3. ***Read the text again and translate it.***

4. ***Reading for general understanding .Read the text and answer the following questions to the text:***

- Can the loads from the internal partitions of a building be estimated accurately? Why?
- Can the loads from storage in a building be estimated accurately? Why not?
- How can an engineer predict the possible loads that will occur on a structure?
- Why do engineers never design a structure so that the applied loads exactly equal the strength of the structure?

- When is there great uncertainty about the loads on a structure and the strength of a structure?
- Does an engineer choose a high or low safety factor?
- When does failure occur?

5. ***Read the text aeain and complete the snidergram:***

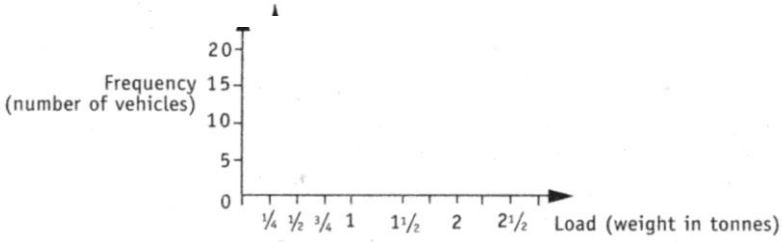


After-Reading

1. ***Read the text and copy the diagram at the top of page and use the results to make a bar chart.***

A survey was made of the weights of **74** vehicles passing over a bridge. The results of the survey were recorded as follows:

Weight in tones	Number of vehicles
0 to ¼	1
¼ to ½	3
½ to ¾	7
¾ to 1	15
1 to 1 ¼	20
1 ¼ to 1 ½	13
1 ½ to 1 ¾	8
1 ¾ to 2	4
2 to 2 ¼	2
2 ¼ to 2 ½	1



2. Read the previous text again and complete the sentences, predicting average future loads from vehicles on the bridge:

- It is that the load will be less than 0 tones.
- That the load will be 0—3 tones.
- It is that the load will exceed 2 tones.
- The most frequent load on the bridge will probably be between and tones.

3. ***Read and copy the diagram in exercise 2 again and use these results to make another bar chart.***

74 identical structural components were tested for tensile strength. The results were as follows:

Tensile strength at Failure in tones	Number of components
1 ¼ to 1 ½	4
1 ½ to 1 ¾	18
1 ¾ to 2	30
2 to 2 ¼	18
2 ¼ to 2 ½	4

4. ***Read the statements and say whether they are true or false. Correct the false statements:***

- Most of the components failed at a load between 1 ½ and 1 ¾ tones.
- No components failed below a load of 1 ¼ tones.
- Nearly all the components failed above a load of 1 ½ tones.
- Very few components failed over a lewd of 2 ½ tones.
- If these components are used in a bridge which is loaded to destruction, they will probably fail at a load between 2 and 2 ¼ tones.

5. ***Look at these diagrams of joints and answer these questions'.***

- For each joint, say how the units are joined together.
- Explain how forces are transmitted through each joint.
- In which joints can packing be used?
- In which joints should the joint surfaces be machined flat?

After-Reading

Grammar Focus

1. Write down all the nouns from the text in plural.

2. ***Match nouns and adjectives:***

• force	"live"
• loads	exact
• loads	gravitational
• value	applied
• loads	"dead"
• loads	probable

3. ***Make the following sentences negative and put into the interrogative form:***

- The gravitational force on a structure can be divided into dead loads and live loads.Live loads are always variable and movable.
- This condition is too dangerous.
- Structures must also resist wind or earthquakes.
- It is impossible to predict accurately the magnitude of all the forces that act on a structure during its life.

4. ***Find all the sentences with modal verbs, translate them. Copy them in your note-books.***

5. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

Get talking

7. *Discuss the possibility of catastrophes occurring in your country and their likely effects. Example:* A major earthquake will probably occur in Japan during the next six months. There is a very slight possibility that a major earthquake will occur in Australia during the next twelve months. The {(possibility) or (likelihood)} that a major earthquake will occur in Great Britain in the near future is low. The chances that a major earthquake will occur in Peru in the next five years are high.

TEXT № 1 2 FRAMES

Before-Reading

1. ***Discuss the following:***

- What is a role of frames in building?
- How many frames can a single-storey structure consist of? Try to prove your own opinion.

2. Try to guess the meaning of the following words. Use the dictionary if you need:

- single-storey structure
- sheet steel cladding
- steel angles
- brick walls
- beams

While-Reading

1. ***Read the text and find new words from the text.***

2. Reading for general understanding. Skim read the text. Think of a good title for it. Compare it with other students' titles.

3. ***Reading for specific information. Read the text, choose a right word.***

There are different kinds of a structure. They are big, small, simple and with different details. First of all any engineer must know about any single-storey structure. The single-storey *(structure, building)* consists of three frames. The *(frames, doors)* are placed between end walls and spaced at 3 meter centers. These frames are made up of steel stanchions and beams. The *(stanchions, walls)* carry the beams. These beams support the *(roof, ceiling).* The roof *(beams, frames)* cantilever a short distance beyond the stanchions. This means that they extend over the profiled sheet steel cladding. *(cladding, work)* can then be placed outside the line of the stanchions. The beams are bolted to steel stanchion caps. The stanchion *(caps, frames)* are welded to the top of each stanchion. The *(load, roof)* on each beam is transmitted through these plates to the stanchions. The upper face of the *(steel, iron)* base plates and the ends of the stanchions are machined flat. The *(bottom, top)* of each stanchion is welded to a base plate. Each base *(plate, frame)* is fixed to a concrete column base by two holding-down bolts. Steel angles are fixed across the ends of the beams and built into *(the brick, leaf)* walls. These *(angles, caps)* tie the frames together and also provide a place to fix the top of the cladding.

4. ***Read the text again and complete the sentences:***

- ...are machined flat.
- Steel angles...
- ...consists of three frames.
- ...is transmitted through these plates...
- ...a short distance beyond the stanchions.

After-Reading

Grammar focus

1. Complete the following words from the text:

S_n_le-stor_y, str_ct__e , st_n__ion, b_am, m_ter, _en_er, r__f, d_st_nce, _la_ding, _pper, ma__ine, _on_rete, col_mn, _ngle.

2. ***Choose the correct words in these sentences:***

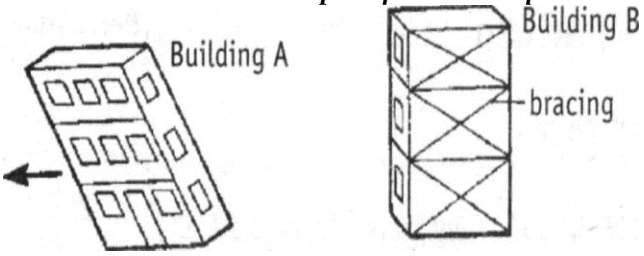
- A flood *may/might/will* probably cover large areas of ground in Australia sometimes during the next ten years.
- Hurricane *might/may/will* not kill several people in Japan before the end of the year.
- The possibility that a flood will damage crops in India sometimes during the next year is *high/low/non-existent.*
- There is *no/slight/strong* possibility that a hurricane will destroy several buildings in Peru sometimes during the next ten years.
- The likelihood of an earthquake causing a breakdown in power supplies in Florida is *low/non-existent/high.*

3. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

4. ***Write down all irregular verbs and their three forms.***

Get talking

1. ***Read the text "Houses in Japan after an earthquake" and make the following generalization:***



Architects looking at buildings in Japan after an earthquake, observe that Building A has collapsed because the structural frame was not braced to resist the force of the earthquake. From this observation we can make the following generalization:

Example: Buildings {(tend to) or (are likely to)} collapse during an earthquake if their structural frames are not braced to resist the force of earthquakes.

2. ***Look at this table about other hazards:***

a) *What observations do you think you could make about buildings in the above countries?*

Example: During a hailstorm in Iran, the roof of a light structure was penetrated because the roof covering had not been made hail resistant.

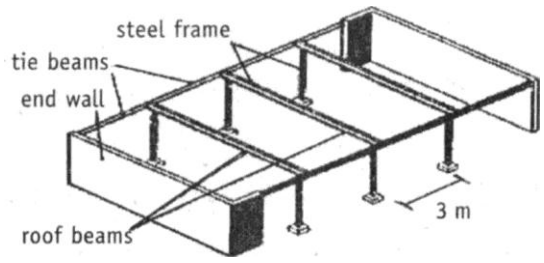
b) *What generalizations can you make?*

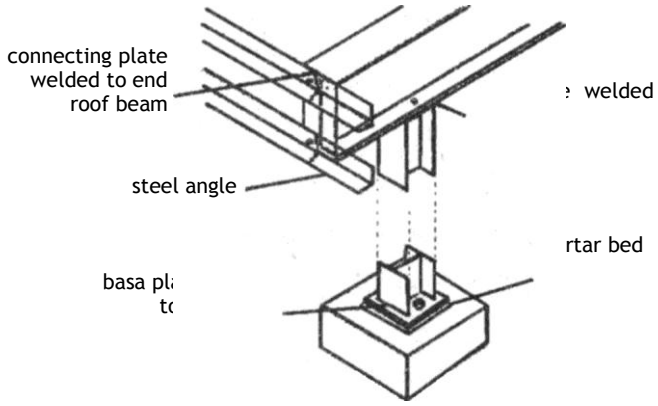
Example: Roofs of light structures in Iran are likely to be penetrated during a hailstorm if they are not hail resistant.

	Country	**Hazard**	**Possible effect**	**Precautions taken**
a)	Iran	Hailstorm	penetrate the roof of a light structure	make roof covering hail resistant
b)	All countries	thunderstorm	cause structural damage to tall buildings	fit a lightning conductor
	Country	**Hazard**	**Possible effect**	**Precautions taken**
c)	Hot-dry countries	sandstorm	damage exterior surfaces of a building	stop by erecting barrier screens a few metres from the building
d)	Africa	attack by termites	destroy the wooden components of a building	treat wood with preservatives
e)	All countries	fire	cause structural damage to buildings	use fireproof materials

3. ***Look at the following diagram showing the layout of frames the span of beams is 9 meters and make the following generalization:***

Example: The frames *are spaced at **3** meter centers.*





TEXT № 13

METHODS OF CONSTRUCTING WALLS FOR BUILDINGS

Before-Reading

1. ***Discuss the following:***

- What types of walls do you know?
- Is there a great difference between types of walls? Explain

and try to prove your own point of view.

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- wall
- interior
- door
- window
- method for constructing
- exterior wall

3. ***Make up your own sentences with the words from Ex 2.***

While-Reading

1. ***Read the text and find new words from the text.***

2. Reading for general understanding. Skim read the text. Think of a good title for it. Compare it with other students titles.

3. ***Read the text again and translate the second paragraph from the text.***

A very important part of any structure is a wall. Walls may be constructed in different forms. The walls include windows and doors, heads and sills, stanchion casings and inner lining panels. The doors and windows provide for controlled passage of environmental factors and people through the wall line. The aluminium heads, sills and windows are fixed from inside the building. After this, the 900 mm and 1.800 mm wide exterior doors are installed. These doors are aluminum framed and pre-glazed or hardwood framed and glazing is done on site. All walls are also designed to provide resistance to passage of fire for some defined period of time, such as a one-hour wall. The function of resisting fire fulfills stanchions. The stanchions are enclosed in casings.

That's why any engineer must know all methods of constructing walls for buildings. Of cause walls are made of various materials to serve several functions. The walls are divided into interior and exterior walls. The exterior walls protect the building interior from external environmental effects such as heat and cold, sunlight, ultraviolet radiation, rain, sound, while containing desirable interior environmental conditions. The exterior walls are made up of brick cladding, wall planks. The wall planks are designed to be weatherproof and to support the outer cladding. The wall planks and floor units are fixed only while the steel frame is being erected. The concrete floor units are capable of carrying a load of up to 5 kN/sq m.

Finally, the internal sills and lining panels are installed. The lining panels are capable of being removed to give access to the services. The lining panels and the internal sills are cavity for heating and electrical services.

4. ***Read the text again and answer the following questions to the text:***

- What are exterior walls?
- Do walls often contain doors and windows, which provide for controlled passage of environmental factors and people through the wall line?
- When are wall planks and floor fixed?
- How are wall planks designed?
- What are two sizes of external doors?
- What are the lining panels capable?

5. ***Read the text again and find the main idea of each paragraph.***

6. ***Read the text once more and match the parts of the sentences:***

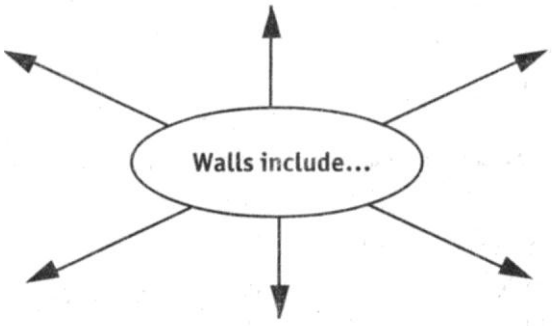
- The external walls
- are designed to be weatherproof and

- The steel frame

- The lining panels
- The walls planks

- The stanchions
to support the outer cladding.
- are made of brick cladding wall planks, windows, door, heads and sills.
- are closed in casings.
- are capable of being removed to give access to the services.
- is being erected.

7. ***Read the text again and complete the spideragram:***



8. ***Read the text and complete the following sentences:***

- Exterior walls protect the...
- Walls are also designed to provide...
- Walls often contain...
- ...are made up of brick cladding...
- ...are installed.

9. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- Methods for constructing walls for buildings.
- Walls are constructed in different forms and of various materials to serve several functions.
- Exterior walls destroy the building interior from external environmental effects.
- Walls are also designed to provide resistance to passage of fire for some defined period of time.
- Walls never contain doors and windows.

After-Reading

Grammar focus

1. ***Write all the following nouns in plural:***

a wall, a window, a door, a sill, a frame, a floor, a function, a building, a panel, a level, a service.

2. ***Write down all the numerals from the text in letters.***

3. ***Complete the table (pay attention to degrees of comparison):***

external		
capable		
wide		
different		
hard		
internal		
electrical		
lining		
environmental		
skirting		

4. ***Write the words in the correct order to make sentences and translate them into Russian:***

- Are, the, brick, external, cladding, doors, walls, planks, sills, and, made, stanchion, and, panels, are, inner, walls, lining, heads, windows.
- Are, give, the, being, lining, capable, to, panels, to, services, of, the, removed, access.
- 900, wide, the, mm, 1800, doors, installed, mm, external, are, and.
- In, are, the, enclosed, stanchions, casings.
- The, planks, and, fixed, floor, wall, units, are.

5. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

6. ***Translate from Russian into English:***

Стены делаются различных форм и из различных материалов с целью выполнить несколько функций. В стенах есть проемы — окна и двери, которые обеспечивают контролируемый проход людей через каменную кладку.

Get talking

1. ***Make up a plan to the text.***

2. Imagine you are a future skilled engineer. Say some words about "Methods for constructing walls for buildings". Your talk should last a minute.

3. ***Work in pairs. Discuss "Exterior walls".Your dialogue should include 20 phrases.***

TEXT № 14 MASONRY

Before-Reading

1. ***Discuss the following:***

- What kinds of work are used to build houses?
- Did you take part at any kind of work?

2. ***Match the following words with their Russian equivalents:***

- brick
- cement
- inner
- metal tie
- quality
- reinforcement
- rod
- space
- standard
- thickness
- veneer
- to manufacture
- damage
- укрепление
- место
- прут
- внутренний
- металлическая

связь

- цемент
- качество
- производить
- толщина
- кирпич
- стандарт
- повреждение
- фанера

While-Reading

1. ***Find and translate all the sentences containing the following words:***

- to include stone work
- cement mortar
- concrete units
- space between inner
- an earthquake
- a damage
- a similar manner
- vertical parallel walls
- a vertical reinforcement
- to standard reinforcing rods

foundations, exterior or fire-separation walls. The brick and concrete units are manufactured in standard sizes. Though a stone may be any size, thickness, quality or color.

2. ***Reading for specific information. Read the text and answer the following questions to the text:***

- What is masonry?
- What materials does masonry include?
- What spacing is normal for vertical reinforcement?
- What method provides "cavity walls"?
- What is in a similar manner laid?
- What is manufacture in standard sizes?

3. ***Read the text again and complete the sentences:***

..vertical reinforcement is...
.. brick and concrete units are...
Masonry is installed with...
...a space between...
In areas of possible earthquake...
...primarily as foundations...
...standard reinforcing rods...
...reinforcement requirements...
This method provides...
...exterior or fire-separation walls...

4. ***Read the text and say whether the following statements are true or false. Correct the false statements:***

- This method provides "cavity rooms".
- In areas of possible earthquake damage the "cavity" in brick work.
- Masonry is installed with cement mortar at exit and end joints.

We have mentioned about some methods of constructing walls for buildings. All walls are made of different materials. For example, walls are made of brick. The brick walls are laid up with a space between separate vertical parallel walls and connected with occasional cross bricks or metal ties. This method provides «cavity walls.» In areas of possible earthquake damage the «cavity» in brick work and the open cells in concrete units is reinforced with standard reinforcing rods and fully grouted with a soupy mixture of concrete. Normal spacing for vertical reinforcement is #4 at 24" with #4 at 48" horizontal fully, encased in grout up to 10" high. Reinforcement requirements should be shown on the drawings for other situations. But it is a special part of building called masonry. Masonry is installed with cement mortar at bed and end joints, usually 3/8" or 1/2" thick. The masonry includes a stone or brick work and concrete units. The concrete units are laid in a similar manner, but obviously there is no open space between inner and outer shells. Each unit has an open core. The concrete units are used primarily as Brick and concrete units are manufactured in substandard sizes.

- Masonry includes plastic work, brick, and others.
- Normal spacing for vertical reinforcement is #4 at 24".
- Concrete units are laid in a similar manner.
- Brick walls are laid up with a space between frames.

After-Reading

Grammar focus

1. ***Write all the following nouns in plural:***

a requirement, a rod, an area, a core, a shell, a manner, a tie, a metal, a space, a joint, a mortar, a cement, a color, a size, a construction, a veneer, a wall, a foundation, a unit, a brick, a work, masonry, a stone.

2. ***Write down all irregular verbs and their three forms.***

3. ***Write down all the numerals from the text in letters.***

4. ***Make the following sentences negative and put into the interrogative form:***

- Masonry includes stone work, brick and concrete units.
- Brick and concrete units are manufactured in standard sizes.
- Masonry is installed with cement mortar at bed and end joints.

- Reinforcement requirements should be shown on the drawings for other situations.

- Brick walls are laid up with a space between separate vertical parallel walls.

Get talking

1. Make up dialogues about: a) What is masonry?
b) Why is it necessary to study a material about masonry?
The dialogues should last for about a minute and include between 10—20 phrases.

TEXT № 15

BRICK WORK

Before-Reading

1. ***Discuss the following:***

- What kinds of work do you know?
- Have you worked anywhere?

2. ***Match the following words with their Russian equivalents:***

- shade
- glaze
- dump
- ash
- lintel
- pattern
- installation
- labor
- scaffold
- pavement
- clay
- глина
- образец
- свалка
- труд
- перемычка
- глина
- подмостки
- зола
- установка
- тротуар
- образец

While-Reading

1. ***Reading for specific information. Read the text, choose a right word.***

We have mentioned about *(masonry, theater)* including the brick or stone work. Let's tell some more words about a brick. Bricks are used for *(walls, foundations)* and fireplace constructions, paving. In addition to the actual *(brick, ice)* units belong many accessories, such as clay flue linings, fireplace dampers and ash dumps, fire brick linings, masonry reinforcement and various lintels and ties. Clay *(bricks, units)* are available in a variety of size and colour. Most of them are red or brown *(shades,groups).* If it is a glazed brick with one face it is glazed in color. Any brick is laid in various face patterns, which affects the cost of installation. *(Costs, numbers)* for masonry *(construction, field)* depend on a great deal on location of the masonry working deck as well as on the availability of labor and material. Starting at *(ground, top)* level a masonry wall may be laid as high as 4'-0" with reasonable accessibility. However, scaffolding at intervals of about 4'-0" is necessary above that to install work properly at higher *(levels, stories).*

2. Read the text. Find and translate all the sentences, containing the following words:

- working deck
- actual brick units
- availability of labor
- glazed brick
- clay bricks
- masonry construction

3. ***Reading for specific information. Read the text and answer the following questions to the text:***

- What is a brick?

- What is laid in various face patterns of construction?
- How do you think, who had invented a brick?
- How are the bricks used?
- What kind of bricks do you know?
- What materials are used for manufacturing of bricks?

4. ***Read the text again and complete the following sentences:***

- ...bricks are available...
- ...in various face patterns...
- ...masonry construction depend...
- Brick are used for walls...
- ...fireplace dampers...
- ...such as clay flue linings...
- Starting at ground level...
- ..scaffolding at intervals ...

5. ***Read the text and say whether the following statements are true or false. Correct the false statements:***

- Starting at ground level a masonry wall may be laid as high as 4.5'—0" with reasonable accessibility.
- Brick are used for walls, fireplace construction, paving and others.
- Costs for masonry construction don't depend on a great deal on location of the masonry working deck.
- Clay bricks are available in a deficiency of sizes and colors.
- In addition to the actual brick units belong many accessories.
- Scaffolding at intervals of about 4'—0" is necessary above that to install work properly at higher levels.
- Clay bricks are mostly red to green shades.
- Masonry is used for walls, fireplace construction, paving, and as a veneer.
- Exit at water level a masonry wall may be laid as high as 4'-0" with reasonable accessibility.

- When was the brick invented?

After-Reading

Grammar focus

1. ***Translate from Russian into English:***

Кирпичи бывают различной формы, цветов и размеров. Кирпич используют для кладки стен, каминов и др. От вида кирпича зависит стоимость строительных работ. При строительстве должны выдерживаться определенные нормы. Стена, выложенная хорошим кирпичом, стоит дольше.

2. ***Make the following sentences negative and put into the interrogativeform:***

- In addition to the actual brick units belong many accessories.
- Scaffolding at intervals of about 4'—0" is necessary above that to install work properly at higher levels.
- Starting at ground level a masonry wall may be laid as high as 4'—0" with reasonable accessibility.
- Clay bricks are available in a variety of sizes and colors.
- Costs for masonry construction depend on a great deal on location of the masonry working deck.
- Brick is laid in various face patterns.
- Brick is used for walls, fireplace construction, paving, and as a veneer.

3. ***Write all the following nouns in plural.***

a level, a ground, a material, a labor, a deck, a deal, a cost, a pattern, a lintel, a reinforcement, masonry, a dump, a damper, an accessory, a unit, a construction, a fireplace, a wall, a face, a shade, a color, a size, a brick.

4. ***Find all the sentences from the text with the forms of the verb "to be". Copy them in your exercise-books.***

Get talking

1. ***Make up a dialogue about "BRICK WORK". It should last for about a minute and include between 10—20 phrases.***

TEXT № 16 PANEL HEATING

Before-Reading

1. ***Discuss the following:***

- What is ventilation?
- What's its role?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- ventilation
- boiler
- condensate
- radiator
- atmospheric
- air-conditioning
- fundamental
- heating system

3. ***Make up your own sentences with the following words:***

to heat (нагревать), ***to require*** (требовать), ***emphasis*** (акцент), ***to contaminate*** (загрязнять), ***ambient air*** (окружающий воздух), *rate* (норма), ***to obtain*** (получить), ***evaporation*** (испарение), ***moisture*** (влажность), ***fuel*** (топливо), ***to burn*** (гореть), ***pipe*** (труба), ***steam*** (пар).

While-Reading

1. ***Read the text and find new words from the text.***

2. Read the text. Find and translate all the sentences containing the following word combinations:

- heating and ventilation
- air-conditioning
- a hot-water system
- central heating
- cooling of the steam
- panel heating

Besides masonry, a brick work, any engineer must know about heating and ventilation. They are two branches of engineering which are very closely connected. Both they are treated as a dual subject. Heating is to prevent too rapid loss of heat from the body. The rate of heat lost from the body is controlled. Some old concepts of heating have been gradually changed since engineers obtained more precise knowledge about how the body loses heat. Insufficient attention was paid formerly to loss by radiation, which is the transmission of energy in the form of waves from a body to surrounding bodies at a temperature. The human being also loses heat by conduction (through his clothes) and convection, the latter by air currents not only past his skin or outside clothing surface but also by evaporation of moisture from his skin (respiration).

The determination of the capacity or size of the various components of the heating system is based on the fundamental concept that heat supplied to a space equals heat lost from the space. The most widely used system of heating is the central heating.

There are two most common systems of heating: hot water and steam. There the fuel is burned in one place, from which steam, hot water or warm air is distributed to adjacent and remote spaces to be heated. Both systems are widely used nowadays. A hot-water system consists of the boilers and a system of pipes connected to radiators suitably located in the rooms. The steel or copper pipes give hot water to radiators or convectors which give up their heat to the rooms.

Then cooled water is returned to the boiler for reheating. As for steam systems, steam is usually generated. The steam is led to the radiators through or by means of steel or copper pipes. The steam gives up its heat to the radiators and the radiators to the room. After this cooling of the steam condenses to water. The condensate is returned to the boiler by gravity or by a pump. The air valve on each radiator is necessary for air to escape. Otherwise it would prevent steam from entering the radiator.

Recent efforts have resulted to completely conceal heating equipment in an arrangement. Hot water, steam, air, or electricity are circulated through distribution units embedded in the building construction. Panel heating is a method of introducing heat to rooms in which emitting surfaces are usually completely concealed in the floor, walls or ceiling. The heat is disseminated from such panels partly by radiation and partly by convection. Ceiling panels release the largest proportion of heat by radiation and floor panels release the smallest one. The proportion of heat disseminated by radiation and convection is also dependent to some extent upon panel-surface temperatures. Other factors must be considered by an engineer. They are a type of occupancy, furniture or equipment location, large glass areas, heat-storing capacity of building construction, room height, and possible change of wall partitions, climate, exposure, cost. Sometimes fuel is used for heating. They include coal, oil, manufactured and natural gas, wood. Nowadays gas fuel is being used on an increasing level.

After-Reading

Grammar focus

1. ***Complete the following words from the text:***

H__ting, v_nt_lation, atm_sp_eri_, _nv_ronm_nt, temp_rat__e, _qui_ment,

D_strib_ti_n, r_di_tio_n, c_nve_ti_n, h__ting, _lim_te, _le_tri_ity, c_nv__tor,

C_nd_ns_te, k_owle__e, _ontam_nat__n, ev_por_ti_n.

2. ***Write down all the nouns from the text in plural.***

3. ***Complete the table (pay attention to degrees of comparison):***

atmospheric		
		the smallest
basic		
fundamental		
		the largest
dual		
rapid		
relative		
		the most
insufficient		

4. ***Write down all irregular verbs and their three forms. Copy them in your exercise-books.***

5. Make the following sentences negative and put into the interrogative form:

- Heating is to prevent too rapid loss of heat from the body.
- Heating and ventilation are two branches of engineering.
- The human being also loses heat by conduction.
- There are two most common systems of heating-hot water and steam.
- The steam gives up its heat to the radiators and the radiator to the room and cooling of the steam condenses to water.
- Panel heating is a method of introducing heat to rooms in which emitting surfaces are usually completely concealed in the floor, walls or ceiling.
- The heat is disseminated from such panels partly by radiation and partly by convection.
- Air-conditioning is closely related to both heating and ventilation.
- Some old concepts of heating have been gradually changed since engineers obtained more precise knowledge about how the body loses heat.

6. ***Translate from Russian into English:***

- Отопление и вентиляция — две связанные между собой отрасли.
- Отопление предназначено для нагревания воздуха до определенной температуры.
- Вентиляция охлаждает и очищает воздух.
- В наше время существует два вида систем отопления.
- В городах широко применяется система центрального
- Нагревательные элементы скрыты в полу, стенах или потолке.
- Потолочные обогреватели дают больше тепла, чем все остальные.
- Перед установкой обогревателя необходимо учесть положение мебели в квартире.
- Отопительная система состоит из котлов, труб и радиаторов в квартирах.

Get talking

1. ***Make up a plan to the text.***

2. Work in pairs. Discuss:

a) What is panel heating?

b) Why is panel heating necessary?

Your talks should include 20 phrases.

TEXT № 1 7

HEAT TREAMENTS

Before-Reading

1. ***Discuss the following:***

- What do you know about heating system?
- And what about heating equipment?

2. Try to guess the meaning of the following words. Use the dictionary if you need:

- recrystallisation
- length of time
- highly stressed
- final tempering temperature
- crystals cooling

3. ***Make up your own sentences with the words from Ex 2.***

While-Reading

1. ***Read the text and find new words from the text.***

2. Reading for specific information. Read the text, choose a right word.

3. ***Read the text again and translate about three broad groups of treatment.***

4. Reading for general understanding. Read the text and answer the following questions to the text:

- What are reasons to promote recrystallisation?
- What are three broad groups of the treatment?
- What is a process of annealing?
- What is a process of quenching?
- What is a process of tempering?
- What do you know about a final tempering temperature of the steelwork?
- What is quench hardening done for?
- What is austenitic?

HEAT TREATMENTS

Other treatments include *(steel .iron)* heating to promote recrystallisation. This is done for a number of reasons. Among these are: a) Softening for machining or further working, for instance in certain cold-formed *(components, parts);* b) Hardening — steels for use in *(tools, treatments)* and high-wear components; c) To remove internal stresses imposed by previous treatments.

The treatment falls into three broad *(groups, parts):* annealing, quenching and tempering.

Annealing. In annealing the *(steel, water)* is heated to a particular temperature. After this it is "soaked" at that *(temperature, form)* for a length. Then it cooled at a predetermined rate. This causes the crystals in the *(metal, wall)* to reform longer (in annealing usually to room temperature) and larger crystals. The type of structure that predominates in annealed steel is austenitic. Occasionally steel is described as "normalized". This means that it has been heated and then allowed to *(cool, heat)* in still air with no retardation or speeding of cooling.

Quenching. The steel is heated to a given temperature and rapidly cooled by "quenching" in oil or *(water, juice).* Oil tends to be used where less severe cooling or "quenching velocity" is required. Quench hardening is done to promote the formation of martensites in the *(steel, butter)* by forcing *(recrystallisation, boiling)* at a much faster rate than produced by annealing. The side-effect is *(usually, never)* an increase in brittleness, and this can be relieved by tempering.

Tempering. The Martensite in quenched *(steel, iron)* is brittle and highly stressed. The steel is warmed, sometimes in oil baths *(for lower-temperature tempering)* or in a furnace. It is at this point that the steel surface takes on a cooler, known as temper *(cooler, bath)* caused by the interference effects between thin *(films, faccs)of* oxide. Sometimes it is used as a guide to the *(final, long)* tempering of the steelwork. Therefore "pale straw" refers to a tempering at 230°C and "blue" at 450-600 °C for mild steels. Other steels with higher alloying *(proportions, rooms)* produce a cooler lower in the series, so "pale straw" would correspond to a temperature of 300°C for stainless steel.

5. ***Read the text again and complete the spidergram:***

6. ***Read the text once more and match the parts of the sentences:***

1) In annealing the steel
1) is brittle and highly stressed.
2) The steel is heated to
2) a given temperature and
rapidly cooled by
"quenching" in oil or water.
3) The Martensite in quenched steel — 3) is heated to a particular temperature.

7. ***Read the text once more and complete the following sentences:***

- ...heating the steel to promote recrystallisation.
- ...to reform longer (in annealing usually to room temperature) and larger the crystals...
- Oil tends to be used... is required.
- Quench hardening...
- ...a tempering temperature of 230 °C and "blue" to 450— 600 °C for mild steels.

After-Reading

Grammar focus

1. ***Write all the following nouns in plural.***

Steel, a temperature, a formation, oil, brittleness, a component, recrystallisation, cooler, a effect, bath, a film, oxide, surface, a number, a tool, a rate, a type, a crystal, air, guide, retardation.

2. ***Complete the table (pay attention to degrees of comparison):***

internal		
	longer	
previous		
	less severe	
	larger	
	faster	
brittle		
final		
	higher	
	lower	

3. ***Write down all the numerals from the text in letters.***

4. ***Write the following words in the correct order to make sentences and translate them into Russian:***

- For, is, of, number, this, reasons, done, a.
- Heated, is, to, given, the, temperature, steel, a.
- Steel, baths, or, warmed, in, oil, the, in, is, furnace, a.
- Martensite, and, the, highly, steel, is, brittle, stressed, quenched, in.
- Steel, as, steel, occasionally, described, "normalized", is.

5. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

Get talking

1. ***Make up a plan to the text.***

2. ***Work in pairs. Discuss: a) What is a process of annealing?***
b) What is a process of quenching?
c) What is a process of tempering?
Your talks should include 20 phrases.

3. ***Give a summary of the text in 50 words.***

TEXT № 18 BUILDING MATERIALS

Before-Reading

1. ***Discuss the following:***

- What are building materials?
- What building materials do you know?

2. ***Make up your own sentences with the following words:***

Building materials (строительные материалы), ***loads*** (грузы), ***building components*** (строительные компоненты), ***Rod materials*** (материалы из прутьев), ***sheet material*** (листовой материал).

While-Reading

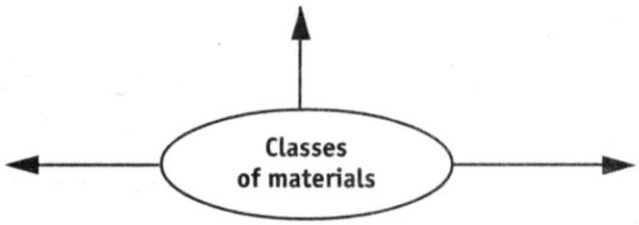
1. ***Reading for general understanding. Skim read the text. Think of a good title for it. Compare it with other students' titles.***

We have mentioned about building materials as one of the components of building. It is high time to tell about them. It is important for an engineer to know that all building materials are used in two basic ways. In the first way they are used to support the loads on a building and in the second way they are used to divide the space in a building. But it is more important to realize that building components are made from building materials. At the same
time the form of a component is related to the way in which it is used. We can see how this works by considering three different types of any construction:

1. The first type of a construction is made of building materials such as a brick, a stone or concrete. They are called blocks. The blocks arc put together to form solid walls. These materials are heavy. They can support the structural loads because they have the property of high compressive strength. At the same time the walls made up of blocks support the building and divide the space in the building.
2. The second type of a construction is made of sheet materials. They are used to form walls which act as both space-dividers and structural support. Timber, concrete and some plastics can be made into large rigid sheets and fixed together to form a building. Such kind of buildings is lighter and faster to construct than a building made up of blocks.
3. The third type of a construction is made of rod materials. They can be used for structural support but not for dividing spaces. There timber, steel and concrete can be formed into rods. Usually rod materials are used as columns because of high tensile and compressive strength. On the other hand, they can be fixed together to form framed structures. The spaces between the rods can be filled with light sheet materials which act as space dividers but do not support structural loads.

2. ***Read the text again and translate it.***

3. ***Read the text again and complete the spidergram:***



4. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- Rod materials can be used for both dividing space and supporting the building.
- The blocks arc put together to form solid walls.
- Concrete can be used as a block material, a sheet material and a rod material.
- Steel is used for frame construction because it has high tensile strength and low compressive strength.
- There timber, steel and concrete can be formed into rods.
- The sheet materials, which act as space dividers in a frame construction building, can be very light because they do not support structural loads.
- The second type of a construction is made of sheet materials.

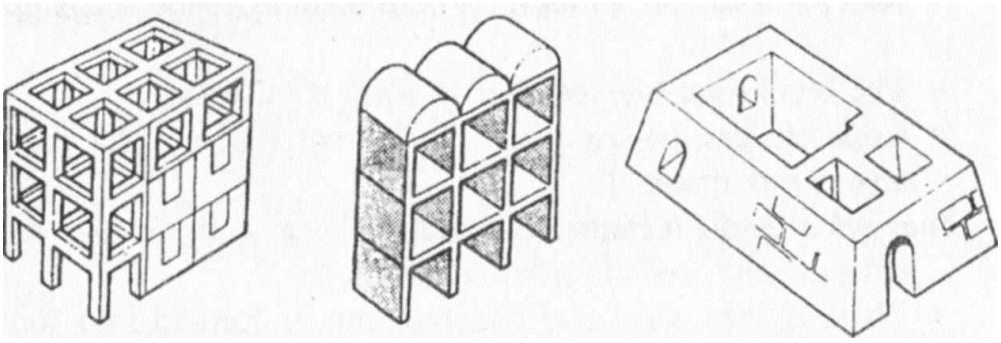
5. ***Copy and complete this table by putting ticks in the boxes to show the functions of the components:***

	Function of components		
Form of material	**Structural support only**	**Space diving only**	**Both structural support and space diving**
Blocks			
Sheets			
Rods			

After-Reading

1. ***Look at these diagrams. Read the passage, say which paragraph discusses:***

a) planar construction
b) frame construction
c) mass construction



Frame construction Planar construction Mass construction

Grammar focus

B__lding, m_ter__l, str_ct_ral, c_nstr_c__on, s__et, t_mb_r, c_nc__te, t_ns_le.

2. Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.

3. ***Write the following words in the correct order to make sentences and translate them into Russian:***

- ways, two, Building, used, in, materials, are, basic.
- are, Building, from, components, building, made, materials.
- used, Timber, into, and, columns, formed, steel, concrete, can, and, be, rods, as.
- with, Rod, be, and, materials, high, fixed, tensile, compressive, can, together, to form, structures, framed, strength.
- blocks, or, solid, materials, such, form, together, brick, stone, concrete, as, arc, put, walls, to, of.

Get talking

1. ***Imagine you are a future skilled engineer. Say some words about:***

a) planar construction;
b) frame construction;
c) mass construction.

Your talks should include 20 phrases.

TEXT № 19
THE MOST IMPORTANT AND WIDELY USED BUILDING MATERIALS

Before-Reading

1. ***Discuss the following:***

- What materials are used in building construction?

2. Try to guess the meaning of the following words. Use the dictionary if you need:

- physical properties of material
- a building
- a technology
- a construction
- a measure
- a proportion
- a component
- concrete
- cement
- a stone

3. ***Make up your own sentences with the words from Ex 2.***

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Read and translate about Portland cement.***

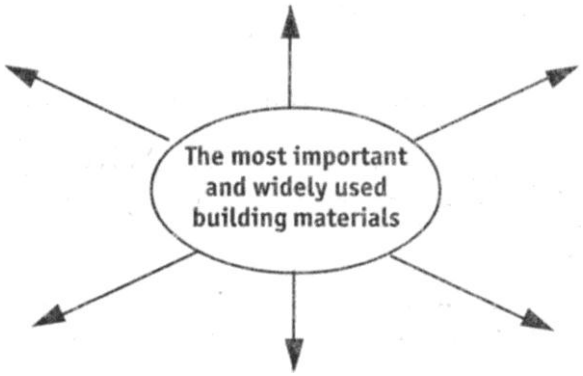
3. ***Find and translate all the sentences containing the following words:***

- concrete
- component measuring
- construction
- technology
- proportion
- building

4. ***Reading for general meaning. Read and answer the following questions to the text:***

- What is a modern technology?
- What materials' forms are very important in all masonry structures?
- What factors must the civil engineer consider?
- What can you tell something about the most accurate method of measuring proportions?
- What kind of material is the most widely used for the purpose of binding together masonry units such as a stone and a brick?
- What material is also known to be the most important com ponent of concrete?
- What kind of material may be considered an artificial conglomerate of crushed stone?
- What can you tell about an important class of cement?
- What is high aluming cement?
- What materials are mostly used in Russia?
- What can you tell about building technology in Russia?

5. ***Read the text once more and complete the spidergram:***



Building materials are very important in the construction. But it is more important for any designer to select and adapt such building materials of construction that will give the most effective result by the most economical means. In this choice of materials for any work of constructions many factors must be considered by the civil engineer. These factors include availability, cost, physical properties of materials and others.

Practically, all buildings materials have their advantages and disadvantages. That's why some materials are used most widely in building construction for the purpose of binding together masonry units. Among them are lime, gypsum and cement. Last material forms very important elements in all masonry structures, such as stone, a brick. Since the time of its introduction a gradual improvement of Portland cement quality has led to the elaboration of rapid hardening Portland cement, or «high early strength". Portland cement like other materials can be modified to suit a articular application. Later developments include low heat and sulphateresisting cements. The scope for such purpose – made cements has led to the development of an increasing variety such as high alumina cement, blast-furnace slag. They may be also white and coloured cements. Alumina cement has an extremely high rate of strength increase. Portland blast-furnace cement has greater resistance to some forms of chemicals.

So, cement is the most important component of concrete. Concrete is even less uniform than many other materials. Concrete may be considered an artificial conglomerate of "crushed stone, gravel or similar inert

material with a mortar". A mortar is a mixture of sand, screenings or similar inert particles with cement and water. It is very important to know everything about proportions. The most accurate method of measuring proportions is to weigh the required quantities of each material. This may be done whether the proportions are based upon volumes or weights. This method is being extensively used in road construction and in many central mixing and in central proportioning plants. It is also widely used in large building constructions. Sometimes timber, steel and concrete are all vary over considerable ranges in the properties desired by the engineer. Even steel varies considerably in its microstructure.

6. ***Read the text again and complete the following sentences:***

- Timber, steel and concrete all vary, sometimes over considerable ranges in the properties desired by...
- ...is even less uniform than many other materials.
- The designer must be able to select and... materials of construction that will give the most effective result by the most...
- The gradual improvement in... from the time of its introduction led to the elaboration of
- High alumina cement is a...
- It has an extremely...
- The most important building materials may now be considered to...
- A... of sand, screenings or similar...
- ...is a specific characteristic of this material.

- **7.** ***Read the following statements and say whether they are true or false. Correct the false statements:***

- Lime, gypsum and cement are not the three materials most widely used in building construction for the purpose of binding together masonry units, such as stone, brick and as constituents of wall plaster.
- Cement is not the most important component of concrete.
- It has an extremely high rate of strength increase which is, owing to the violence of the chemical reaction, accompanied by a considerable evolution of heat.
- The most important building materials are steel and concrete.
- Concrete may be considered an artificial conglomerate of "crushed stone, gravel or similar inert material with a mortar".
- A mixture of sand, screenings or similar inert particles with cement and water which has the capacity of hardening into a rocklike mass is called mortar.
- Timber, steel and concrete all vary, sometimes over considerable ranges in the properties desired by the engineer.
- Portland blast-furnace cement has greater resistance to some forms of chemicals.

After-Reading

Grammar focus

1. ***Complete the following words from the text:***

a d__ign_r, a c_nst__ct_on, a r_su_t, a c_oi_e, an eng_ne_r, a f_ct_r, a co_t, a p__po_e, a str_ctu__, an _mpr_vem_nt, a q_alit_, an _ntr_duct__n, a r_te, a r__cti_n, an a__lication, a s_o_e, a d_vel_pme_t, a c_p_cit_, an ob_ec_, an a_ten_ion, a m_th_d, a _ro_ortio_, a c_nstr_ction, a _olu_e, a m_asure_ent, a wo__ab_li_y, a t_st, a __ief.

2. ***Write down all the nouns from the text in plural.***

3. ***Complete the table (pay attention to degrees of comparison):***

		the most accurate
		the most effective
		the most economical
		the most important
	greater	
	less accurate	
fundamental		
artificial		
careful		
high		

4. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

5. ***Write down all irregular verbs and their three forms.***

6. ***Make the following sentences negative and put into the interrogative form:***

- These factors include availability, cost, physical properties of materials and others.
- Timber, steel and concrete all vary, sometimes over considerable ranges in the properties desired by the engineer.
- Lime, gypsum and cement are the three materials most widely used in building construction for the purpose of binding together masonry units, such as a stone, a brick.
- Cement is furthermore the most important component of concrete.
- Another important class of cement is high alumina cement.
- Portland blast-furnace cement has greater resistance to some forms of chemicals.
- The most important building materials may now be considered to be structural steel and concrete.
- The most accurate method of measuring proportions is to weigh the required quantities of each material.
- It is also widely used in large building construction.
- To be able to undergo high compressive loads is a specific characteristic of this material.

Get talking

1. ***Make up a plan to the text.***

2. ***Work in pairs. Discuss:***

a) The most important and widely used building materials.

b) The most accurate method of measuring proportions.

Your talks should include 15—20 phrases.

3. ***Give a summary of the text in 100 words.***

4. ***Prepare reports about building technology in Russia. A report should include 2000-3000 words.***

TEXT № 20 THE CHOICE OF MATERIAL

Before-Reading

1. ***Discuss the following:***

- What types of material do you know?
- What kind of material is used in Russia?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- ordinary brick
- mechanical properties
- mass production
- reinforced concrete elements
- volume weight
- properties of the materials
- diverse properties

3. ***Match the following words with their Russian equivalents:***

• mass production	• растягивающее напряжение
• reinforced concrete elements	• хрупкий
• compressive loads	• теплопроводность
• bending loads	• жесткий
• brittle	• смола
• thermal conductivity	• сжимающие нагрузки
• volume weight	• изгибающие нагрузки
• rigid	• железобетонные элементы
• wide application	• приятный внешний вид
• construction site	• широкое применение
• mechanical properties	• строительная площадка

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Reading for specific information. Read the text, choose a right word.***

3. ***Read and translate about reinforced concrete.***

Which (*material, part)* can be used to the best advantage for a particular part of the *(building, hospital)* depends on the kind of load to which it is subjected and on the shape of the part. The *(development, increase)* of the metallurgical and machine-building industries made possible *(mass, water)* production of prefabricated large-size concrete and reinforced concrete structural elements. It is the most advantageous to employ reinforced *(concrete, floor)* in such structural elements. Using prefabricated or precast elements, *(builders, teachers)* perform a considerable amount of building work at a factory where highly organized and mechanized *(technological, mechanical)* processes of production are practiced.

Reinforced concrete is a building *(material, window)* in which the joint functions of concrete and steel are advantageously utilized. Being brittle, concrete cannot withstand pensile stresses, and it cannot therefore be

(used, cleaned) in structures subjected to tensile stresses under load. But if steel is introduced into concrete it changes the property of the *(monolith, desk).* Like any other *(stone, light)* material, concrete offers a good resistance to compressive loads.

In service two oppositely directed stresses appear in (*reinforced, difficult)* elements fully withstand bending loads. There are two kinds of reinforced concrete: with ordinary reinforcement and *(concrete, paper)* with pressed reinforcement. To reinforce ordinary concrete *(structures, ideas)* is to introduce steel rods in stretched zones of concrete elements. *(Reinforced-concrete, easy)* structures and elements are widely used both for residential houses and industrial *(buildings, machines).* Depending on the application of reinforced-concrete structures all kinds of *(concrete, flag)* such as heavy, light and heat insulating may be employed.

In many cases bricks are very satisfactory for using in the *(construction, school). (Bricks, doors)* generally present a pleasing appearance and can be obtained with various qualities, *(colours, meters)* and textures. Being of a high volume weight and high thermal conductivity, ordinary brick is not always satisfactory in a *(building, medicine)* practice. There are other kinds of bricks which are more effective, they are *(light-weight, high volume weight)* building bricks, hollow or porous bricks. Light-weight building bricks differ from ordinary clay bricks in a lower *(volume weight, cost)* and lower thermal conductivity, and are more economical than ordinary bricks.

One of the most significant *(facts, children),* dealing with both industries of synthetics and plastics. *(Plastics, water)* has appeared comparatively recently but, owing to their inherent valuable and diverse properties, has found a wide application in many industrial *(fields, boxes)* (machine-building, radiation, textile industry, etc.). *(Application, force)* of plastics in the building field widens from year to year. In respect to physical and mechanical properties at a normal temperature of 20 °C all *(plastics, bricks)* are divided into rigid, semi-rigid, soft. In respect to the number of constituents plastics may be classified as simple and complex. *(Plastics, things)* consisting of one polymer are referred to as simple. Thus, organic glass (plexiglass) consists of one synthetic resin. But in the building field we usually deal with *(complex, metal)* plastics, e.g. plastics consisting of a polymer and other components.

4. ***Read the text again and find the main idea of each paragraph.***

5. ***Read the text once more. Recognize all the sentences, relating to a particular paragraph.***

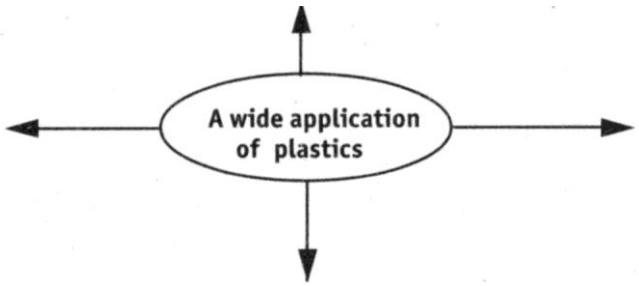
- The main characteristics of concrete.
- The chief principles of plastics classification.
- Factors that influence mass production of prefabricated largeside concrete and reinforced-concrete structural elements.
- New tendencies in the choice of building materials.
- The advantages of reinforced concrete.

6. ***Reading for general meaning. Read the text and answer the following questions to the text:***

- Which material can be used to the best advantage for a particular part of the building?
- Is reinforced concrete a building material in which the joint functions of concrete and steel are advantageously utilized?
- Are there two kinds of reinforced concrete?
- Can you tell anything about one of the most significant facts about both industry land building?
- What are simple plastics?

7. ***Read the text again and find the main idea of each paragraph.***

8. ***Read the text and complete the spidergram.***



9. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- There are some kinds of structural materials that have appeared comparatively recently, sometimes they consist of one polymer. But in building industry some complex materials consisting of a polymer and other components are used.
- In many cases bricks too are very satisfactory for use in the construction.
- There are some kinds of material which are brittle and cannot withstand tensile stress.
- If steel is introduced into some kind of material it changes its property.
- Some building materials offer a good resistance to compressive loads.
- In respect of physical and mechanical properties these materials are divided into rigid, semi-rigid and soft.
- Which material can be used to the best advantage for a particular part of the building, depends as well on the kind of load to which it is subjected and on the shape of the part.
- One of the most significant facts about both industry land building has been research on synthetics and plastics.
- Reinforced concrete is a building material in which the joint functions of concrete and steel are advantageously utilized.
- Plastics consisting of one polymer are referred to as simple.

After-Reading

Grammar focus

1. ***Write all the following nouns in plural:***

an advantage, a brick, a fact, a volume, a field, a conduc tivity, an industry, a temperature, a polymer, a load, a production, a development, a concrete, a factor, a choice, a work, a function, an appearance, a steel.

2. ***Complete the table (pay attention to degrees of comparison):***

		The best
metallurgical		
		the most significant
	more effective	
complex		
	lower	
	more economical	
heavy		
well-known		
		themost advantageous

3. ***Make the following sentences negative and put into the interrogative form:***

- There are two kinds of reinforced concrete.
- Reinforced-concrete structures and elements are widely used both for residential houses and industrial buildings.
- It is most advantageous to employ reinforced concrete in such structural elements.
- Reinforced concrete is a building material in which the joint functions of concrete and steel are advantageously utilized.
- In many cases bricks are very satisfactory for use in the construction.
- There are other kinds of bricks which are more effective.
- Light-weight building bricks differ from ordinary clay bricks in a lower volume weight and lower thermal conductivity.
- One of the most significant facts about industry land building has been research on synthetics and plastics.
- Application of plastics in the building field widens from year to year.

4. Plastics consisting of one polymer are referred to as simple.

5. ***Find all the sentences from the text in the Passive Voice. Copythem in your exercise-books.***

6. ***Find all the sentences from the text in the Present Perfect. Copythem in your exercise-books.***

Get talking

1. ***Make up a plan to the text.***

2. Work in pairs. Discuss:

a) an application of two kinds of reinforced concrete.

b) Using bricks in construction.

Your talk should include 15—20 phrases.

3. ***Give a summary of the text in 100 words.***

TEXT № 21 PROPERTIES OF MATERIALS

Before-Reading

1. ***Discuss the following:***

• The development of the metallurgical and machine-building industry made possible mass production of materials, did not it? Prove your own point of view.

- What advantages do all materials have?
- **3.** ***Make up your own sentences with the following words:***

density (плотность), ***weight*** (вес), ***volume*** (объем), ***stiffness*** (жесткость), ***to yield strength*** (поддерживать опору), ***fracture*** (предел текучести), ***break*** (перелом, излом), ***ductility*** (ковкость), ***brittle*** (хрупкий), ***toughness*** (прочность), ***resistance*** (сопротивление), ***crack*** (трещина), ***creep resistance*** (устойчивость к ползучести), ***gradual*** (постепенный), ***permanent*** (постоянный), ***engine***(двигатель).

4. ***Find a right word:***

x	s	t	i	f	n	e	s	s	i
u	d	e	f	o	r	m	s	t	d
w	i	z	u	r	o	o	a	r	g
p	e	e	r	c	w	z	y	l	e
x	i	s	t	e	e	l	o	g	h
w	y	o	o	l	l	a	z	I	g
s	s	e	n	h	g	u	o	t	n
f	r	a	c	t	u	r	e	h	c

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Read the text. Find and translate all the sentences, containing the following words:***

- engine
- permanent
- change
- shape
- crack
- creep
- resistance
- gradual
- toughness
- brittle
- ductility

3. ***Reading for specific information. Read the text, choose a right word.***

4. ***Reading for general meaning. Read the text and answer the following questions to the text:***

- Is density (specific weight) the amount of mass in a unit volume?
- Is it measured in kilograms per cubic meter?
- Is density important in any application where the material must not be heavy?

- Is stiffness (rigidity) a measure of the resistance to deformation such as stretching or bending?
- Is strength the force per unit area (stress) that a material can support without failing?
- Is toughness the resistance of a material to breaking when there is a crack in it?
- Is creep resistance the resistance to a gradual permanent change of shape?

Density (specific weight) is the amount of *(mass, quality)* in a unit volume. It is measured in *(kilograms, distances)* per cubic meter. The density of water is 1000 kg/m^3 but most *(materials, kinds)* have a higher density. Aluminium alloys, with typical densities around 2800 kg/m^3 are considerably less dense than steels, which have typical densities around 7800 kg/m^3. *(Density, class)* is important in any application where the material must not be heavy.

Stiffness (rigidity) is a *(measure, glass)* of the resistance to deformation such as stretching or bending. The Young modulus is a measure of the resistance to *(simple, different)* stretching or compression. It is the ratio of the applied force per unit area (stress) to the fractional elastic deformation (strain). *(Stiffness, Density)* is important when a rigid *(structure, house)* is to be made.

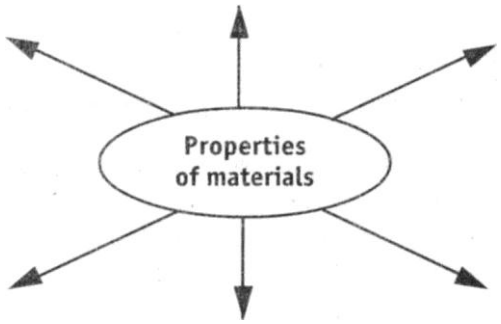
Strength is the *(force, column)* per unit area (stress) that a material can support without failing. The units are the same as those of stiffness, but in this case the *(deformation, local)* is irreversible. The yield strength is the *(stress, point)* at which a material first deforms plastically. For a *(metal, water)* the yield strength may be less than the fracture strength. It is the *(stress,metal)* at which it breaks. Many materials have a higher *(strength, work)* in compression than in tension.

Ductility is the ability of a *(material, column)* to deform without breaking. One of the great *(advantages, styles)* of metals is their ability to be formed into the *(shape , part)* that is needed, such as car body parts. Materials that are not ductile are brittle. Ductile materials can absorb energy by *(deformation, assignation)* but brittle materials cannot.

Toughness is the *(resistance, deformation)* of a material to breaking when there is a crack in it. For a material of given toughness, the stress at which it will fail is inversely proportional to the square root of the size of the largest *(defect, form)* present. *(Toughness, importance)* is different from strength. For example, the toughest steels are different from the ones with the highest tensile strength. *(Brittle, easy)* materials have low toughness. For example, glass can be broken along a chosen line by first scratching it with a diamond. Composites can be designed to have considerably greater *(toughness, flexible) than* their constituent materials. The example of a very tough composite is *(fiberglass, idea)* that is very flexible and strong.

Creep resistance is the *(resistance, part)* to a gradual permanent change of a shape, and it becomes especially important at higher *(temperatures, speeds).* A successful research has been made in *(materials, classes)* for machine parts that operate at high temperatures and under high tensile forces without gradually extending. For example, they can be the *(parts, ways)* of plane engines.

5. *Read the text and complete the spidergram:*



6. Read the text again and complete the following sentences:

- Aluminium alloys, with typical densities around...are considerably less dense than steels, which have typical densities around...
- ...is important in any application where the material must not be heavy.
- The Young modulus is a... to simple stretching or compression.
- It is the ratio of the applied force per unit area (stress) to the...
- The yield strength is the stress at which a ...
- For a metal the yield strength may be which the stress at which it breaks is; many materials have a... tension.
- One of the great advantages of metals is... such as car body parts.
- Materials that are not ductile are...
- Toughness is the... of a material to breaking when there is a crack in it.
- ...is a measure of the resistance to deformation such as stretching or bending.

7. *Read the following statements and say whether they are true or false. Correct the false statements:*

- Density (specific weight) is not the amount of mass in a unit volume.
- Aluminium alloys, with typical densities around 3000 kg/m^3 are considerably less dense than steels, which have typical densities around 7800 kg/m^3.
- Density is not important in any application where the material must not be heavy.
- The Young modulus is a measure of the resistance to simple stretching or compression.
- It is the ratio of the applied force per unit area (stress) to the fractional elastic deformation (strain).
- Strength is the force per unit area (stress) that a material can support without failing.
- Many materials have not a higher strength in compression than in tension. Ductility is the ability of a material to deform without breaking.
- Toughness is the resistance of a material to breaking when there is a crack in it.
- It is measured in a kilogram per cubic meter.

8. ***Match the parts of the following sentences:***

• Density	• is the resistance of a material to breaking when there is a crack init.
• Stiffness	• is the amount of mass in a unit volume.
• Strength	• is a measure of the resistance to deformation such as stretching or bending.
• Ductility	• is the resistance to a gradual permanent change of shape.
• Toughness	• is the ability of a material to deform without breaking.
• Creep resistance	• is the force per unit area that a material can support without failing.

After-Reading

Grammar focus

1. *Write down all the nouns from the text in plural.*

2. Make the following sentences negative and put into the inter-rogative form:

- **Density** (specific weight) is the amount of mass in a unit volume.
- **Stiffness** (rigidity) is a measure of the resistance to deformation such as stretching or bending.
- **Toughness** is the resistance of a material to breaking when there is a crack in it.
- **Ductility** is the ability of a material to deform without breaking.

- **Strength** is the force per unit area (stress) that a material can support without failing.

3. ***Write the following words in the correct order to make sentences and translate them into Russian:***

- any, in , density, important, application, is
- important, a, is, stiffness, rigid, structure, is, to,when, mad, be
- from, toughness, is, strength, different
- low, brittle, have, materials, toughness
- a, many, in, materials, have, higher, strength, in, tension, than, compression.

Get talking

1. ***Make up a plan to the text.***

2. ***Imagine you are a future skilled engineer. Say some words about properties of materials. Your talk should include 15—20 phrases.***

TEXT № 2 2

MANUFACTURED BUILDING MATERIALS

Before-Reading

1. ***Discuss the following:***

- What a modern industrial technology do you know?
- Have you been at any industrial plant?
- Have you seen any process of industrial technology?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- ingredient
- mechanical extrusion process
- conveyor belt
- diagonal boards
- balloon frame system

3. ***Make up your own sentences with the following words:***

a production of brick (производство кирпича), ***a timber technology*** (технология обработки лесоматериала), ***an industrial method*** (промышленный метод), ***a small building*** (небольшое строение), ***an innovation in building construction*** (инновационный метод в строительстве), ***a production development*** (развитие производства), ***a mechanical process*** (механический процесс).

While-Reading

1. ***Read the text and find new words front the text.***

2. ***Find and translate all the sentences containing the following words:***

- warehouse
- timber technology
- laborious process of hand-molding
- balloon frame
- building construction
- conveyor belt
- constituent building materials

One of the building materials used in a construction is a brick. The production of a brick was industrialized in the 19th century. Earlier it was a process of hand-molding. Later it was superseded by «pressed» bricks. It was a mass production by a mechanical extrusion process. In this way clay was squeezed by "pressed" through a rectangular die as a continuous column and sliced to size by a wire cutter. Periodically fired kilns were used. Bricks were moved slowly on a conveyor belt. New methods considerably reduced the cost of a brick. That's why it became one of the constituent building materials of the age.

Rapid development of timber technology was in the 19th century in North America. It was explained large softwood fir's forests and pine trees. There they were used as industrial methods. Steam- and water-powered sawmills began.producing standard-dimension timbers in the 1820s. The production of cheap machine made nails in the 1830s. It provided other necessary ingredient — a balloon frame. That made possible a major

provided a quick, flexible, inexpensive solution to this problem. Heavy timbers and complex joinery were abandoned in the balloon frame system. The building walls were framed with 5x 10-centimetre (2x4-inch) vertical members. They were placed at 40 centimeters (16 inches) from the centre. This supplied a roof and floor joists, usually 5x25 centimeters (2x10 inches) and placed 40 centimeters (16 inches) apart and were capable of spanning up to six meters (20 feet).

3. ***Read the text again and translate the second paragraph from the text.***

4. ***Read the text again and find the main idea of each paragraph.***

5. ***Reading for specific information. Read the text and answer the following questions to the text:***

- When was the production of a brick industrialized?
- When did rapid development of a timber technology undergo?
- What was George W. Snow?

6. ***Read the text again and complete the following sentences:***

The production of a brick was industrialized in the...
It was a mass production...
in North America.
There were large softwood fir's forests...
..in the 1820s.
..in the 1830s.
..were moved slowly .
..it was a process.
..a great demand for small buildings.

7. ***Read the following statements and say whether they are true or false. Correct the false statements:***

The production of brick was industrialized in the 20th century.

innovation in building construction. The first example was a warehouse erected in Chicago in 1832 by George W. Snow. There was a great demand for small buildings of all types settled on North American continent. Light timber frame These were not mass-produced by a mechanical extrusion process in which clay was squeezed by "pressed" through a rectangular die as a continuous column and sliced to size by a wire cutter.

- There was also a proliferation of elaborately shaped and stamped masonry units.
- Timber technology underwent rapid development in the 20th century in North America, where there were large forests of softwood fir and pine trees that could be harvested and processed by industrial methods; steam- and water-powered sawmills began producing standard-dimension timbers in quantity in the 1920s.
- The production of cheap machine-made nails in the 1830s provided the other necessary ingredient that made possible a major innovation in building construction, the balloon frame; the first example is thought to be a warehouse erected in Chicago in 1832 by George W. Snow.

After-Reading

Grammar focus:

1. ***Write all the following nouns in plural:***

a production, a brick, a process, an ingredient, a development, a centimeter, an inch, a meter, a tree, a demand, a solution, a problem.

2. ***Write down all the numerals from the text in letters.***

3. ***Put "was" or "were" in.***

- The production of brick industrialized in the 19th century.

- These mass-produced by a mechanical extrusion process in which clay squeezed by "pressed" through a rectangular die as a continuous column and sliced to size by a wire cutter.There also a proliferation of elaborately shaped and stamped masonry units.
- Periodically fired beehive kilns continued used, but the continuous-tunnel kiln, through which bricks moved slowly on a conveyor belt, had appeared by the end of the century.
- Timber technology underwent rapid development in the 19^{th} century in North America.
- There large forests of softwood fir and pine trees that could be harvested and processed by industrial methods.
- There a great demand for small buildings of all types as the North American continent settled, and the light timber frame provided a quick, flexible, and inexpensive solution to this problem.
- In the balloon frame system, traditional heavy timbers and complex joinery abandoned.
- The building walls framed with 5 x 10-centimetre.
- Lateral stability achieved by light diagonal braces let into the studs or, more commonly, by two-centimeter thick diagonal boards applied to all exterior walls and to floor and roof lists creating a rigid, light box.

4. ***Write all the complex sentences from the text and translate them.***

Get talking

1. ***Work in pairs. Discuss "Manufactured building materials". Your talk should last for about a minute and include between 10—20 phrases.***

TEXT № 23 ADVANCED COMPOSITE MATERIALS

Before-Reading

1. ***Discuss the following:***

- What manufactured building materials do you know?
- And what about different types of materials?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- monolithic materials
- reinforced concrete
- plywood panels
- composite materials
- linoleum
- plastic

3. ***Match the following words with their Russian equivalents:***

• clay	• солома
• straw	• железо
• a brick	• медь
• iron	• пластмассовый лист
• copper	• глина
• linoleum	• кирпич

While-Reading

1. ***Read the text again and translate the first paragraph from the text.***

2. ***Read the text once more find the main idea of each paragraph.***

3. ***Reading for specific information. Read the text and answer the following questions to the text:***

- What are characteristics of composite materials?
- What is the present tendency in the use of composite materials?
- What are the main reasons for the interest in composite materials?
- Why do engineers insist on using composite materials despite their high cost?

Among the oldest and newest of structural materials are composite materials. It was discovered many years ago that two or more materials could be used together as one. Later it was proved that such a combination often behaved better than each material alone. Following this principle, clay and straw were combined to make bricks. For centuries composite materials remained virtually untapped. Only then monolithic materials, such as iron, copper were served for needs of an advancing technology. Recently it was a development of technology with coming of reinforced concrete, linoleum, plasterboard and plywood panels.

During the 1930"s and 1940"s light-weight honeycomb structures, machine parts made from compressed metal powders and plastic reinforced with glass fibers became commercial realities. These developments marked the beginning of the modern era of composite engineering materials. It was mentioned growing and using composite materials. The consumption of the fiber reinforced plastics, for example, has been increasing at the phenomenal rate of 25 per cent annually. Nevertheless, the emergence of a strict discipline and technology of composite materials is barely 20 years old.

There are two major reasons for the current interest in composite materials. The first is the demand for materials that will outperform the traditional monolithic materials. The second and more important in the long run, is that composites offer engineers the opportunity to design totally new materials, with the precise combination of properties needed for a specific task. Although new composites are usually more costly than conventional materials, they can be used more sparingly, because of their superior qualities.

4. ***Read the text again and complete the following sentences:***

- ...combined clay and straw...
- The first is...
- ...growing and using...
- There are two major reasons...
- Although the new composites are usually more costly...

5. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- There are three major reasons for the current interest in composite material.
- Composite materials are among the oldest and newest of structural materials.
- Although the new composites are not usually more costly than conventional
- Materials, they can't be and more sparing, because of their superior qualities.
- Men discovered early that when two or more materials are used together as one.
- The combination often behaves better than each of the materials alone.
- These developments didn't mark the beginning of the modern era of composite.
- Engineering materials.

After-Reading

Grammar focus

1. ***Write all the following nouns in plural:***

a material, a man, a clay, a straw, a brick, an exception, a century, an aniron, a copper, a technology, a concrete, a linoleum, a discipline, a technology, a reason, an engineer, a combination, a quality.

2. ***Complete the table (pay attention to degrees of comparison):***

		The newest
modern		
	more important	
long		
strict		
specific		
notable		
		The oldest
plastic		
conventional		

3. ***Write down all the numerals from the text in letters.***

4. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

5. ***Write the following words in the correct order to make sentences and translate them into Russian:***

- Growing, the, has, use, materials, been, of, composite, steadily.
- Two, reasons, materials, there, for, the, are, current, composite, in, major, interest.
- The, composite, among, oldest, of, materials, newest, are, structural, materials, and.
- To, following, they, straw, make, clay, this, bricks, principle, combined, and.
- These, marked, of, developments, the, era, composite, materials, the, beginning, modern, engineering.

Get talking

1. ***Find all the sentences, describing: a) new materials b) spheres, where new materials are used. Give your talks using these sentences. Your talk should last half a minute.***

2. Make up dialogues about:
a) Advanced composite materials.
b) The oldest composite materials.
c) The newest composite materials.
They should last for about a minute and include between 10-20 phrases.

TEXT № 24 FICIENCY OF EASY METAL DESIGNS OF BUILDINGS

Before-Reading

1. ***Discuss the following:***

- Do you like old-fashioned houses? Try to prove your own point of view.
- What is your own idea about modern constructions?
- What do you think about metallic construction?
- Can you imagine it? Air your own ideas.

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- metallic construction
- to organize modern competitive manufacture
- metal skeleton
- special panels such as "sandwich"
- bolt connections
- building site
- facing
- trading constructions.

3. ***Make up your own sentences with the words from Ex 2.***

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Read the text and translate it.***

3. ***Reading for general understanding. Read the text and answer the following questions to the text:***

- What is a very important distinctive feature of fast?
- What do you know about "sandwich"?
- What advantages of the fast metallic construction do you know?

All cultures have their own traditions and customs. That's why it is important to know about them. Of cause, architecture has its own history. There are a lot of different kinds of architectural styles, describing some features of every country. For example, red brick buildings of old Petersburg factories, grey Ferro-concrete cases of industrial giants tell us about Soviet epoch. But, today they look old-fashioned. Besides external unattractiveness, these constructions of the last centuries have lacks. They are internal narrowness, conditions of communications in these buildings. In particular, because of these lacks it is impossible to organize a modern competitive manufacture. The majority of the companies do not prefer building of new constructions, using the most perspective materials and technologies, including an easy metallic construction (LMC).

Let's tell some words about a basic fast construction for buildings. It is a metal skeleton. There metal vertical racks and horizontal crossbar with the help bolt connections gather in cross-section frames. The cross-section frames are a system of extensions or communications, giving to design settlement durability fastens. Then it is established roofing, wall runs, frames under windows, doors. Any engineer may say that a bearing skeleton is ready. Further it is possible to use any facing. It can be Ferro-concrete, bricklaying, special panels such as "sandwich", any combinations of the specified designs.

It is necessary to tell some words about panels such as '"sandwich". Every panel consists of two sheets of the zinced iron between which a special heater is placed. The design has no internal skeleton. Its durability is reached due to the certain orientation of fibers.

It is very important for a future skilled engineer to remember about a distinctive feature such as "fast". It is a high degree of a factory's readiness to complete the building. In practice it is carried out as follows. All details, delivered to a building site, are made at a factory with their obligatory test characteristics of strong. On a building site all elements of a design are gathered with the help bolt connections. With the purpose, excepting possible problems during installation, all details are adjusted to each other on the factory-manufacturer control assembly of each design .

The scope of fast metallic construction is very wide. For example, metallic construction is not used at construction of buildings in which nuclear reactors will place, or bank storehouses. There walls' and roofing designs should possess raised isolation properties. It is not accepted to use them. Practically, fast metallic constructions are used at the construction of any industrial targets, warehouses, sports complexes. Recently fast construction designs are used in the market. This process does metallic construction attractive in the field of trading constructions.

Every construction has its own advantages and disadvantages. Advantages of a fast metallic construction are obvious. A cost of a building from a metallic construction is 30—40 % less, than on construction of a similar building, using traditional materials. Naturally, the given statement is correct only under condition of the certain identity of quality of external and internal furnishing. For example, the building constructed from the cheapest brick without additional external furnishing, will be cheaper than a construction from a fast metallic construction with a facade trimmed with dark glass. The essential economy, while using a metallic construction, is reached to decrease in expenses of a zero cycle approximately on 50 %. Today a fast metallic construction is aleader among all building designs, first of all, because of its low price. On the other hand, it has the shortest terms of erection. The economy of time can become very significant and essentially important for any customer. Besides the price and terms of assembly, fast metallic constructions have more important advantage. The matter is that a metallic construction is not only quickly gathered, but also can be disassembled fast and without special financial expenses.

4. ***Read the text again and find the main idea of each paragraph.***

5. ***Read the text once more and complete the following sentences:***

- ...is very wide.
- A very important distinctive feature of fast...
- ...old-fashioned.
- The given statement...

[6] ...more important advantage...

- ...which are delivered to a building site...
- For example,...
- ...with the help bolt connections...
- All cultures...
- ...is a leader among all building designs...
- It is a high degree...
- In particular...
- ...as "sandwich".
- ...delivered to a building site.
- The economy of time...

After-Reading

Grammar focus

1. ***Write down all the nouns from the text in plural.***

2. ***Complete the table (pay attention to degrees of comparison):***

		the most perspective
		the shortest
		the cheapest
wide		
last		
	more essential	
internal		
big		
financial		
traditional		

3. ***Write down all the numerals from the text in letters.***

4. ***Make the following sentences negative and put into the interrogative form:***

- The bearing skeleton is ready.
- A basic fast construction of buildings from LMC is a metal skeleton.
- Advantages of fast metallic construction are obvious.
- On a building site all elements of a design gather exclusively with the help bolt connections.
- The scope of fast metallic construction is very wide.
- Fast metallic construction is indisputable leader among all building designs.

5. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

6. ***Write the words in the correct order to make sentences and translate them into Russian:***

- Architecture, history, its, own, has.
- Today, is ,fast, a, leader, all, construction ,among, metallic, building ,designs, a.
- Further, to, it, possible, facing, use, any, is.
- Advantages, Every, and, has, construction, own, its, disadvantages.
- It, metal, a, skeleton, is.

Get talking

1. ***Make up a plan to the text.***

2. Make up dialogues about:
a) Advantages of fast metallic construction;
b) metal skeleton.
They should last for about a minute and include between 10—20 phrases.

3. ***Prepare reports about old-fashioned buildings in Russia. A report should include 2000-3000 words.***

TEXT № 25 FERROUS METALS

Before-Reading

1. ***Discuss the following:***

- What is a metal?
- Can you describe a metal? Try to do it.

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- steel industry
- different industries
- the main component
- machine tools
- machinery
- automobile
- aeroplane
- other element

3. ***Match the following words with their Russian equivalents:***

• non-ferrous	• медь
• an alloy	• инструмент
• a railway	• мост
• a network	• железо
• a tool	• сплав
• a bridge	• железная дорога
• copper	• сеть

While-Reading

1. ***Read the text and find all the sentences containing the following words:***

- steel industry
- copper
- an alloy
- a railway
- an automobile
- an aeroplane

Copy them in your exercise-books.

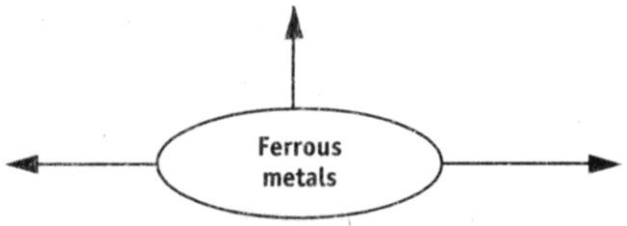
2. ***Reading for specific information. Read the text and answer the following questions to the text:***

- What are ferrous metals?
- What are non-ferrous metals?
- What are the characteristics of non-ferrous metals?

In general metals are used in various constructions and different industries. For example, thousands of miles of railway track. All metals are divided into ferrous and non-ferrous metals. Ferrous metals are metals or alloy the main component of which is iron. The ferrous metals are iron, steel and their alloys. Especially ferrous metals

are of great importance. Machine tools and machinery, steamships and locomotives, automobiles and aeroplanes, rails and bridges, razor blades are turned out by the steel industry.
Non-ferrous are metals and alloys the main component of which is not iron but another element. It may be copper, aluminium, zinc. That's why copper and aluminium are belonged to as non ferrous metals. Non-ferrous metals are extracted from minerals such as magnesium, carbonate and tin oxides, chloride. Non-ferrousmetals have some characteristics. They are: high electric and heat conductivity, high corrosion resistance, non-magnetic qualifies, light weight and easiness to fabrication.

3. ***Read the text again and complete the spidergram:***



4. ***Read the text once more and complete the following sentences:***

- Ferrous metals ..
- ... , steamships and locomotives, automobiles and aeroplanes,

- ... are referred to as non-ferrous metals.
- ... are divided into ...
- In general, .. .
- have some characteristics.

5. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- Thousands of miles of railway track form an intricate network of steel over the
- world, helping to carry daily billions of freight for different industries.
- Copper, aluminium and some other metals are not referred to s non-ferrous metals.
- All metals are divided into ferrous and non-ferrous metals.

- Metals in general and especially ferrous metals are of great importance in various constructions. Ferrous are metals and alloys the main component of which is not iron.
- Non-ferrous metals are extracted from minerals such as magnesium, carbonate and tin oxides, chloride.
- The ferrous metals are iron, steel and their alloys.

After-Reading

Grammar focus

1. ***Complete the following words from the text:***

a m_tal, an all_y, a c_mp_ent, a f_rm, a c_nstr_c_on, a m_le, a n_two_k, a w_rld, an ind_stry, a m_ch_ne, a t__l, a st__mship, a l_co_ot__e, an a_ro_pl_ne, a br_dge, a p_od_ct.

2. Write down all the nouns from the text in plural.

3. ***Make the following sentences negative and put into theinterrogative:***

- All metals are divided into ferrous and non-ferrous metals.
- Ferrous metals are metals and alloy the main component of which is iron.
- Ferrous metals are of great importance in various constructions.
- Non-ferrous are metals and alloys the main component of which is iron.
- Copper, aluminium and some other metals are referred to as non-ferrous metals.

4. ***Write down all irregular verbs and their three forms.***

Get talking

1. ***Imagine you are a future skilled engineer. Say some words about "Methods for constructing walls for buildings". Your talk should last a minute. You should use the spidergram.***

TEXT 26 NON-FERROUS METALS

Before-Reading

1. ***Discuss the following:***

- What have you learnt about metals?
- What are ferrous metals?

2. ***Match the following words with their Russian equivalents:***

conductivity	• аккумулятор
corrosion	• цинк
resistance	• желтая медь
fabrication	• чистая медь
zinc	• серебристый
silvery	• коррозия
suitable	• проводимость
pure copper	• никель
brass	• сопротивление
bronze	• подходящий
nickel	• олово
tin	• бронза
accumulator	• изготовление

3. ***Make up your own sentences with the following words:***

conductivity (проводимость), corrosion (коррозия, ржавчина), resistance (сопротивление), a fabrication (производство, изготовление), zinc (цинк, цинковый), oxid (окись), magnesium (магний), silvery (серебро, серебристый), pure copper (чистая медь), weak acids (кислота), an industry (промышленность, индустрия), a piston (поршень), casting (форма для литья), a cylinder (цилиндр),* a *magnalium (монолит), duralumin (дюралюминий), electricity (электричество), a cable (кабель), brass (латунь, железная руда), bronze (бронза), nickel (никель), a tin plate (пластина олова), to cut (резать, срезка).

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Read the text and find all the sentences, containing the following words:***

- conductivity
- copper
- fabrication

- bronze
- pure copper

- resistance

Copy them in your exercise-books.

3. ***Read and translate the text.***

Aluminium. One of the oldest and best known metal is aluminium. It has some characteristics. First of all, it is a white silvery metal. Thanks to low weight and resistance to corrosion aluminium is very suitable for the bodies of vehicles and also for castings-gear-boxes, pistons, cylinder heads. Also it is one of the metals widely used in the industry. It is used for making cooking utensils, ladders, refrigerators, wrapping material. Aluminium foil is used for the heat insulation of houses. One of aluminum's characteristics is that it does not rust in the air. It is used in painting. Aluminium paint protects ironwork from rust, obliterates dark paint and reflects light. Any engineer must remember that aluminium is soft. That is why it is only used with other metals to make alloys light but very strong. Some important aluminum alloys are magnolium and duralumin (95% aluminium + 4% copper + 1/2% manganese + 1/2% magnesium). It can be tempered by heat treatment. This alloy is used to make aircraft, houses, furniture and motor pistons.

Copper. This metal is found in nature in the form of ores but sometimes it is found'in pure state. So we know pure copper. Pure copper has some specific characteristics. They differ it from other metals. First of all it is reddish colour. Also it has corrosion resistant qualities. Copper is the best conductor of electricity. It is surpassed only by silver for conductivity of electricity. Thanks to copper's conductivity it is widely used for electrical wiring and cables, such as telephone and telegraph cables, making of electrical apparatus, parts of dynamos and electric motors. Copper with other metals is used in alloys. There are three important *copper alloys.*

The first is brass. Brass, including 20% zinc and 80% copper. It is important to know about zinc. Its colour is yellow when hot and white when cold. *Zinc* is a hard grey metal which acquires a protective coating of zinc oxide on its surface. It burns in oxygen and in chlorine with a bluish flame. Zink oxide is used in paints because it is non-poisonous and is not discolored by hydrogen sylphlike. It has a soothing effect upon the skin and is used in ointments and lotions. It is added to rubber for making racing motor treys. Zink is used in the making of dry batteries and in the process of galvanizing. In this way, iron is dipped into molten zinc, which forms a protective layer on its surface, and so prevents rusting. Galvanized iron is used in sheets for roofing and also for buckets and dustbins.This alloy of zinc and copper is header and cheaper than copper itself. It can be pressed into a shape. It resists corrosion. So brass hinges are used in preference to steel if they are exposed to weather.

The second is ***bronze.*** Bronze is an alloy of copper and tin. Tin is a silvery metal which is not corroded by air. Tin plate is suitable for cans in which acid fruit and other food-stuffs are packed because tin is not attacked by weak acids. For good containers, iron is coated with tin instead of zinc because tin is not subject to attack by acids in food. Bronze, including 20% tin and 8o%copper is very tough. Bronze is used for making ship propellers, parts of machinery subject to hard wear and for doors and windows.

And the third one is ***copra-nickel*** (75% copper + 25%nickel). Last one is used for the present "silver" coins.

For a very long time such a combination as supplies including metals lead, zinc with supplier is known. It was mentioned about zinc. It is high time to tell some words about lead. Lead is a grey malleable metal which melts at 327°C, which is low for a metal. Earlier it was used for roofing and for water piping because of its softness and resistance to corrosion. Today copper and iron have taken its place. Now lead is a very expensive metal. But lead is still used for roofing and for making waste pipes and sink traps because it is easily bent into shape, storage battery (accumulator) plates, cable sheaths, storage tanks for sulphuric acid, lead shot, solder, screens to stop harmful radiation from radioactive substances. Other lead alloy is a type of metal such as lead, tin, bismuth, cadmium. Lead monoxide is used for making glass that it is brilliant and sparking.

4. ***Reading for specific information. Read the seventh and the eight paragraphs from the text and answer the questions to the text:***

- For what lead is used?
- For what zinc is used?
- What colour is zinc?
- Why is the lead a very expensive metal?
- What metal can you see mostly in our life?
- What copper alloys do you know?

The second is *bronze.* Bronze is an alloy of copper and tin. *Tin* is a silvery metal which is not corroded by air. Tin plate is suitable for cans in which acid fruit and other food-stuffs are packed because tin is not attacked by weak acids. For good containers, iron is coated with tin instead of zinc because tin is not subject to attack by acids in food. Bronze, including 20% tin and 8o%copper is very tough. Bronze is used for making ship propellers, parts of machinery subject to hard wear and for doors and windows.

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heat insulation of houses. One of aluminum's characteristics is that it does not rust in the air. It is used in painting. Aluminium paint protects ironwork from rust, obliterates dark paint and reflects light. Any engineer must remember that aluminium is soft. That is why it is only used with other metals to make alloys light but very strong. Some important aluminum alloys are magnolium and duralumin (95% aluminium + 4% copper + 1/2% manganese + 1/2% magnesium). It can be tempered by heat treatment. This alloy is used to make aircraft, houses, furniture and motor pistons.

Copper. This metal is found in nature in the form of ores but sometimes it is found'in pure state. So we know pure copper. Pure copper has some specific characteristics. They differ it from other metals. First of all it is reddish colour. Also it has corrosion resistant qualities. Copper is the best conductor of electricity. It is surpassed only by silver for conductivity of electricity. Thanks to copper's conductivity it is widely used for electrical wiring and cables, such as telephone and telegraph cables, making of electrical apparatus, parts of dynamos and electric motors. Copper with other metals is used in alloys. There are three important *copper alloys.*

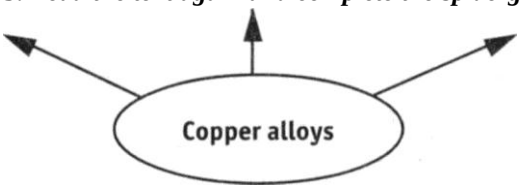
The first is brass. Brass, including 20% zinc and 80% copper. It is important to know about zinc. Its colour is yellow when hot and white when cold. ***Zinc*** is a hard grey metal which acquires a protective coating of zinc oxide on its surface. It burns in oxygen and in chlorine with a bluish flame. Zink oxide is used in paints because it is non-poisonous and is not discolored by hydrogen sylphlike. It has a soothing effect upon the skin and is used in ointments and lotions. It is added to rubber for making racing motor treys. Zink is used in the making of dry batteries and in the process of galvanizing. In this way, iron is dipped into molten zinc, which forms a protective layer on its surface, and so prevents

rusting. Galvanized iron is used in sheets for roofing and also for buckets and dustbins.This alloy of zinc and copper is header and cheaper than copper itself. It can be pressed into a shape. It resists corrosion. So brass hinges are used in preference to steel if they are exposed to weather.

4. ***Reading for specific information. Read the seventh and the eight paragraphs from the text and answer the questions to the text:***

- For what lead is used?
- For what zinc is used?
- What colour is zinc?
- Why is the lead a very expensive metal?
- What metal can you see mostly in our life?
- What copper alloys do you know?
- What are specific characteristics of copper?
- What is the oldest and best known metal?
- What are aluminium's characteristics?
- What aluminium alloys do you know?

5. ***Read the text again and complete the spidergram:***



6. ***Read the text again and complete the following sentences:***

- Aluminum is the ... and best ... metal.
- Coppies found in nature in the form of... but it is sometimes found in ...
- ... is the best conductor of electricity.
- ... is a silvery metal.
- Tin is not attacked by ...
- ... is soft...
- ... is used for making cooking utensils, refrigerations.
- Aluminum protects .. from rust, reflects light.
- ... is used for making aircraft, houses, furniture and motor pistons.
- Tin plate is suitable for ...
- And the third one...
- ...have taken its place.
- It is added...

7. ***Read the following statements and say whether they are true of false. Correct the false statements:***

- Tin is a golden metal.
- Aluminum is the latest light metal.

- Tin plate is suitable for can.
- Bronze is very tough.
- Pure copper is of white colour.
- Tin is not corroded by air.
- Copper is founded in nature.
- Cupro-nickel is consist of 75% copper and 25% nickel.
- Tin is not subject to attack by acids in food.
- Copper is the worst conductor of electricity.

8. ***Match the parts of the following sentences:***

Aluminum	[1] is a silvery metal which is not corroded by air
Copper	[1] is used for making ship propellers, parts of machinery subject to hard wear and for doors and windows
Tin .	[1] is found in nature in the form of ores but it is sometimes found in pure state
Zink	are also metals which occur in combination with sapphire as sapheads
Lead and Zink	is the oldest and best known light metal
Bronze	Is a moderately hard grey metal which acquires a protective coating of zinc oxide on its surface

After-Reading

Grammar focus

1. ***Write all the following nouns in plural.***

Zinc, copper, flame, iron, corrosion, radiation, ladder, brass, refrigerator, aircraft, furniture, piston, tin, conductor, vehicle,

3. ***Complete the table (pay attention to degrees of comparison):***

		the best
high		
	header	
	cheaper	
		the commonest
		the oldest
great		
dark		
soft		
strong		

4. ***Write the numerals from the text in letters.***

5. ***Make the following sentences negative and put into the interrogative:***

- Aluminum is the oldest and best known light metal alloyed with other metals.
- It is one of the commonest metals in industry.
- Copper is found in nature in the form of ores but it is sometimes found in pure.
- Pure copper is of reddish colour, and it has corrosion resistant qualities.
- Copper is the best conductor of electricity.
- Tin is a silvery metal which is not corroded by air.
- Bronze is very tough.
- Brass is header and cheaper than copper.
- Lead and Zink are also metals which occur in combination with sulfur as sulphides.
- Lead is now a very expensive metal.

6. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

aluminium, magnesium, carbonate, chloride, water, glass.

Find all the sentences from the text with Present Perfect. Copy them in your exercise-books.

7. ***Write all the complex sentences from the text and translate them.***

Get talking

1. ***Make up a plan to the text.***

2. Work in pairs. A future engineer should know about non-ferrous metals. Discuss:

a) aluminum;
b) copper;
c) tin;
d) zinc;
e) bronze.

Your talks should include between 30—50 words.

TEXT 27 TOOLS FROM METAL

Before-Reading

1. ***Discuss the following:***

• Do you know any product of metal?

2. ***Match the following words with their Russian equivalents:***

- tools
- saw
- axe
- chisel
- tree
- dwelling
- erect
- temple
- manufacturing bricks
- durable material
- wooden forms
- solution
- fastening
- plaster
- oksid calcium
- sand
- volcanic ashes
- gravel

сооружать
храм
дерево
гравий
мрамор
инструменты
прочный материал
раствор
штукатурка
дома
песок
стамеска
топор
вулканическая зола
пила
прикреплять
деревянная форма
промышленные кирпичи

- stone • оксид кальция
- marble • камень

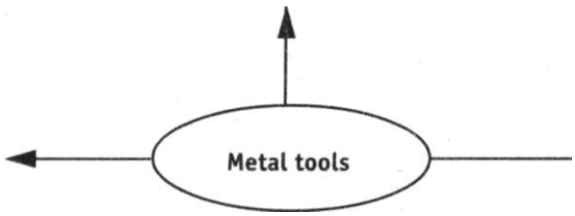
While-Reading

1. ***Read the text and find new words from the text.***

2. Read the text again and translate it.

Various materials are used as a solution for fastening. It was so a long ago. Sometimes in Mesopotamia (modern Iraq) masters applied resin substance — bitumen. Egyptians used plaster (sulfate of calcium). Greeks and Romans originally worked with oxide calcium. But the limy solution was easily washed away by a rain. Subsequently Greeks and Romans took more durable cement mortal on arms — a mix to exhaust, sand and volcanic ashes. Later Romans began to add to it gravel for reception of concrete. Greeks continued building of integral blocks of a stone or marble. One more major landmark became manufacturing bricks in the furnace for roasting at high temperatures. So it was received stronger and more durable material in comparison with samanom. But Romans used only thin layers of these materials for facing concrete designs. Besides dwellings, builders could erect majestic palaces, temples and monuments. They also decorated with their decorative stone lying.
Many things are made by metal tools. Metal tools allow cutting, squaring and polishing a stone. Metal tools such as an axe, a saw, builders used many years ago. Also they had an opportunity to use available materials more widely. Now they could cut the big

3. ***Read the text again and complete the spidergram:***



trees and split them and bars.

4. ***Read the text again and complete the following sentences:***

- Now they could cut the big trees and...
- Various materials were used...
- ...took more durable cement mortal on arms — a mix to exhaust, sand and volcanic ashes.
- Many things...
- Greeks and Romans...
- ...in comparison with samanom.

After-Reading

Grammar focus

1. ***Write down all the nouns from the text in plural.***

2. ***Write down metal tools in your nottebooks.***

3. ***Write down all irregular verbs and their three forms.***

4. ***Write the words in the correct order to make sentences and translate them into Russian:***

- they, the, big, bars, and, now, could, trees, cut, split, them, and.
- besides, builders, erect, palaces, and, and, to, with, decorative, laying, dwellings, could, majestic, temples, monuments, decorative, also, stone, their.
- formation, allowed, full, convenient, work, size, in, wooden, to, lots, of, bricks, work, one, forms, do, of.
- as, the Greeks, buildings, Romans, only, designs, facing, materials, of, thin, used, against, continuing, build, to, integral, a stone, or, a marble, blocks, layers, these, for, concrete, of.
- metal, civilizations, of, on, huge, that, polish, square, to, tools, ancient, development, influence, rendered, a stone, and, cut, allowed.

Get talking

1. ***Give a summary of the text in 150 words.***

2. Prepare reports metal about tools in different countries. A report should include 2000—3000 words.

TEXT 28 EXTRUDED PRODUCTS

Before-Reading

1. ***Discuss the following:***

- What do you know about high-quality products?
- What are their advantages and disadvantages?

2. Try to guess the meaning of the following words. Use the dictionary if you need:

- parameters
- finished products
- customers demands
- high-quality products
- printing industries
- manufacturing of aluminum

3. ***Make up your own sentences with the words from Ex 2.***

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Reading for general understanding. Skim read the text. Dxink of a good title for it. Compare it with other students' titles.***

3. ***Reading for specific information. Read the text, choose a right word.***

Using aluminum extrusions is growing rapidly *(worldwide, nowhere).* They are increasingly used in a variety of *(new, old)* applications. As a construction *(material, hook),* aluminum extrusions free the imagination and expand the *(parameters, borders)* of possibilities. We offer extruded aluminum profiles, semi-manufactured *(components, goods),* systems and finished products — meeting our customers' *(demands, methods)* for performance, quality, precision and economy. Hydro Aluminum has already implemented more than 200.000 customer profiles worldwide. Customer satisfaction and product excellence are our key *(goals, words).* Hydro *(Aluminum, concrete)* also offers a wide selection of standard extrusions with more than 1.500 different profiles. Hydro Aluminum will assist you in finding the *(standard, defective)* aluminum extrusion that fits your needs.

Extrusion is a *(process, idea)* that provides virtually unlimited opportunities for adapting product shapes. *(Costs, processes)* are cut by using fewer components, which reduces the finishing process and simplifies assembly. Aluminum extrusions inspire creative *(designs,works)* and technical solutions that improve, simplify and reduce costs. At the initial stage, we work together with our *(customers, produces)* on product development. Optimal design and correct alloy selection can simplify later stages of the creation *(process, method)* and generate cost savings. Besides this, we use

cutting-edge *(technology, words)* for quality fabrication with high precision.
Hydro Aluminum is a global supplier of a *(wide, narrow)* range of high-quality products such as cast, rolled and extruded products for the automotive, construction, packaging end printing *(industries, hospitals).* We are a strong and versatile *(partner, teacher)* with more than 85 years of experience in the *(production, sating)* and manufacturing of aluminum, and are active throughout the entire value chain. *(Aluminum, concrete)* from our smelters and participating interests in smelters at home and abroad forms the basis of these operations. We supply the *(market, house)* with over 3 million tones of *(metal, glass)* products annually from our global metal supply network. In addition, aluminum recycling represents a valuable resource for our *(company, school).*

4. *Reading for specific information. Read the first paragraph and translate, answer the following questions:*

- What is extrusion?
- Is the use of aluminum extmsions growing rapidly worldwide? « Are they increasingly used in a variety of new applications?
- For what are aluminum extrusions used?
- Why is Hydro Aluminum a global supplier of a wide range of high-quality products such as cast, rolled and extruded products for the automotive, construction, packaging end printing industries?

5. *Read the text again and complete the spidergram:*

6. *Read the text once more and complete the following sentences:*

- ...is a process that provides virtually unlimited opportunities for...
- Aluminum extrusions inspire creative designs and...
- Hydro Aluminum has already implemented more than...
- We... of metal products annually from our global metal supply network.
- In addition... represents a valuable resource for our company.
- ...we work to enhance people's quality of life — every day.
- ...is a process...
- ...we use...
- ...are our key goals.
- We after...

7. ***Read the following statements and say whether they are true of false. Correct the false statements:***

- The use of aluminum extrusions is not growing rapidly worldwide.
- Hydro Aluminum has already implemented more than 100.000 customer profiles worldwide.
- Customer satisfaction and product excellence are not our key goals.
- Hydro Aluminum also offers a wide selection of standard extrusions with more than 1.000 different profiles.
- We supply the market with over 2 million tones of metal products annually from our global metal supply network.
- We offer cost-effective solutions by implementing best practices.
- Aluminum extrusions inspire creative designs and technical solutions that improve, simplify and reduce costs.
- Extrusion is a process that provides virtually limited opportunities for adapting product shapes.
- Our focus isn't on product quality and capabilities.
- Optimal design and correct alloy selection can not simplify later stages of the creation process and generate cost savings.

After-Reading

Grammar focus

1. ***Complete the following words from the text:***

3. ***Write down all the numerals from the text in letters.***

Get talking

1. ***Make up a plan to the text.***

2. Imagine: You are a member of the conference. Round table: make a report about:
a) Advantages of the extrusion process;
b) Advantages of Hydro-aluminum.
Your reports should include between 50—100 words.

TEXT 29 ALUMINIUM

Before-Reading

1. ***Discuss the following:***

- What products are used in building and construction?
- Can you describe any of these materials?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- quality labels
- training for employees
- calculations
- documentations
- leading role
- competence
- certificate
- engine blocks
- structural components for the automobile industry

3. ***There are 10 words in this word square. Can you find them?***

a	l	u	m	i	n	i	u	m
e	x	t	r	u	s	i	o	n
s	d	e	s	i	g	n	x	o
i	n	d	u	s	t	r	y	i
s	m	a	c	h	i	n	e	t
t	m	a	r	k	e	t	n	a
a	c	h	i	e	v	e	g	i
n	o	b	l	o	c	k	i	i
c	d	e	n	s	i	t	y	r
e	l	a	t	e	m	e		b
z	u	t	i	v	i	t	c	a
e	m	p	l	o	y	e	e	f

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Reading for general understanding. Skim read the text and think of a good title for it. Compare it with other students' titles.***

3. ***Find and translate all the sentences containing the following words:***

- a worldwide network
- packaging and printing industries
- to create innovative and sustainable solutions
- an aluminium's strength
- an industrial machinery
- an aluminium extrusion

4. *Reading for specific information. Read the text, choose a right word.*

5. ***Read and translate the first paragraph from the text.***

As one of the worlds top integrated aluminum companies Hydro Aluminum offers customers a wide range of high-quality products.

Our focus on innovation, quality and cost-efficient solutions has led us to achieve market leadership in many of the most important industry's *(market, school)* segments in the automobile, construction, packaging and printing industries. 27.000 employees of Hydro Aluminum form a worldwide network that builds on 85 years of experience in the *(production, sailing)* and fabrication of aluminum. Hydro Aluminum has achieved a leading *(role, place)* in the following market segments: foil, lithographic strip, a building system, heat transfer systems and structural components for the automobile industry, high purity aluminum and magnesium. With 27.000 *(employees, teachers)* from 28 countries of the world our aluminum business holds a leading position in a number of areas. Our own *(production, manufacture)* was nearly 1.5 million tones of primary aluminum in 2003, in addition to a considerable trading activity.

Aluminum's strength, low density, corrosion, resistance and design flexibility make it an ideal *(material, role)* for building applications. More than 50 percent of all extruded products are used in *(building, field)* and construction. We are a major global supplier of building systems based on aluminum extrusions. We have a wide product range and are active in all parts of the *(industry, school).* We offer everything from single home residential solutions to large international tender projects. Working with Building Systems teams you can save *(time, position)* — starting with the design process all the way to logistics. Proprietary software for project calculations hands are on project support *(documentation, idea)* in a wide range of languages extrusion accessories and fittings. We have the competence for efficient tooling and can supply *(machine, water)* solutions. We can assist you in testing your finished products and assembly line productivity, as well as providing fireproof *(certificates, boxes)* and other quality labels. We can provide training for your employees to ensure efficiency. We can deliver directly to the project site.

Industrial machinery and accessories, tools, equipment, precision engineering, medical gear and instruments include *(aluminum, iron)* extrusions due to the metal's inimitable combination of properties. Aluminum extrusions are used in practically as businesses, products and environments. We have all the *(resources, members)* required to deliver extrusions of exactly the right design, shape and size for our customers *(finished product, resources).* Using of aluminum extrusions reduces the number of *(components, customers)* and simplifies assembly and individual component connections. An attractive finish and good thermal conductivity are just some of the strong *(arguments, facts)* for using aluminum in these products. At the design stage it is possible to construct an *(extrusion, components)* that minimizes the need for further work and makes fitting and assembly more efficient. Because of its ductility, *(aluminum, water)* is highly suitable for all types of fabrication. The bulk of the extrusions we deliver go through some form of fabrication and some kind of surface treatment.

6. ***Reading for specific information. Read the second paragraph and answer the following questions:***

- How much percent of all extruded products are used in building and construction?
- What can you tell about working Building Systems teams of Hydro Aluminum?
- What are advantages of aluminum?
- What can this company provide?

1. Read the text again and complete the following sentences:

- Our focus on innovation, quality and cost-efficient solutions has led us to achieve market leadership in many of the industry's most important market segments in the...
- We have... all the... shape and size for our customers finished product.
- We have for efficient tooling and...
- Aluminum's strength, low density... for building applications.
- The... employees of Hydro Aluminum form a... on 85 years of experience in the production and fabrication of aluminum as well as a strong... for today's challenges and tomorrow's opportunities.
- We can provide training for...
- ...we deliver go through...
- ...aluminum is highly suitable...
- We have... international tender projects.
- Working with our...

8. ***Read the following statements and say whether they are true of false. Correct the false statements:***

- The 25.000 employees of Hydro Aluminum form a worldwide network that builds on 85 years of experience in the production and fabrication of aluminum as well as a strong commitment to research and design, to create innovative and sustainable solutions for today's challenges and tomorrow's opportunities
- With 20.000 employees in 23 countries throughout the world, our aluminium business holds a leading position in a number of areas.
- Our own production was nearly 1.7 million tones of primary aluminium in 2003, in addition to a considerable trading activity.
- More than 45 percent of all extruded products are used in building and construction.
- The bulk of the extrusions we don't deliver go through some form of fabrication and some kind of surface treatment.

After-Reading

Grammar Focus

1. ***Write all the following nouns in plural:***

innovation, extrusion, machinery, assembly, ductility, fabrication, strength, range, process, documentation, solution, quality,

2. ***Complete the table (pay attention to degrees of comparison):***

worldwide	
good	
	more efficient
low	
innovative	
considerable	
global	
structural	
inimitable	
industrial	

3. ***Write the numerals from the text in letters.***

opportunity, industry, component, tone.

Write down all irregular verbs and their three forms.

4. ***Make the following sentences negative and put into the interrogative:***

- Hydro Aluminum has achieved a leading role in market segments.
- Our own production was nearly 1.5 million tones of primary aluminum in 2003.
- More than 50 percent of all extruded products are used in building and construction.
- We are a major global supplier of building systems based on aluminum extrusions.
- We have a wide product range and are active in all parts of the industry
- Aluminum extrusions are used in practically an businesses, products and environments.
- We have all the resources required to deliver extrusions of exactly the right design.
- The use of aluminum extrusions reduces the number of components and simplifies assembly and individual component connections.
- The bulk of the extrusions we deliver go through some form of fabrication and some kind of surface treatment.
- Aluminum's strength, low density, corrosion resistance and design flexibility make it the ideal material for building applications.

6. End all the sentences with the modal verb "can".

Get talking

1. *Make up a plan to the text.*

2. *Imagine: You are a leading engineer of one of the worlds top integrated aluminum companies. Give your talk about a wide range of high-quality products of Hydro-aluminum. Your talk should last a minute.*

3. *Prepare reports about one of the world's top integrated aluminum companies. A report should include 2000—3000 words.*

TEXT 30 PLASTIC MATERIALS

Before-Reading

1. ***Discuss the following:***

- Many new materials we live with have become familiar to us over centuries, have not they?
- What are these materials?

2. ***Match the following words with their Russian equivalents:***

wood
glass
brittle
rust
chemical plant
synthetic rubbers
modern paints
varnish
tough
nylon
polystyrene
heat
прочный
лесоматериалы
теплота
синтетические
резины
современные
краски
хрупкий
лак
стекло
нейлон
пластичные
материалы
химический завод
ржавчина

3. ***There are seven words in this word square. Can you find them?***

p	l	a	s	t	i	c	s
x	w	o	r	a	n	g	e
z	a	e	x	p	e	r	t
t	f	a	r	c	r	i	a
y	g	l	a	s	s	z	n
f	r	a	g	i	l	e	i
l	a	i	r	e	t	a	m
b	o	t	t	l	e	w	a
c	o	m	p	l	e	t	e

While-Reading

1. ***Read the text and find new words from the text.***

2. Reading for general understanding. Skim read the text. Think of a good title for it. Compare it with other students' titles.

Many new materials are familiar to us over centuries. We are pretty well acquainted with the advantages and disadvantages of wood. We know that glass is transparent, but in some ways it is rather brittle. Glass has the advantages of cheapness, rigidity and chemical inertness. We are aware that most metals can stand severe handling, but some of them rust.

But such materials as plastic materials are not found in nature. Some years ago plastics were little more than laboratory curiosities. Today plastics are conceived in the laboratory of the chemical plant. But plastic is formed by extrusion or injection molding under very high pressure. It can be molded into any desired shape. Organic plastics are divided into two general groups: thermosetting and thermoplastic. The thermosetting group becomes rigid through a chemical change that occurs when heat is applied. These plastics cannot be remolded. The thermoplastic group remains soft at high temperatures and must be cooled before becoming rigid. This group is not used generally as a structural material.

Plastics are rapidly becoming important construction materials because of their great variety, strength, durability and lightness. The high strength to weight ratio of some plastics offers big field in the coming age of space travels and rockets. Plastics are light. The same benefits of light weight coupled with good strength and absence of corrosion offer tremendous potential as alternatives to traditional building materials. A given volume of polythene weights less than one-eighth of an equal volume of iron and less then half of the same volume of aluminum. The following characteristics of plastics are usually shared by all plastics: lightweight, corrosion resistance, electrical and thermal insulation, ease of fabrication, transparency in some materially ease of coloring and economy of production.

These characteristics of plastics explain their increasing acceptance by industries. The development of plastic has been so rapid. Since World War 11 there have been rapid developments in the manufacture of blown thermoplastic bottles made of polyethylene, polypropylene, polyvinyl chloride, or some other plastics. Plastic bottles are much lighter and less fragile than glass bottles. We can hardly name a branch of industry where plastics are not applied. Plastics have

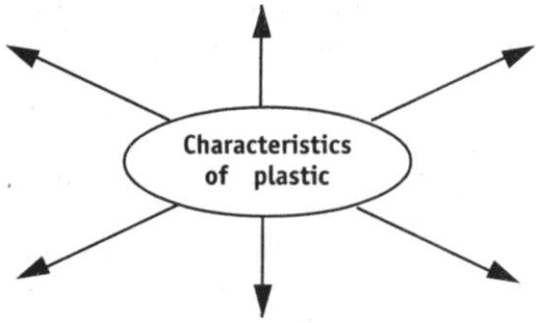
been already used in the industry: from rockets and electronics to toys and house ware. Plastic products offer many advantages over the materials they replace, such as ease of handling, lower maintenance costs and rapidity of assembly. The insulation and dielectric properties of plastics led to their early use in the electrical engineering industry, which was followed by special application in mechanical engineering. Automobile, aircraft and shipbuilding industries have also made use of advantages offered by plastics.
Using of plastics as materials for a construction in the form of sheets, rods or tubes is substituting the conventional metals. Plastics offer a lot of properties for the designs. Plastics have now been developed to such an extent that they can be applied to almost every branch of building, from the laying of foundations to the final coat of paint.

3. ***Read the text again and translate the second paragraph.***

4. ***Reading for specific information. Read the text and answer the following questions to the text:***

- What plastic products do you know?
- Have plastics been conceived in the laboratory or are born in a chemical plant?
- Were several years ago plastics little more than laboratory curiosities?
- What rapid developments have been in the manufacture of blown thermoplastic bottles made since World War II?
- What are the main characteristics of glass?

5. ***Read the text again and complete the spidergram:***



6. ***Read the text once more and complete the following sentences:***

- ...their increasing acceptance by industries.
- ...glass is transparent...
- ...are conceived in the laboratory...
- We are aware...
- The development of plastic...
- Since World War II...
- ...the same basic sequences.

• The following characteristics of plastics are usually shared by all plastics...
• ...are light.
• ...are rapidly becoming important construction materials because of their great variety, strength, durability and lightness.
• ...products offer many advantages over the materials they replace, such as ease of maintenance costs and rapidity of... assembly.
• A plastic is a... any desired shape and which uses an organic substance as a binder.
• ...plastics are divided into two general groups:
• ...becomes rigid through a chemical change that occurs when heat is applied.

7. ***Read the following statements and say whether they are true of false. Correct the false statements:***

• We are not pretty well acquainted with the advantages and aura of wood.
• Two years ago plastics were little more than laboratory curiosities.
• Since World War 1 there have been rapid developments in the manufacture of blown thermoplastic bottles made of Polyethylene, polypropylene, polyvinyl chloride, or some other plastics.
• Plastic bottles are much lighter and less fragile than glass bottles.
• Plastics have been conceived in the laboratory and are born in a chemical plant.
• Plastics are not light.
• Plastics offer a lot of properties for these designs.
• Glass has the advantages of cheapness, rigidity and chemical inertness.
• We are pretty well acquainted with the advantages and wood.
• Few new materials are familiar to us over centuries.

After-Reading

Grammar focus

1. ***Write all the following nouns in plural:***

Wood, glass, air, water, sand, salt, coal, petroleum, a toy, bottle, pressure, cheapness.

2. ***Complete the table (pay attention to degrees of comparison):***

		the fastest
little		
rapid		
high		
	lighter	
	less fragile	

brittle		
important		
thermoplastic		
strong		

3. ***Write down all irregular verbs and their three forms.***

4. ***find all the sentences from the text in the Present Perfect. Copy them in your exercise-books.***

5. ***Make the following sentences negative and put into the interrogative:***

• Many new materials we live with have become familiar to us over century.
- Glass is transparent and while strong in some ways.
- Plastic materials are found as such in nature.
- Plastics have other things in common.
- Plastics have found wide application both in everyday life and in the industry.

6. ***Make notes about advantages of plastics.***

Get talking

1. ***Work in pairs. Discuss:***
a) history of new materials;
b) history of plastic bottles;
Your talks should include between 10—20 phrases.

2. Imagine: You are an engineer of a chemical plant. Give your talk about «Main characteristics of plastics". Your talk should last a minute.

TEXT № 3 1 PLASTICS

Before-Reading

1. ***Discuss the following:***

- What do you know about plastics?
- What plastic products are you familiar with?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- plastic
- resin
- organic
- celluloid
- electrical engineering industry
- automobile
- volume of polythene
- revolution in interior and exterior design

While-Reading

1. ***Read the text and find new words from the text.***
2. ***Reading for general understanding. Skim read the text. Think of a good title for it. Compare it with other students' titles.***

One of new synthetic materials used widely is plastic. Although the first plastic, celluloid was introduced 100 years ago. Some types of plastics are very tough, e.g., nylon. Others may be relatively brittle, as polystyrene. Plastic is not as strong as iron or steel or concrete when it comes to supporting great weights. Plastics do not rust and therefore require no protective layer, such as paint, which can subsequently peel off. They can be colored and such color is part of the material. Some types will withstand higher temperatures than others and the ceiling temperature is constantly being raised as new varieties appear. Plastics have found wide application both in everyday life and in industry.

It is a decorative plastic — laminate. Lt consists of paper filler impregnated with thermosetting resins, on top of which is laid similarly impregnated paper. The paper itself is topped with a melamine resin treated skin which gives a tough surface. This sandwich being then pressed and subjected to heat. A laminate has been developed which is suitable for both inside and outside use. It is used by an architect and a builder in interior and exterior design. A Laminate can be worked by all the methods commonly employed by a builder. A Laminate has some weathering properties. There were many disadvantages in the development of decorative laminates before they could be put on the market. Its chief advantage is that it needs no maintenance other than an occasional wipe

down with a damp cloth. Another important property is that curved surfaces can be introduced and sharp corners eliminated in areas where hygiene is an essential consideration.

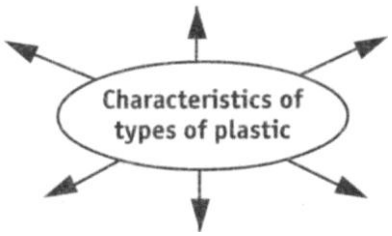
3. ***Read the text once more and translate about.***

a) types of plastics;

b) decorative plastic — laminate.

5. Read the text again and find the main idea of each paragraph.

6. ***Read the text once more and complete the spidergram:***



6. ***Reading for specific information. Read the text, choose a right word.***

7. ***Read the paragraphs about Reinforced and Foamed Plastics and answer the following questions:***

- What is added to create a reinforced plastic?
- What are foamed plastics?

Reinforced Plastics. In order to improve the *(mechanical, plastic)* properties of resin, glass fibers are often added to create a reinforced *(plastic, water).* Glass fabrics offer great potential for structural use. Since the *(glass, iron)* fibers have tensile strengths up to 600.000 (42.000 kg/sq cm)? their addition to a resin results in a composite *(material,work)* with an ultimate strength up to 250.000 (17.500 kg/sq cm), although lower strength combinations are normally used as structural *(panels, boxes) as* structural shapes such as I-beams and as bodies for ships and trailers. An experimental *(house, work)* built in Disneyland in 1956 has a reinforced plastic shell.

Foamed Plastics. Foamed plastics, such as urethane and polystyrene, have very low compressive and tensile *(strength, glass) and* puncture easily. They can be used between two layers of a hard surface material such as a metal to create a laminated *(sandwich, ship)* panel with high stiffness. Such panels are used as floors, partitions and exterior walls in *(buildings, garages).*

8. ***Read the following statements and say whether they are true of false. Correct the false statements:***

- Plastic like heat.
- Plastic can not part of the material.
- Plastic is not applied in industry.
- The use of plastic in the form of robs or tubes are substituting the conventional metals.
- There was a drop in power consumption of between 10 and 20 percent.
- It is a decorative plastic — laminate.
- It is not used by an architect and a builder in interior and exterior design.
- Some types of plastics are very tensile.
- Color is part of the material.
- There were many advantages in the development of decorative laminates.

After-Reading

Grammar focus

1. Complete the table (pay attention to degrees of comparison):

	lower	
hard		
	longer	
important		
brittle		
	higher	
strong		
successful		
light		
large		

2. ***Write down all the nouns from the text in plural.***

3. ***Make the following sentences negative and put into the interrogative:***

- Many new materials become familiar to us over centuries.
- Glass is transparent and strong in some ways.
- Plastic materials are found as such in nature.
- Plastics have other things in common.
- Plastics rust.
- Plastics have found wide application both in everyday life and in industry.
- Plastics as a material for construction are used in the form of sheets, rods or tubes.
- Today all plastic gears for machinery are made from fabricbase laminates.
- The large range of decorative plastics laminates now available to the architect.
- A builder has brought about a revolution in interior and exterior design.
- Many disadvantages have had to be overcome in the development of decorative laminates.

4. ***Write down all irregular verbs and their three forms.***

5. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

6. ***Find all the sentences from the text in the Present Perfect. Copy them in your exercise-books.***

7. ***Make notes about advantages of plastics.***

Get talking

1. ***Work in pairs. Discuss:***
a) history of a laminate;
b) advantages of plastics;
c) history of plastics.
Your talks should include between 10—20 phrases.

2. Give a summary of the paragraph "Foamed plastics".

3. ***Imagine: You are an engineer of a chemical plant. Give your talk about "Reinforced Plastics". Your talk should last a minute.***

TEXT № 3 2 THE PLASTIC HOUSE FOR TOMORROW

Before-Reading

1. ***Discuss the following:***

- What do you think about tomorrow's houses?
- Can you imagine plastic houses?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- magnesium
- architect
- school of design
- research material
- skeleton
- bulldozer

3. ***Match the following words with their Russian equivalents:***

- plastic
- an insulation
- a skeleton
- coil
- a frame
- a spring
- to weld
- уголь
- пружина
- проволока
- пластиковый

- каркас
- изоляция
- сваривать

While-Reading

1. *Read the text and find new words from the text.*

2. *Reading for specific information. Read the text and answer the following questions to the text:*

- What makes the house blend with its surroundings?
- What is the skeleton of the house of the second design made of?
- What are the advantages of the spiral framework according to the designer of the house?

New developments of architects are known today. One of them is a design of a new house. Young architects from the architectural department of the Rhode Island School of Design have designedtomorrow's houses. Such a house was designed with the help of research material by a graduate of this school. The system is based on cast plastic bubbles linked together. It permits the creation of almost any size and shape of such a house. The walls are giant curved sandwiches with rigid plastic as outside surfaces and foamed plastic between to act as insulation. This house has features associating more and more with modern living. The huge glass areas admit a lot of light. A the same time it also tends to add outdoor space to the indoors and increases the feeling of speciousness. Another house is a beautiful example of what engineers like to call "blue sky thinking". Its skeleton is a coil of magnesium alloy covered by a vapor barrier and a sprayed coat of concrete. The floor is also concrete. If glass were desired, it could be set between the coils of the frame. The entire structure would rest on pieces of curved recast masonry. It is difficult to imagine such a house. On the contrary, the spiral framework would be compressed, just like a spring for shipment to the site. It is expanded, braced with welded

3. ***Read the text again and complete the following sentences:***

- One such house was designed with the... of this school.
- The walls will be giant curved sandwiches, with rigid plastic as outside surfaces and ...
- The entire structure would ...
- Another house is a ... like to call "... ".
- It is difficult ...
- ...would be solved.
- One of them...
- The system is based...

4. ***Read the following statements and say whether they are true of false. Correct the false statements:***

- Young architects from the architectural department of the Rhode Island School of Design are not dreaming up tomorrow's houses today.
- The system is not based on cast plastic bubbles linked together, and it permits the creation of almost any size and shape of house.
- The walls will be giant curved sandwiches, with rigid plastic as outside surfaces and foamed plastic between to act as insulation.
- The huge glass areas will admit lots of light, and will also tend to add outdoor space to the indoors and increase the feeling of speciousness.
- Another house is not a beautiful example of what engineers like to call "blue sky thinking".
- Its skeleton is not a coil of magnesium alloy covered by a vapory barrier and a sprayed coat of concrete, and the floor is concrete.
- Once there it is not expanded, braced with welded pieces between coils, and the skin is applied.

pieces between coils there. A skin is applied. In this way the problem of manufacturing large pieces of house that are still transportable would be solved.

After -Reading

Grammar focus

1. ***Complete the following words from the text:***

an ar__it_c__, a de__rtm__t, a s__oo_, a h_u_e, a m__eri_l, a s_st_m, a c_ea_ion, a s_ze, a sha_e, a w__l, a s_ndw__hes, a s_rf__e, a f__tu_e, a su_rou_d__g, an _re_, a li_h_, a s__ce, a f_el__ng, an eng_ne_r, a sk_let_n, a f_oor, a d_sig__r, a fr_mew_rk, a sp__ng, a pr_bl_m, a p__ces, a d_mens_on_.

2. Write down all the nouns from the text in plural.

3. *Write down all irregular verbs and their three forms.*

4. *Write the following words in the correct order to make sentences and translate them into Russian.*

- Be, spiral, compressed, framework.
- To, ideas, mind, other, come.
- The, be, sandwiches, will, giant, walls, curved.
- Will, the, this, features, house, embody.
- Another, is, example, a, house, beautiful.

5. ***Make the following sentences negative and put into the interrogative:***

- Young architects are dreaming up tomorrow's houses today.
- One such house was designed with the help of research material by a graduate of this school.
- The walls will be giant curved sandwiches.
- This house will embody the features.
- The huge glass areas will admit lots of light.
- The floor is concrete.
- The entire structure would rest on pieces of curved recast masonry.
- Thus would be solved the problem of manufacturing large pieces of house that are still transportable.
- The system is based on cast plastic bubbles linked together.
- Another house is a beautiful example of what engineers like to call "blue sky thinking".

Get talking

1. *Imagine your own plastic house for future. Give your talk about this project. Your talk should last a minute.*

TEXT № 33

REIN FORCED-CONCRETE ELEMENTS PRODUCTION

Before-Reading

1. ***Discuss the following:***

- What do you know about any modern industry to maintain and improve the quality of the products?
- What about the plants producing recast reinforced-concrete elements?
- Could you describe any modern plant producing recast reinforced-concrete elements?

2. Try to guess the meaning of the following words. Use the dictionary if you need:

- plant floor level
- well designed plant
- main building
- autoclaves
- adequate
- drainage
- aggregate
- standards

3. ***Match the following words with their Russian equivalents:***

design	• уклон
pebble	• заполнитель
truck	• устанавливать
establish	• насыпь
fill	• вагонетка
aggregate	• доставлять
runways	• форма
deliver	• проектировать
slope	• транспортные пути
lay-out	• разбивка, трассировка
storage bin	• галька, гравий
mould	• пропаривание
steam curing	• бункер для хранения материалов

- mixers

- **4.** ***Make up your own sentences with the following words:***

stress (давление, напряжение), ***tensile*** (растяжимый), ***Plexiglas*** (синтетическое стекло), ***manpower*** (трудовые ресурсы), ***autoclaves*** (автоклавы), ***a treatment*** (обработка), ***steam*** (пар, паровой), ***a capacity*** (мощность, способность), ***a slab*** (плита, пластина), ***a beam*** (балка, брус), ***hollow*** (полый), ***porous*** (пористый), ***polymer*** (полимер), ***a load*** (нагрузка, загрузка).

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Read the text once more and translate it about producing recast reinforced-concrete elements.***

3. ***Read the text again and find the main idea of each paragraph.***

4. ***Reading for specific information. Read the text and answer the following questions to the text:***

- Why is it preferable to elevate all raw materials into overhead storage bins?
- Is it axiomatic now that materials can be handled more cheaply with machinery than with manpower?
- Why should be the following general aspects kept in mind when designing a plant?
- Why is a great number of plants producing recast reinforced-concrete elements now in operation in our country and abroad?

With a great number of plants producing recast reinforced-concrete elements in our country and abroad it is a rapid growth of recast-concrete products. Particularly they are wall panels, slabs, beams to serve a multitude of building needs. This industry has a task to maintain and improve the quality of the products. A lot of excellent work has already been done to raise the standards of this industry to their present level.

First of all, a well-designed plant must be established in a given area. A careful appraisal of the potential requirements provides valuable information for determining the size of the plant which should be built. A number of economic considerations deserve a particular attention. The following general aspects should be kept in mind when designing a plant. The plant floor level should be not 6 inches above the general grade of the yard to assure. In addition, concrete yard runways should be slightly above the level of the surrounding yard so that they will remain free of pebbles and other obstructions that might interfere with the operation of trucks or other equipment. The yard should slope away from the main building in all directions if possible. Adequate space should be allowed at sides and in front of machines and casting beds.

Then, a well-designed plant must have sufficient capacity for the normal output plus reasonable margin for a possible increased.

The design should specifically and carefully antic-creased production without disrupting the original lay-out. Regardless of the general lay -out of the plant, aggregates and cement should be stored as close to the mixers as possible. Machinery and equipment designers have made important contributions by creating better machines and tools for the industry. It is axiomatic now that materials can be handled more cheaply with machinery than with manpower. All raw materials are elevated into overhead storage bins. The materials may move by gravity from the bins to the mixers and molding machinery without re-elevating. With such an arrangement the mixers are located on a separate floor level directly above the molding machinery. In large plants producing precast-concrete elements the moulded units are delivered from the moulding machinery to high-pressure steam curing autoclaves for further treatment.

5. ***Read the text again and choose a right word:***

contribution 1. контрибуция; 2. содействие; 3. вклад
consideration 1. рассмотрение; 2. соображение;
3. обсуждение
grade 1. покатость (уклон); 2. сорт; 3. градус
lay-out 1. разбивка; 2. трасса; 3. планировка
arrangement 1. аранжировка; 2. расположение;
3. соглашение
plant 1. растение; 2. оборудование; 3. завод
to maintain 1. содержать; 2. поддерживать;
3. ремонтировать.

6. ***Read the following statements and say whether they are true of false. Correct the false statements:***

- At present in our country there are but a small number of plants producing precast elements.
- Ordinary brick is an artificial stone made of clay by moulding and burning.

- Hi is recommended to store aggregates and cement as close to the mixer as possible.
- When designing a plant it is necessary to anticipate the future installation of additional equipment.
- It is not economic to elevate all raw materials into storage bins over the mixers.
- The yard should slope to the main building of the plant from all directions.
- Materials can not be handled more cheaply with machinery than with manpower.
- Particularly they are wall panels, slabs, beams to serve a multitude of building needs.
- A well-designed plant must be established in a given area.
- The plant floor level should be not 10 inches above the general grade of the yard to assure.

7. ***Read the text again and complete the following sentences:***

- ...have made important contributions...
- ...without disrupting the original lay-out.
- First of all, ...
- ...should be allowed at sides and in front of...
- It is axiomatic...
- A lot of excellent work...
- ...a particular attention.
- ...producing precast-concrete elements....
- Then, a well-designed plant...
- ...the main building in all directions if possible.

After-Reading

Grammar focus

1. ***Complete the following words from the text:***

high-pre__ure, dr__nag_, e_o_omi_, ag_reg_te, st_nd__d, mi_ers , p_b_le.

2. ***Write down all the nouns from the text in plural.***

p_nel, sl_b, b__m, ma__in__y , g_n_ral , gr_de, manp__er, inf__mat__n , ad__uate,

3. ***Complete the table (pay attention to degrees of comparison):***

young		
great		
careful		
	better	
normal		
general		
potential		
economic		
vast		
excellent		

4. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

5. ***Find all the sentences from the text with modal verbs. Copy them in your exercise-books.***

Get talking

1. ***Make up a plan to the text.***

2. ***Work in pairs. Discuss:***

a) Producing reinforced concrete elements.

b) General aspects in designing.

Your talk should last a minute and include between 10—20 phrases.

3. ***Give a summary of the text in 150 words.***

TEXT № 34 CONCRETE

Before-Reading

1. ***Discuss the following:***

• It is axiomatic now that materials can be handled more cheaply with machinery than with manpower, is not it? Try to prove your own idea.
• A great number of plants producing recast reinforced-concrete elements is now in operation in our country and abroad, is not it? Try to prove your own idea.
• What reinforced-concrete elements do you know?

2. ***Make up your own sentences with the following words:***

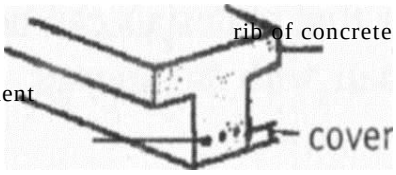
The maximum size (максимальный размер), ***small concrete sections*** (небольшие секции из цемента), ***the minimum thickness of the finished concrete*** (минимальная толщина залитого бетона), ***cement*** (цемент).

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Reading for general understanding. Skim read the text. Think of a good title for it. Compare it with other students' titles.*****3. *Reading for specific information. Read the text, choose a right word.***

Concrete is made from *(cement, nylon)* coarse aggregate (stones), fine aggregate (sand or crushed stone) and water. Coarse aggregate ranging from 5 mm to 40 mm may be used for *(normal, class)* work. The maximum *(size, piece)* of the aggregate should not be greater than one quarter of the minimum thickness of the finished concrete. The *(normal maximum sizes, large parts)* are 20 mm and 40 mm (20 mm being more common). The maximum size of aggregate which should be used in small *(concrete sections, window frames)* or, where reinforcement is close together, is 10 mm.



Reinforced concrete section

In *(concrete, room)* with widely spaced reinforcement, such as solid slabs, the size of the coarse aggregate should not be greater than the minimum cover to the reinforcement otherwise spilling will occur, i.e. the breaking off concrete's pieces of below the reinforcement. For ....yilYj5inforced *(sections,boxes)* e.g. the ribs of main beams, the maximum size of the coarse aggregate should be either:

(i) 5 mm less than the minimum horizontal distance between the Reinforcing rods, or.

(ii) 5 mm less than the minimum cover to the reinforcement, Which is smaller?

4. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- Concrete is made from three different materials.
- Coarse aggregate ranges in size from 20 mm to 40 mm.
- When the minimum thickness of the finished concrete is 100 mm, the maximum size of aggregate should not be greater than 25 mm.
- When the reinforcing rods are close together, the maximum size of aggregate used should be 10 mm.
- The reinforcing rods are placed near the bottom of the rib of a concrete beam.
- Spilling can occur in a solid concrete slab when the cover to the reinforcement is greater than the maximum size of the coarse aggregate.
- When the minimum horizontal distance between reinforcing rods is 15 mm, the maximum size of aggregate should be less than 12 mm.

5. ***Read the text again and complete the following sentences with the name of a building trade:***

- The ... finish just before the plumbers start.
- The ... should finish by the end of week 40.
- The ... work until the end of week 30.
- The ... work up to the end of week 50.
- The ... should finish no later than the end of week 8.

After-Reading

Grammar focus

1. ***Write the following words in the correct order to make sentences and translate them into Russian:***

- from, concrete, cement, fine aggregate, and, is, coarse, water, aggregate.
- work, for, coarse, from, to, used, may, normal, be, aggregate, 5 mm, ranging, 40 mm.
- 40 mm, are, the normal, sizes, 20 mm, maximum, and.
- aggregate, 10 mm, close, concrete, size, of, which, together, is, where, the maximum, should, used, sections, in, be, small, or, reinforcement.
- such, cover, occur, of, the, reinforcement, in, widely, concrete, with, spaced, as, slabs, the size, not, greater, the, minimum, otherwise, i.e., pieces, below, with, solid, the coarse, aggregate, should, be, than, to, spilling, will, the breaking, off, of.

3. ***Write the numerals from the text in letters.***

4. ***Write down all irregular verbs and their three forms.***

Get talking

1. ***Imagine: You are a future skilled engineer. Give your talk about concrete sections. It should last about a minute.***

TEXT № 3 5 THE METHOD Of PRESSURE

Before-Reading

1. ***Discuss the following:***

e What do you know about any building construction?

- What building materials are used during any construction?

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- mixture
- cement
- monolith
- resistant
- standardized concrete units

3. ***Make up your own sentences with the following words:***

strong concrete (крепкий цемент), ***to use a great many forms*** (использовать как можно больше форм), ***a monolith*** (монолит), ***a building's framework*** (строительная рамка).

While-Reading

1. ***Read the text and find new words from the text.***

2. ***Reading for general understanding. Skim read the text. Think of a good title for it. Compare it with other students' titles.***

Nowadays a building's framework is made of reinforced concrete and of structural steel. Concrete is made by mixing together small stones, sand, cement and water. The coarse stones used in the mix give the concrete its strength. The sand is needed to fill the gaps between the stones. The cement, mixed with just enough water to make it into a paste, covers the surface of all solids, and binds the entire mixture into single mass. It is used less water to make mixing concrete denser and stronger. It is a difficulty here. Dry mixing concrete is not so easy to stir as one that is fairly wet and sloppy. When it is really strong concrete, it is mixed with the necessary minimum of water and placed in the forms. After this it is vibrated with electrically vibrated bars. The mixture is tipped or piped into forms (wooden molds) of the shape required.

To make concrete resistant to bending, building engineers reinforce it. It is done by putting bars of steel or miniature steel frameworks into the forms. Hence is named «reinforced concrete». With such a material a variety of constructional shapes can be produced. They can be "shells" and roofs. For this reinforced concrete is used in thin sheets. Reinforced concrete can be used more effectively if before the external load comes on. For instance, suppose that a reinforced beam could be bent out of the straight by

an inch before it developed serious cracks. By pressing it in reverse, building engineers prepare the concrete in advance to withstand the pressures and pulls that the external load causes.

Concrete can be pressed in two ways. In the first method, the concrete is casted around stretched steel wires. After setting concrete, the wires are released and compress the concrete as they contract. Such a method of pressing produces pretension concrete.

The other method is called post-tensioning. In the case of a beam the concrete is casted around polythene tubes. After setting concrete, steel cables are drawn through polythene tubes. These cables are anchored at one end of the beam, stretched by jacks and then fixed at the end of the beam.

In constructing of a building, it is possible to cast the floors and walls as well as the framework directly on the spot where they are to stand. Building forms a monolith. Last one is a large artificial stone composed entirely of concrete that has been shaped within wooden molds fitted together perfectly. To cast all the parts in place, a builder has to use many forms. They are removed as soon as the concrete has set. Before beginning another work, concrete must be given plenty of time to harden. In order to save time, a builder may prefer to use a number of standardized concrete units. These can be made. Individual members can be pressed. Also different sections of the building can be prefabricated.

3. ***Find and translate all the sentences containing the following words:***

- concrete
- sand
- reinforced concrete
- pretension concrete
- dry mix
- window frames
- polythene tubes
- vibrated bars
- steel wires
- gaps
- standardized concrete units

4. ***Read the text again and find the main idea of each paragraph.***

5. ***Reading for general understanding. Read the text again and answer the following questions to the text:***

- How many methods of concrete do you know?
- Can you tell anything about the first method of a concrete?
- How is the second method called?
- Can you tell anything about the second method of a concrete?
- What can a builder do to save lime?
- How is the concrete made?
- Can the concrete consist of stones, sand, cement and water?
- What is concrete?
- What is "reinforced concrete"?
- What method of concrete is used in Russia?
- What method of concrete is better?

6. ***Read the following statements and say whether they are true of false. Correct the false statements:***

- To make the concrete resistant to bending, engineers reinforce it.
- Concrete is not made by mixing together small stones, sand, cement, and water in rotating drums.
- Concrete can not be pressed in two ways.
- With such material an infinite variety of constructional shapes can be produced, including "shells" and roofs.
- The building then forms a monolith
- Last one is a large artificial stone composed entirely of concrete that has been shaped within wooden molds that fit together perfectly.
- In constructing a building, it is possible to cast the floors and walls as well as the framework directly on the spot where they are to stand.
- They are removed as soon as the concrete has set.
- For this reinforced concrete is used in thin sheets.

- Nowadays a building's framework is made of reinforced concrete and of structural steel.

7. ***Read the text again and complete the following sentences:***

- ... are as likely to be of reinforced concrete as of structural steel.
- ...is made by mixing together small stones, sand, cement, and water in rotating drums.
- The mixture is tipped or piped...
- The coarse stones used in covers the surface of all solids and binds the entire mixture .
- ...it is mixed with the necessary minimum of...
- Hence is named...
- ...pretension concrete.
- Before beginning another work, ...
- It is used less water...
- By pressing it in reverse, ...

After-Reading

Grammar focus

1. ***Complete the following words from the text:***

fr_mew__k , mono__th, w__den, b__lder, lo_d, st__l, st_ne, res_st_nt, pr_ten__on, cr__k, _a_le, b__lding, m_ter__l, mi_tu_e, sh_pe.

2. ***Write down all the nouns from the text in plural.***

3. ***Complete the table (pay attention to degrees of comparison):***

	less	
large		
		The greatest
dry		
wet		
strong		
modern		
serious		
external		

4. ***Write the following words in correct order to make sentences and translate them:***

- Between, the, needed, to, is, gaps, sand, the, fill, required, shape.
- Can, two, in, concrete, pressed, be, ways.
- Method, called, the, is, ot5her, post-tensioning.
- Concrete, by, stones, is, mixing, cement, drums, made, together, small, in sand, rotating, water.
- The, story, given, concrete, be, of, plenty, each, of, to, time, before, on, harden, the, can, work, next, begin.

5. ***Make the following sentences negative and put into the interrogative:***

- Concrete is made by mixing together small stones, sand, cement, and water in rotating drums.
- Concrete can be pressed in two ways.
- The other method is called post-tensioning.
- The sand is needed to fill the gaps between the stones.
- Less water is used in mixing the concrete.
- It is used less water to make mixing concrete denser and stronger.
- It is a difficulty here.

single		

- A builder has to use many forms.
- They can be "shells" and roofs.
- Concrete must be given plenty of time to harden.

6. ***Find all the sentences from the text in the Passive Voice. Copy them in your exercise-books.***

7. ***End all the sentences with the modal verbs. Copy them in your exercise-books.***

Get talking

1. ***Make up a plan to the text.***

2. Work in pairs. Discuss:

a) a monolith;

b) methods of pressing.

Your talk should last a minute. Your talk should include between 10—20 phrases.

3. ***Imagine: You are a future skilled engineer. Give your talk about one of the most important building material — concrete. It should last about 2 minutes.***

4. ***Give a summary of the paragraph about making the concrete resistant to bending in*** 5 ***sentences.***

TEXT № 36
What are the fundamental characteristics of nylon?

Before-Reading

1. ***Discuss the following:***

- What natural materials do you know?
- What synthetic materials do you know?
- Is nylon a synthetic or natural material? Try to prove your own point of view.

2. ***Try to guess the meaning of the following words. Use the dictionary if you need:***

- characteristic
- application
- plastic materials
- type
- machine
- nylon
- vibrations

While-Reading

1. ***Read the text and find new words from the text.***

2. Find and translate all the sentences containing the following words:

- timber
- agricultural machinery
- general industrial application
- food machinery
- new fields

3. ***Reading for general understanding. Read the text again and answer the following questions to the text:***

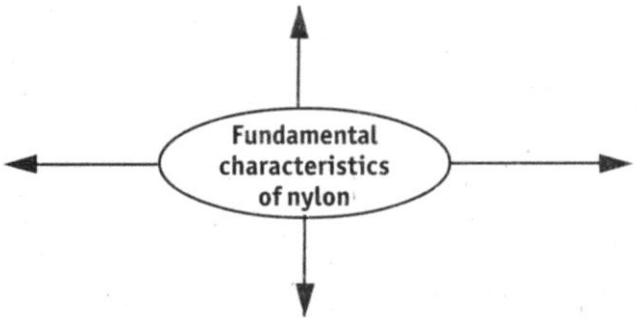
What is nylon?
Is nylon a very versatile material?
Is nylon capable of overcoming a wide range of difficult problems?
Is nylon a material for the manufacture of bearings and runners of all sizes in many types of machines?
Where is nylon used?
Why is nylon a modern material?

Recently using of plastics in industrial application has grown.
This growth has been due to their exceptional in-built qualities.
Metal and timber often are more difficult to fabricate than plastics
materials. Gears made of plastics produce less noise and vibrations than metal gears. We can say about an improvement of older materials for many purposes. New fields, which were not previously
possible, have opened up.

A new material as nylon has been accepted. It is a material for the manufacture of bearings and runners of all sizes in many types of machines, earth-moving equipment and agricultural machinery due to its fundamental characteristics of low friction and good wear resistance. Nylon is a very versatile material and is capable of overcoming a wide range of difficult problems. It will operate satisfactorily without lubrication in an abrasive atmosphere. One of its features is that nylon functions under water or is immersed in any other liquid. Being non-toxic nylon is frequently used in food machinery. Nylon gears usually do not require lubrication, they are shock-resistant, do not deform permanently and — running in train with metal gears—they outlast them.

4. ***Read the text again and find the main idea of each paragraph.***

5. ***Read the text once more and complete the following spidergramm:***



6. Read the text again and complete the following sentences:

- Recently using of plastics...
- ...a material for the... in many types of machines, earth-moving equipment and agricultural machinery due to its... of low friction and good wear resistance.
- ...is very versatile material and is capable of overcoming a wide range of difficult problems.
- This growth has been...
- One of its features...
- ...they outlast them.
- ...which were not previously possible...

7. ***Read the following statements and say whether they are true or false. Correct the false statements:***

- The use of plastics in general industrial application has not grown considerably in recent years.
- Metal and timber often are not more difficult to fabricate than plastics materials and also may need surface protective which is not necessary with plastics.
- Nylon gears usually do require lubrication, they are shock-resistant, do deform permanently and — running in train with metal gears — they outlast them.
- Nylon is veiy versatile material and is capable of overcoming a wide range of difficult problems.
- Gears made of plastics produce less noise and vibrations than metal gears.

After-Reading

Grammar focus

1. ***Write down all the nouns from the text in plural.***

2. ***Make the following sentences negative and put into the interrogative:***

- Metal and timber of ten are more difficult to fabricate than plastics materials.
- Nylon has been accepted as a material for the manufacture of bearings and runners of all sizes in many types of machines.
- Nylon is a very versatile material.
- Nylon gears usually do not require lubrication.
- The use of plastics in general industrial application has grown in recent years.

4. ***Write down all irregular verbs and their three forms.***

5. ***Write about "The fundamental characteristics of nylon?" Your story should include 10 sentences.***

Get talking

1. ***Give a summary of the text in 150 words.***

2. Imagine: You are a future skilled engineer. Give your talk about one of the most important building material — nylon. It should last about 2 minutes.

ГЛОССАРИЙ

1. ***Read these words. Try to continue the glossary.***

Слово	**Перевод**	**Предложение**
Spadework	Подготовительные работы	Spadework are made after end of drawing up of the topographical plan for definition of a technique and provisional volume of forthcoming work on inspection and search of underground communication.
Topographical plan	Топографическая карта	
Technique	Методика (техническая)	
Forthcoming work	Предстоящая работа	
Underground communication	Подземные коммуникации	
Gathering materials	Сбор материалов	At a spadework gathering materials about underground communication available in a nature with drawing up of the scheme of an arrangement of networks is made.
Arrangement of networks	Расположение сетей	
Data of inventory character	Данные инвентаризационного характера	Data of inventory character - quantity of wells, length of networks, a material of pipes and mark of a cable, pressure of gas.
Wells	Колодцы	
Pipes	Трубы	
Pressure of gas	Давление газа	
Слово	**Перевод**	**Предложение**
Water drain	Канализация	For this purpose, knowing provisional quantity of wells of each kinds of network, establish, that, for example, wells of water drain will be mark numbers with 1 on 500, a water pipe with 501 on 1000.
Water pipe	Водопровод	
Scheduled position	Плановое положение	Scheduled position of pipes, cables and channels in wells often does not coincide with a projection of the center of the hatch adhered on a surface of the ground by geodetic methods, stated above, therefore by manufacture of shootings and scales 1:500 and 1:1000 the scheduled binding of all entering and leaving linings placed in a well or the chamber is carried
Projection	Проекция	
Hatch	Люк	
Geodetic methods	Геодезические методы	
Surface	Поверхность	
Scale	Масштаб	
Scheduled binding	Плановая привязка	
	"	

		out.
Measure	Измерение	To measure the shortest distance from lines up to points of crossing of a lining with walls of a well, and also up to possible breaks of the pipeline inside of a well.
Points of crossing	Точки пересечения	
Lining	Прокладка	
Breaks of the pipeline	Изломы трубопровода	
Слово	**Перевод**	**Предложение**
Plane	Плоскость	Visually to plan and design on the same plane a line from a projection of the center of the hatch in a direction of the adhered pipeline or a cable, using adjacent wells or external attributes of communication.
Direction	Направление	
Adjacent	Смежный	
External attributes	Внешние признаки	
Surveyed wells	Обследованные колодцы	The surveyed wells incorporate among themselves lines when for this purpose data of inspection enough.
Incorporate	Соединять	
Leveling	Нивелирование	Leveling of underground communications includes definition of heights top of a pig-iron ring of the hatch of wells, the grounds and also heights of the pipes located in a well, cables and channels.
Definition	Определение	
Pig-iron	Чугун	
Geometrical leveling	Геометрическое нивелирование	At shooting in scales 1:500, 1:5000 heights define from results of geometrical leveling on two parties.
Admissible divergence	Допустимая разница	The admissible divergence between results, received on two parties, should not exceed 20 mm.
Слово	**Перевод**	**Предложение**
Dimensions	Габариты	At presence in a well of channels of different dimensions or adjoining at different levels it is necessary to define heights of top and a bottom of each channel.
Metal Timber Plastics materials	Метал Строевой лес Материалы из пластика	Metal and timber often are more difficult to fabricate than plastics materials.
Nylon Versatile material	Нейлон Гибкий материал	Nylon is a very versatile material and is capable of overcoming a wide range of difficult problems.
Concrete	Бетон	Concrete is made by

Sand Cement	Песок Цемент	mixing together small stones, sand, cement, and water.
Reinforced concrete	Железобетон	For this reinforced concrete is used in thin sheets.
Monolith	Монолит	Building forms a monolith.
Wall panels Slabs Beams	Панели Плиты Балки, брусья	Particularly they are wall panels, slabs, beams to serve a multitude of building needs.
Durability Lightness Construction materials	Прочность, долговечность Легкость Строительные материалы	Plastics are rapidly becoming important construction materials because of their great variety, strength, durability, and lightness.

Слово	**Перевод**	**Предложение**
Architect	Архитектор	A man who designs buildings and makes the plans for them is called an architect.
Laminate Weathering properties	Ламинат Стойкие(прочные) свойства	A Laminate has some weathering properties.
Aluminum's strength Corrosion Resistance Flexibility	Прочность алюминия Коррозия Сопротивление Гибкость	Aluminum's strength, low density, corrosion, resistance and design flexibility make it an ideal *(material, role)* for building applications.
Copper Conductor of electricity	Медь Проводник электричества	Copper is the best conductor of electricity.
Lime Gypsum	Известь Гипс	Among them are lime, gypsum and cement.
Iron Steel	Железо Сталь	Plastic is not as strong as iron or steel or concrete when it comes to supporting great weights.
Doors Windows Walls Roofs	Двери Окна Стены Крыши	They are doors to allow ingress and egress; windows to admit light and air; walls for shelter or support; roofs to keep out the rain, snow, cold, and sometimes sun.
Bronze Alloy Tin	Бронза Сплав Олово	Bronze is an alloy of copper and tin.

Слово	Перевод	Предложение
Density weight	Плотность	Density weight is the amount of mass in a unit volume.
Zink Process of galvanizing	Цинк Процесс гальваники	Zink is used in the making of dry batteries and in the process of galvanizing.
Ductility	Эластичность	Ductility is the ability of a material to deform without breaking.
Toughness	Жесткость, упругость	Toughness is the resistance of a material to breaking when there is a crack in it.
Metallurgical and machine-building industries Mass production of prefabricated large-size concrete and reinforced concrete structural elements	Металлургическая и машиностроительная индустрии Массовое заводское производство бетонных и железобетонных конструкций больших размеров	The development of the metallurgical and machine-building industries made possible mass production of prefabricated large-size concrete and reinforced concrete structural elements.
synthetic materials	Синтетические материалы	One of new synthetic materials used widely is plastic.
Sheets Rods Tubes	Листы Пруты, стержни Тюбики	Using of plastics as materials for a construction in the form of sheets, rods or tubes is substituting the conventional metals.
Слово	**Перевод**	**Предложение**
Lead alloy Bismuth Cadmium	Сплав из свинца Висмут Кадмий	Other lead alloy is a type of metal such as lead, tin, bismuth, cadmium.
Recrystallization	Рекристаллизация	Other treatments include steel heating to promote recrystallization.