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ПРЕДИСЛОВИЕ

Учебно-методическое пособие имеет профессиональную направленность и предназначено для студентов-заочников строительных специальностей, имеющих базовую подготовку по английскому языку.

Целью пособия является систематизация и совершенствование знаний и умений студентов, расширение их словарного запаса, формирование навыков понимания, перевода и реферирования оригинальных текстов по специальности.

Тематика текстов дает возможность повысить общеобразовательный и профессиональный уровень студентов.

Учебно-методическое пособие состоит из 4-х самостоятельных разделов. Разделы построены по единому принципу. Основной структурной единицей является лингвометодический комплекс, который представляет собой тематически завершенный блок (Unit). Каждый блок соответствует определенному этапу обучения (Unit I – первый семестр, Unit II – второй семестр, Unit III – третий семестр, Unit IV – четвертый семестр).

Каждый раздел пособия включает профессионально ориентированные тексты для обучения различным видам чтения: изучающего (Text A), ознакомительного (Text B), просмотрового (Text C), поискового (Text D), и упражнения к ним: лексические, лексико-грамматические и речевые, позволяющие проверить как общее понимание прочитанного, так и закрепить приобретенные лексические навыки. Система упражнений способствует усвоению профессиональной лексики и повторению основных грамматических явлений.

Все четыре текста для чтения, составляющие тот или иной раздел, а также тексты контрольных работ, объединены общей темой, которая и выносится в его название.

Грамматический материал унифицирован по семестрам и предполагает самостоятельное изучение. Заключительным этапом работы над разделом является выполнение контрольных работ на основе текстов, которые приведены в конце каждого раздела.

Проверка изученного грамматического и лексического материала и контрольных работ осуществляется преподавателем на практических занятиях. Пособие включает тематический словарь-минимум и дополнительные тексты для чтения.
UNIT I

BUILDING MATERIALS

Section I. Reading material

Pre-reading Exercises

1. Read the following international words and guess their meaning. Mind the stress.

- materials
- manufacture
- product
- type
- composite
- group
- substance
- nature
- plastics
- energy
- biological
- process
- micro-structure
- metal
- mineral
- silicate
- practical
- object
- construction
- synthetic
- molecule
- polymer
- elastomer
- original
- electricity
- temperature


1. solid substances  a) извлеченные материалы
2. natural materials  b) колебаться в пределах
3. to return to the original shape  c) твердые вещества
4. dimension stone  d) минеральные соединения
5. extracted materials  e) содержать большое количество
6. to range from  f) вернуться в исходную форму
7. mineral compounds  g) природные материалы
8. to contain a large amount  h) штучный камень
9. railroad tie  i) цепочка молекул
10. chain of molecules  j) рельсовая шпала
11. semiconductor  k) проводник
12. conductor  l) полупроводник
3. Read the text carefully and translate it into Russian.

Text A. Modern Building Materials: Classification

Materials are solid substances of which manufactured products are made. A variety of materials are used in different products. Basic types of materials range from wood, which has been used for thousands of years, to composite materials, which are still under development.

Materials belong to two groups: (1) natural materials and (2) extracted materials. Natural materials, which include stone, wood, and wool, are used much as they occur in nature. Extracted materials, such as plastics, alloys (metal mixtures), and ceramics, are created through the processing of various natural substances.

**Natural materials** generally are used as they are found, except for being cleaned, cut, or processed in a simple way that does not use much energy. Natural materials include stone and biological materials.

Certain types of rock are extremely strong and hard, and are therefore used as building stone. There are two types of building stone—crushed stone and dimension stone.

Biological materials are substances that develop as part of a plant or animal. Common plant materials include wood and various fibers such as cotton. Animal materials include leather and fibers such as wool.

Wood is a valuable biological material because of its strength, toughness, and low density. These properties make wood an excellent material for thousands of products, including houses, sailboats, furniture, baseball bats, and railroad ties.

**Extracted materials** are created through processes that expend a great deal of energy or alter the microstructure of the substances used to make the materials. Extracted materials include ceramics, metals and their alloys, plastics, rubber, composite materials, and semiconductors.

Ceramics include such everyday materials as brick, cement, glass, and porcelain. These materials are made from mineral compounds called silicates, including clay, feldspar, silica, and talc.

People have used such metals as copper, gold, iron, and silver for thousands of years to make various practical and decorative objects. Today, metals are important in all aspects of construction and manufacturing.

Plastics are synthetic materials made up primarily of long chains of...
molecules called polymers. There are two basic types of plastics: (1) thermosetting plastics (usually called thermosets) and (2) thermoplastics.

Rubber is made up of elastomers, polymers that stretch easily to several times their length and then return to their original shape.

Engineers may artificially combine various materials to create a new composite material. Many composite materials contain a large amount of one substance to which fibers, flakes, or layers of another substance are added.

Semiconductors are materials that conduct electricity better than insulators, but not as well as conductors, at room temperature.

Notes:
processing – обработка
toughness - жёсткость, прочность
porcelain – фарфор
feldspar - полевой шпат
insulator - изоляционный материал

Comprehension Check

4. Decide which statements are true and which ones are false.

1. Composite materials have been used for thousands of years.
2. Extracted materials are used much as they occur in nature.
3. Stone belongs to natural materials which are widely used in the construction industry.
4 Brick, cement, glass, and porcelain are natural materials which are made from mineral compounds
5. People have used such metals as copper, gold, iron, and silver for thousands of years to make various practical and decorative objects.
6. Insulators are materials that conduct electricity better than semiconductors, but not as well as conductors, at room temperature.
5. Complete the sentences.

1. Basic types of materials range from wood to ….
2. Natural materials, which include stone, wood, and wool, are used much as they…
3. Certain types of rock are extremely strong and hard, and are therefore used as ….
4. These properties make wood an excellent material for thousands of ….
5. Today, metals are important in all aspects of …
6. People have used such metals as copper, gold, iron, and silver for thousands of years to make …

6. Answer the questions on the text.

1. What are materials? 2. What groups do materials belong to? 3. How are natural materials generally used? 4. Do natural materials include alloys and plastics? 5. Extracted materials are created through processes that expend a great deal of energy or alter the microstructure of the substances used to make the materials, aren’t they? 6. How long have people used such metals as copper, gold, iron, and silver? 7. What materials conduct electricity better than insulators?

Vocabulary Practice

7. Study the following pairs of derivatives. Transform as in the models.

V→N
- to create – creation
- to construct – construction
- to add – addition
- to alter – alteration
- to insulate - insulation
- to include – inclusion
- to occur –occurrence
- to contain – container
- to conduct – conductor

Adj→Adv
- original - originally
- primary – primarily
- easy – easily
- artificial – artificially
Model 1: to include stone – the inclusion of stone
to create a new composite material, to construct a building, to occur in
nature, to alter the microstructure, to add another substance

Model 2: a sudden appearance – to appear suddenly
an easy stretch, an artificial combination, a primary mixture.

Language Focus

8. Choose the right word or word-combination.

1. Natural materials, which include stone, wood, and … are used much as they occur in nature.
   a) alloys       b) wool       c) plastics
2. Biological materials are substances that … as part of a plant or animal.
   a) are formed   b) grew       c) develop
3. Wood is a valuable biological material because of its strength, toughness, and low….
   a) stiffness    b) density    c) creep
4. Plastics are synthetic materials made up primarily of … called polymers.
   a) long chains of molecules b) mineral compounds c) biological materials
5. Engineers may …combine various materials to create a new composite material.
   a) primarily     b) easily     c) artificially

9. Insert the right words.

   a) develop b) cement c) electricity d) thermoplastics e) are used
   f) processes j) various natural substances

1. A variety of materials … in different products.
2. Extracted materials, such as plastics, alloys and ceramics, are created through the processing of….
3. Biological materials are substances that … as part of a plant or animal.
4. Extracted materials are created through … that expend a great deal of energy or alter the microstructure of the substances used to make the materials.
5. Ceramics include such everyday materials as brick …, glass, and porcelain.
6. There are two basic types of plastics: (1) thermosetting plastics and (2) …
7. Semiconductors are materials that conduct … better than insulators, but not as well as conductors, at room temperature.

**Summarizing**

10. Make a short summary of the text. Do it according to the following plan.

1. The title of the text is…
2. The text is devoted to …
3. It consists of …
4. The first passage deals with…
5. The second (third, forth, etc.) passage deals with…
6. The main idea of the text is…

**Text B. Properties of Materials**

1. Skim the text and answer the questions below.

Manufacturers determine which material to use for a given product by evaluating properties (qualities) of materials. Some properties can be linked with a material's macrostructure (structure visible to the unaided eye). Other properties are explained by a material's microstructure (structure that can be seen only through a microscope). The properties of materials are determined by their internal structure—that is, the way in which the fundamental parts of the materials are put together. At the most basic level, properties of materials are determined by chemical bonds, forces that attract atoms to one another and hold them together.

Materials scientists study how the structure of materials relates to their properties. A large part of their work involves experimentation. Scientists group the properties of materials according to various functions that must be performed by objects made of the materials. Most properties of materials fall into six groups: (1) mechanical, (2) chemical,
(3) electrical, (4) magnetic, (5) thermal, (6) optical.

Mechanical properties are critical in a wide variety of structures and objects—from bridges, houses, and space vehicles to chairs and even food trays. Some of the most important mechanical properties are (1) stiffness, (2) yield stress, (3) toughness, (4) strength, (5) creep and (6) fatigue resistance.

Stiffness measures how much a material bends when first subjected to a mechanical force.

Yield stress measures how much force per unit area must be exerted on a material for that material to permanently deform (change its shape).

Toughness measures a material's resistance to cracking. The tougher a material, the greater the stress necessary to break that material near a crack.

Strength measures the greatest force a material can withstand without breaking. A material's strength depends on many factors, including its toughness and its shape.

Creep is a measure of a material's resistance to gradual deformation under a constant force.

Fatigue resistance measures the resistance of a material to repeated applications and withdrawals of force.

Chemical properties include catalytic properties and resistance to corrosion.

Electrical properties are important in products designed either to conduct (carry) or block the flow of electric current.

Dielectric strength describes a material's response to an electric field.

Magnetic properties indicate a material's response to a magnetic field—the region around a magnet or a conductor where the force of magnetism can be felt.

Thermal properties reflect a material's response to heat. Thermal conductivity is a measure of how well a material conducts heat.

Notes:
yield stress - предел текучести
fatigue resistance - усталостная прочность
resistance to corrosion - коррозионная стойкость

1. What are the properties of materials linked with?
2. What do materials scientists study?
3. How many groups of properties do the materials scientists distinguish and what are they?
4. Does creep belong to mechanical properties of materials?
5. Could you name major mechanical properties of materials?
6. What do chemical properties of materials include?
7. What do magnetic properties of materials reflect?

**Text C. Wood**

1. **Scan the text and describe major uses of wood in the construction industry.**

Wood has many characteristics that make it an important construction material. It can be easily shaped with tools and fastened with nails, screws, staples, and adhesives. It is light but strong. Wood provides insulation against electricity, heat, cold, and sound. It can hold paint and other finishes, and it does not rust like metal construction materials. Wood is a renewable resource.

Some of the chief wood structural materials are round timbers, lumber, plywood, veneer products, and particle board.

Round timbers include pilings, poles, and posts. Pilings are driven into the ground as foundations for buildings. Poles link overhead telephone wires and power lines. Posts are used chiefly to build fences.

Lumber includes boards and larger pieces of wood that have been sawed from logs. The construction industry uses about 50 per cent of the lumber manufactured. We can classify lumber as softwood or hardwood. Softwood lumber comes from needle leaf trees that are also called evergreens or conifers. It is used primarily for structural work because of its straightness and length. Softwoods include pine, larch, fir, cedar. Hardwood lumber comes from trees that lose their leaves every autumn. They are widely used for flooring, furniture and paneling. Popular hardwoods include birch, maple, oak, walnut, and mahogany.

Plywood consists of a number of thin sheets of wood called veneers that are glued together. Veneer products include beams that support ceilings and floors.

Particle board is made from wood shavings, flakes, wafers, splinters, or sawdust left over in sawmills. This wood is mixed with an adhesive and pressed at a high temperature and pressure to form large panels.
Particle board shrinks and swells very little in length and width.

2. Render the text in Russian.
   Text D. Concrete

1. Scan the text and say how the builders use different kinds of concrete.

Concrete is a mixture of portland cement, water, and aggregates. Aggregates are materials such as sand, gravel, crushed rock, and blast furnace slag. The cement and water form a paste that binds the aggregates into a rocklike mass as the paste hardens. Builders generally use both a fine aggregate such as sand, and a coarse aggregate such as crushed rock, to make concrete. The aggregates must be free from silt, mud, clay, dust, and other materials that might weaken the concrete. The water used to make concrete should also be free from dirt and other impurities.

Concrete is highly fire-resistant, watertight, and comparatively cheap and easy to make. When first mixed, concrete can be molded into almost any shape. It quickly hardens into an extremely strong material that lasts a long time and requires little care.

Nearly all skyscrapers and factories and many homes stand on concrete foundations. These buildings may also have concrete frames, walls, floors and roofs. Concrete is used to build dams to store water and bridges to span rivers. Cars and trucks travel on concrete highways, and airplanes land on concrete runways.

Major kinds of concrete include (1) reinforced concrete, (2) prestressed concrete, and (3) precast concrete.

Reinforced concrete is made by casting concrete around steel rods or bars. The steel strengthens the concrete. Almost all large structures, including skyscrapers and bridges, require this extra-strong type of concrete.

Prestressed concrete usually is made by casting concrete around steel cables stretched by hydraulic jacks. After the concrete hardens, the jacks are released and the cables compress the concrete. Concrete is strongest when it is compressed. Steel is strong when it is stretched, or in tension. In this way, builders combine the two strongest qualities of the two materials. Prestressed concrete beams, roofs, floors, and bridges are
often cheaper for some uses than those made of reinforced concrete.

Precast concrete is cast and hardened before being used for construction. Precasting firms make concrete sewer pipes, floor and roof units, wall panels, beams, and girders, and ship them to the building site. Precasting makes possible the mass production of concrete building materials. Nearly all prestressed concrete is precast.

Notes:
aggregate - заполнитель
impurity - примесь
watertight - водонепроницаемый; влагонепроницаемый; герметичный
reinforced concrete – железобетон
prestressed concrete - предварительно напряжённый железобетон
precast concrete - сборный железобетон

Section II. Lexical - Grammar Tests.

Для того, чтобы правильно выполнить контрольные работы, необходимо усвоить следующий грамматический материал:

1. Имя существительное. Мн. Число. Существительное в функции определения и его перевод.
2. Имя прилагательное. Степени сравнения. Сравнительные конструкции.
3. Местоимения: личные, притяжательные, вопросительные, указательные, неопределённые, относительные и отрицательные.
4. Словообразование. Наиболее распространенные суффиксы существительных, прилагательных, глаголов и наречий; приставки; конверсия.
5. Видо-временные формы глагола: активный залог – формы Indefinite, Continuous, Perfect (Present, Past, Future),
6. Многозначность глаголов to be, to have, to do.
7. Оборот There + to be.

Test 1. Metals

Iron and steel are the world's cheapest and most useful metals. These hard, durable metals are used in making thousands of products, from
paper clips to automobiles.

The word iron can refer to both an element and a number of alloys of iron and other metallic elements. As an element, iron is one of the most common chemical substances, but it is never found in pure form. Almost all iron occurs in ores, though some meteorites also contain iron. The properties of any kind of iron depend largely on the chemical composition of the alloy. Heating and shaping the metal can greatly change its physical properties. Manufactures use iron alloys in the manufacture of so-called iron products.

Cast iron is any iron alloy that contains from 2 to 4 per cent carbon and from 1 to 3 per cent silicon. Because of its high carbon content, solid cast iron cannot be shaped, no matter how hot it is heated. This kind of iron is made into useful objects by pouring the liquid metal into molds and letting it harden. Cast iron's hardness, low cost, and ability to absorb shocks make it an important construction material.

Steel is produced by refining iron and alloying it with other metals. Steel finds its use in corrugated sheets for roofing, for girders, frames, etc. Various shapes are employed in construction.

Aluminum is the oldest and best known light metal. It is the most plentiful metallic element in the earth's crust and the third most common of all the elements, after oxygen and silicon. But unlike some other metals, such as gold and silver, aluminum is always chemically combined with other elements. Aluminum, with its alloys, has such valuable properties as light weight, strength, corrosion resistance, electrical conduction, heat conduction, light and heat reflection.

The world construction industry uses more aluminum than any other metal except iron and steel. It is very suitable for framing members in building and prefabricated housing, for window frames and for the skin of the building in curtain-wall construction. Aluminum is also used in such items as gutters, panels, residential roofing, tubes for electric wires.

**Notes:**
durable – прочный
define - очищать

**Test 2. Plastics**
Plastics are man-made materials that can be shaped into any form. They are one of the most useful materials ever created. Engineers have developed plastics that are as rigid as steel or as soft as cotton. They can
make plastics that are any color of the rainbow or as clear and colorless as crystal. Plastics can be rubbery or rigid, and they can be shaped into an endless variety of objects. Plastic products often have a useful life of many years.

But why are the chemists so enthusiastic about plastics? Plastics are rapidly becoming important synthetic materials because of their great variety, strength, durability and lightness. A synthetic product must necessarily be both better and cheaper in order to justify its manufacture. This is essentially true of the various plastics when compared to the material they are to replace.

Since plastics combine all the fine characteristics of a building material together with good insulating properties, and are fireproof as well, it is no wonder that the architects and engineers have turned to them to add color and attractiveness to modern homes and offices. Engineers have created hundreds of different plastics, each with its own properties. They have developed plastics that can replace metals, natural fibers, paper, wood and stone, and glass and ceramics. For example, plastic siding does not dent as easily as that made of aluminum. Plastic pipes are lightweight and easy to cut and join. Moreover, they do not corrode like metal pipes. Plastic wall tiles, bathtubs, and sinks are less fragile, cheaper and easier to install than ceramic ones. Plastics are also used to make insulating foam that blocks the flow of heat and sound.

Foamed plastics have very low compressive and tensile strength. They can be used between two layers of a hard surface material, such as a metal or plywood, to create a laminated sandwich panel with high stiffness. Laminated panels are used as floors, partitions and exterior walls in building.

Nowadays, builders are using plastics in almost any part of a building from the foundation to the final coat of paint.
Notes:
shape – придавать форму
compressive – компрессионный
tensile strength – предел прочности на растяжение
UNIT II

BUILDING A HOUSE

Section I. Reading material

Pre-reading Exercises

1. Read the following international words and guess their meaning. Mind the stress.

<table>
<thead>
<tr>
<th>English Word</th>
<th>Russian Equivalent</th>
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<tr>
<td>protect</td>
<td>a) внутренняя конструкция</td>
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<tr>
<td>classification</td>
<td>b) фундамент на естественном основании</td>
</tr>
<tr>
<td>industrial</td>
<td>c) несущий каркас</td>
</tr>
<tr>
<td>material</td>
<td>d) искусственный материал</td>
</tr>
<tr>
<td>natural</td>
<td>e) системы отопления и охлаждения</td>
</tr>
<tr>
<td>mason</td>
<td>f) выдерживать бурю</td>
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<tr>
<td>interior</td>
<td>g) наружные стены</td>
</tr>
<tr>
<td>construction</td>
<td>h) ветровая нагрузка</td>
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<tr>
<td>mechanical</td>
<td>i) свайный фундамент</td>
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<tr>
<td>electrical</td>
<td>j) природный камень</td>
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<td>system</td>
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<td>lift</td>
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<tr>
<td>contact</td>
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<tr>
<td>gravel</td>
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<tr>
<td>machine</td>
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<tr>
<td>meter</td>
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<tr>
<td>normally</td>
<td></td>
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<tr>
<td>economical</td>
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1. artificial material
2. natural stone
3. external walls
4. to carry the load
5. load-carrying frame
6. interior construction
7. heating and cooling systems
8. dead load
9. to withstand storm
10. wind load

a) внутренняя конструкция
b) фундамент на естественном основании
c) несущий каркас
d) искусственный материал
e) системы отопления и охлаждения
f) выдерживать бурю
g) наружные стены
h) ветровая нагрузка
i) свайный фундамент
j) природный камень
11. spread foundations
12. pile foundations

3. Read the text carefully and translate it into Russian.

Text A. Elements of a Building. Types of Foundation

The first houses were built for the purpose of protecting their owners from the weather and, therefore, were very simple - a roof to keep off the rain or snow, and walls to keep out the wind.

The buildings erected now can be divided into two broad classifications: they are either for housing or for industrial purpose.

As far as the material is concerned, the building can be divided into stone (or brick), wood and concrete types. The brick is an artificial material made of clay then burnt to harden it. The natural stone is used for footing and foundations for external walls carrying the load. The buildings made of stone or brick are durable, fireproof and have poor heat conductivity.

Materials and structural forms are combined to make up the various parts of a building, including foundations, load-carrying frame, skin and interior constructions. The building also has mechanical and electrical systems, such as lifts and escalators, heating and cooling systems, and lighting systems.

A building has two main parts, the substructure (the part below ground) and the superstructure (the part above ground). The substructure is usually called the foundation. It includes the basement walls, even though these may extend above the ground.

Both the substructure and the superstructure help to support the load (weight) of the building. The dead load of a building is the total weight of all its parts. The live load is the weight of the furniture, equipment, stored material, and occupants of a building. In some regions, the wind load of a building is important if the structure is to withstand storms. The snow load and earthquake shocks may also be important factors.

Foundations are the chief means of supporting a building. They carry both the dead and live loads. There are four main types of foundations: (1) spread, (2) pier, (3) pile, and (4) mat or raft.

Spread foundations are long sections and rectangular slabs of reinforced concrete that extend beyond the outer edges of the building.
and under its walls and columns. Such foundations are not so firm as those based on solid rock. The footing areas in contact with the soil must be of sufficient size to spread the load safely over the soil and to avoid excessive or uneven settlement that would cause walls to crack or doors to bind.

Pier foundations are heavy columns of concrete that go down through the loose topsoil to a bed of firm rock. This bed may also be sand, gravel, or firm clay. If the bed consists of firm clay, the pier is usually belled out (enlarged) at the base, to increase the bearing area.

Pile foundations are long, slender columns of steel, concrete, or wood. Machines called pile drivers hammer them down as deep as 200 feet (61 meters) to a layer of solid soil or rock. These columns transmit the building load to the supporting soil. Most skyscrapers are supported by rock foundations.

Mat foundations, also called raft foundations, are thick slabs of reinforced concrete that span the whole area beneath a building. They are normally used in poor soil conditions where it is not possible or economical to drive piles or piers down to good soil or rock. In effect, they enable the building to "float" on the soft soils.

Notes:
skin - наружная обшивка
live load - временная нагрузка; подвижная нагрузка
spread foundation - фундамент на естественном основании
pier foundation - пиленный фундамент; кессонный фундамент
mat foundation - сплошной фундамент

Comprehension Check

4. Decide which statements are true and which ones are false.

1. Foundations carry both the dead and wind loads.
2. There are four main types of foundations: (1) spread, (2) pier, (3) pile, and (4) raft.
3. The dead load of a building is the weight of the furniture, equipment, stored material, and occupants of a building.
4. The wind load may also be an important factor along with the snow
load and earthquake shocks.
5. If the bed consists of firm clay, the pier is usually belled out (enlarged) at the base, to increase the bearing area.
6. The columns of pile foundations transmit the building load to the supporting soil.

5. Complete the sentences.

1. The building erected now can be divided into two broad classifications: they are either …
2. Materials and structural forms are combined to make up the various parts of a building, including foundations, …
3. Spread foundations are not so firm as those …
4. A bed of pier foundations may also be …
5. Long, slender columns of steel, concrete, or wood transmit the building load …
6. Most skyscrapers are supported …

6. Answer the questions on the text.

1. What purpose were the first houses built for?
2. The buildings erected now can be divided into two broad classifications: they are either for housing or for industrial purpose, aren’t they?
3. What types can the building be divided into, as far as the material is concerned?
4. Is brick an artificial or natural material?
5. What kind of stone is used for foundations?
6. What makes various parts of a building?
7. What is called the foundation?
8. Both the substructure and the superstructure help to support the load (weight) of the building, don’t they?
9. Is the live load the total weight of all parts of a building?
10. What are the four main types of foundations?
11. Is spread foundation a firm one?
12. Are long, slender columns of steel, concrete, or wood pile or pier foundations?
13. Where are mat foundations normally used?
7. Study the following pairs of derivatives. Transform as in the models.

**V→N**
- to build - builder
- to drive - driver
- to erect - erection
- to combine - combination
- to divide - division
- to include - inclusion
- to extend - extension

**N→V**
- owner - to owe
- layer - to lay
- escalator - to escalate
- classification - to classify
- foundation - to found

**Adj→N**
- industrial - industry
- natural - nature
- structural - structure
- mechanical - mechanic
- electrical - electricity
- economical - economy

**Model 1:** to combine materials – the combination of materials
To erect the building, to divide the building, to combine materials, to include the basement walls, to extend above the ground.

**Model 2:** the type of foundation - the foundation type
The weight of the furniture, the slab of concrete, the column of steel, a bed of sand, a layer of soil.

8. Choose the right word or word combination.

1. As far as the material is concerned, the building can be divided into stone (or brick), … and concrete types.
   a) gravel   b) plastics   c) wood
2. Both the substructure and the superstructure help to support the … of the building.
   a) width  
   b) weight  
   c) light
3. In some regions, the … of a building is important if the structure is to withstand storms.
   a) live load  
   b) snow load  
   c) wind load
4. … foundations are long, slender columns of steel, concrete, or wood.
   a) pile  
   b) spread  
   c) mat
5. Mat foundations are thick slabs of reinforced … that span the whole area beneath a building.
   a) asphalt  
   b) cement  
   c) concrete
6. Pier foundations are heavy columns of … that go down through the loose topsoil to a bed of firm rock.
   a) steel  
   b) concrete  
   c) wood

9. Insert the right words.

   a) pier  
   b) heat  
   c) foundation  
   d) spread  
   e) live load

1. The substructure is usually called the…
2. The buildings made of stone or brick are durable, fireproof and have poor … conductivity.
3. The … is the weight of the furniture, equipment, stored material, and occupants of a building.
4. … foundations are not so firm as those based on solid rock.
5. … foundations are heavy columns of concrete that go down through the loose topsoil to a bed of firm rock.

10. Make a short summary of the text. Do it according to the following plan.

1. The title of the text is…2. The text is devoted to … 3. It consists of …
4. The first passage deals with…5. The second (third, forth, etc.) passage deals with…6. The main idea of the text is…
Text B. Elements of a Building. Load-Carrying Frame

1. Skim the text and answer the questions below.

The frame is the skeleton around which the rest of the house is built. Until the late 19th century, the exterior walls of a building were used as bearing walls to support the floors. This construction is essentially a post and lintel type, and it is still used in frame construction for houses. Bearing-wall construction limited the height of buildings because of the enormous wall thicknesses. In bearing-wall construction the walls transmit the load to the foundation. Bearing-wall construction is usually most economical for buildings less than four stories high.

In skeleton construction, all loads are transmitted to the foundation by a rigidly constructed framework made up of beams, girders, and columns. This skeleton carries the roof, walls, and floors, together with their loads. Beams and girders run horizontally. Girders are usually larger than beams. Closely spaced beams are called joists, especially in wooden buildings. Purlins are small beams that brace rafters or girders and help to provide the structure to support roofs. Beams above window and door openings are called lintels. Slabs are beams whose width is greater than their depth. Columns are heavy vertical supports that carry the load of beams and girders. Trusses consist of wood or steel supports that are connected in triangular patterns. The trusses provide the strength and rigidity to span large distances with relatively small amounts of material. Arches are curved supports that usually extend over openings.

Skeleton construction is better for taller buildings. All buildings in the skyscraper class are of skeleton construction. The 10-story Home Insurance Building in Chicago was one of the first buildings to have a skeleton construction. Completed in 1885, this building is often considered the world's first metal-framed skyscraper. Skeleton construction, consisting of steel beams and columns, was first used in 1889.

The three major types of structural frames are wood, steel, and concrete. Wood frames are light, cheap, and simple, consisting of interlocking arrays of vertical and horizontal beams and studs. Steel structural frames consist of vertical members (columns) and horizontal members (girders and beams) that are riveted, bolted, or welded together. Concrete structural frames have the advantage of costing less than steel.
ones, but they must usually be reinforced by steel to carry heavy loads. Steel rods are positioned in an interconnected framework surrounded by a wooden or steel form, and then concrete is poured into the form. The form is withdrawn once the concrete has set. In a method known as prestressing, high-strength wires are stretched and held tight while concrete is set around them. In this way a concrete span as long as 100 feet (30 m) can be attained.

Notes:
bearing wall - несущая стена
skeleton construction - каркасная конструкция
beam - балка, балочная ферма
girder – главная балка; (балочная) ферма; прогон
joist – опорная балка, поперечная перекладина, ригель
purlin – балка-распорка, обрешетина;
truss - ферма; сквозная ферма; решётчатая ферма; стропильная ферма;
stud - стойка (каркаса); косяк; свая

1. What is the frame?
2. What are the two main types of frame?
3. What type of construction is better to use for skyscrapers?
4. Which frame is the strongest and the most expensive?

Text C. Elements of a Building. Skin and Interior Construction

1. Scan the text and speak on skin and interior construction.

The skin of a building consists of both transparent elements (windows) and opaque elements (outside walls). Windows are traditionally glass, although plastics are being used, especially in schools where breakage creates a maintenance problem. Most parts of a window come from a lumber mill, already cut in the proper sizes. Window sashes are made of wood or metal, usually either aluminum or lightweight steel.

Walls are built to enclose areas and carry the weight of floors and roofs. The wall elements, which are used to cover the structure and are supported by it, are built of a variety of materials: brick, precast concrete, stone, opaque glass, plastics, steel, and aluminum. Wood is used mainly in house construction; it is not generally used for
commercial, industrial, or public buildings because of the fire hazard.

**Interior construction** includes (1) walls, (2) floors and (3) doors.

Rooms are made by building inside walls after the outside walls have been attached to the foundation. Inside walls, also called partitions, have studs and must be supported by plates, joists, and girders.

If plaster is to be applied, the interior walls must first be covered with lath, or strips of wood, metal, or plasterboard.

To provide for greater flexibility within buildings, movable or easily disassembled partitioning systems are used. Such partitions may be metal, prefabricated plasterboard components, accordionlike rolling curtains, or, if noise is a problem, leaded curtains that move either horizontally or vertically.

Most houses have several different kinds of doors, each designed to address a particular need. All doors are classified as either exterior or interior models.

**Typical weather-tight exterior doors** include the front entry door, back door, French doors, glass sliders and patio doors. Exterior doors allow access, provide security and maintain a comfortable indoor climate. They are made to be particularly strong, weather-resistant and energy efficient. In addition, a front door is usually designed to project a handsome first impression.

**Lighter-weight interior doors** are used between rooms, on closets and in similar applications. They include folding doors, bypass doors, and conventional hinged doors.

Bypass door is a door that has 2 or more sections. They can slide from each direction on an overhead track. Conventional hinged doors may be either right or left handed. A door that opens toward you and has the door knob on the right is right handed. A door hinged on the opposite side is left handed.

**Notes:**
French door – остекленная дверь
back door - черный ход; запасный выход; потайная дверь
patio door - большая стеклянная дверь на балкон или в сад
fire hazard – опасность возникновения пожара
folding doors - складывающиеся двери
hinged door - навесная дверь
2. Render the text in Russian.

Text D. Elements of a Building. Roofs and Floors

1. Scan the text and name the main types of roofs and floors.

A roof is the covering on the uppermost part of a building. Depending upon the nature of the building, the roof may also protect against heat, against sunlight, against cold and against wind. There are so many different types of roofs available. Any discussion of different types should include two aspects of roof type - the shape of the roof itself and the roofing material used to cover it. The shape is determined by the design of the house. The materials used are also quite varied and may be determined by things like cost, climate, neighborhood covenants, local building codes.

Common types of roofs include lean-to, flat, front or side gabled, cross gabled, pyramid, mansard, tent, hip and more. These are all descriptions of the roof shape, but within each shape, there are many variations as well. Another way to look at roof types is the roofing materials themselves. Examples of commonly used materials include asphalt shingle, wood shake, tile and man made versions of these materials. Tile, metal, and other man made materials tend to cost a bit more but also tend to be the most durable. Traditional materials such as asphalt shingles and wood shakes are usually less expensive but not quite as durable.

Floors divide the building into stories. They form the basic structural components of a building, together with ceilings and walls, The construction of the floors in a building depends on the basic structural frame that is used.

A wide variety of materials is used in modern floors. Concrete and wooden floors are usually covered with carpets, rugs, and other floorings for aesthetic reasons and to increase durability of the surface, absorption of sound, and ease of maintenance. Wood is still extensively used in residences, especially as parquets (short, hard pieces of wood assembled in geometric patterns). Wood tiles and prefabricated parquets can easily be installed on existing floors.

Tiles also play an important role in modern buildings and homes. Of all floor coverings, they are the most resistant to water and humidity, and they are easy to clean. Glazed ceramic tiles are used wherever highly
sanitary conditions are required, such as in hospitals, laboratories, swimming pools, and public toilets. In the home, tiles are used on the floors and walls of kitchens and bathrooms. Synthetic, resilient floorings include linoleum, asphalt tiles, vinyl asbestos and pure vinyl tiles and rubber.

Notes:
gabled roof - остроконечная крыша
asphalt shingle - рубероидная кровельная плитка

Section II. Lexical - Grammar Tests.

Для того, чтобы правильно выполнить контрольные работы, необходимо усвоить следующий грамматический материал:

1. Видо-временные формы глагола:
   а) активный залог - формы Indefinite, Continuous, Perfect (Present, Past, Future).
   б) пассивный залог - формы Indefinite (Present, Past, Future). Особенности перевода пассивных конструкций на русский язык.

2. Модальные глаголы can, may, must и их эквиваленты.
3. Простые неличные формы глагола: Participle I (Present Participle), Participle II (Past Participle) в функциях определения и обстоятельства. Герундий (Gerund).

Test 1. Constructing a Skyscraper

New methods in the design and construction of skyscrapers have been closely related to the development of computers. Engineers use computers to solve the complex mathematical problems involved in such construction projects by breaking the design down into a limited number of pre-calculated elements.

Before construction begins, engineers determine the strength of the soils that will lie underneath the new building. With this information they can design the proper foundation. After the building site is cleared, leveled and drained of water, excavation begins. Ground made of rock may be excavated by blasting.

Sometimes workers dig a trench of all sides of the foundation and fill
it with concrete before excavation begins. Any excavation that may cave
in is braced and shored with wood or steel. Pumps can be used to keep
water from the excavation area at all times. But if the soil becomes too
watery, caissons may be built so the work can continue.

After the excavation is finished the footings and the superstructure
are built. Most steel used in the superstructure, such as beams, girders,
and columns, comes prefabricated. Each piece of steel should have a
number indicating the exact place where it should be used. When the
steel is raised into place, workers fasten the pieces together temporarily
with bolts. Later, welders and riveters join these pieces together
permanently.

Many kinds of derricks and cranes are used in the construction of
skyscrapers. The two main kinds are mobile cranes and tower cranes.
Mobile cranes can manoeuvre around the outside of the building to hoist
material and equipment from various locations. Tower cranes can only
add hoist materials positioned within the maximum radius of their lifting
mechanisms. Some tower cranes can add sections to increase the height
of their support tower as the building goes up. Others are mounted
directly on the recently constructed upper stores of the building’s
framework. They can use a “telescoping” tower mechanism to “jump” up
with successive floors as they are constructed. A derrick, mobile crane,
or even a helicopter can help in removing sections of a tower crane once
the building is nearly complete.

After workers complete the superstructure and outside walls, the
building is ready to be finished, decorated, and furnished.

Notes:
pre-calculated – заранее просчитанный
caisson - кессон (ограждающая конструкция для создания в водонасыщен-
ном грунте рабочего пространства)
manoeuvre - маневрировать, выводить
to fasten – скреплять, закреплять

Test 2. Prefabricated Construction

Prefabrication has become an important part of most types of building
construction. Prefabricated sections of a building are produced in large
quantities in a factory and then shipped to various construction sites.
This procedure may allow work to continue despite poor weather
conditions and should reduce any waste in time and material at the site. As a result, costs are lowered and construction time decreases.

Many types of building sections can be prefabricated. For example, entire walls may be prefabricated for a wooden-frame house. Huge wooden arches are prefabricated for use as supports in churches, gymnasiums, and other buildings. Concrete beams, floors, roofs and wall panels may be pre-cast for many types of structures.

The factory produced prefabricated components can be classified by size and weight. Small units, such as a concrete block, can be handled by one man; medium size units such as a floor or wall panel can be handled by simple mechanical equipment; large prefabricated units, such as a mobile house, can be handled only by heavy mechanical equipment. Large units are moved by cranes and even helicopters.

The level of industrialization and the need of the building industry in a particular country have been the two primary factors affecting the use of prefabrication. In the former USSR, for instance, most apartment houses built after World War II relied heavily on the use of large prefabricated elements. In Europe, prefabricated elements have been used for apartment houses, although to a much lesser extent than in the USSR. The building industry in the United States has been much more reluctant to accept the advantages of pre-stressing with prefabrication.

Prefabricated structures are sometimes made by process called modular construction, first used in Japan. Modular construction refers to the use of a standard measurements as the basis for all building materials. The size of the module may vary considerably from country to country. In the United States, the basic module is 10 centimetres. All building parts are designed so that each dimension equals either this measurement or some multiple of it. Such standardization of building parts can allow all parts to fit together with few alterations. Modular parts are also used in buildings that are not prefabricated.

Notes:
prefabrication – заводское изготовление сборных конструкций
pre-cast – заводского изготовления, блочного сборного типа
apartment houses – многоквартирные дома
modular construction – модульная конструкция
UNIT III

PIPELINES AND NETWORKS

Section I. Reading material

Pre-reading exercises

1. Read the following international words and guess their meaning. Mind the stress.

- apartment
- mechanical
- electrical
- communication
- elevator
- comfortable
- central
- radiator
- ventilation
- telephone
- television
- vertically
- machine
- system
- design
- operation
- generator
- automatically
- control
- lift
- form
- vertical
- transport
- structure
- residential
- kilogram
- commercial


1. ancillary space         a) электропроводка
2. heating and cooling systems b) аварийный генератор
3. plumbing systems        c) средство эвакуации
4. hot-water heating        d) открытые шахты
5. radiant heating          e) грузовой лифт
6. central fan             f) кабельное телевидение
7. air conditioning machinery g) отключение электричества
8. closed circuit television h) центральный вентилятор
9. electrical wiring        i) служебное помещение
10. open shafts             j) водяное отопление
11. power failure          k) оборудование для кондиционирования воздуха
12. emergency power generator l) системы обогревания и
3. Read the text carefully and translate it into Russian.

**Text A. Mechanical and Electrical Systems**

A modern building not only contains the space for which it is intended (office, classroom, apartment) but also contains ancillary space for mechanical and electrical systems, such as heating and cooling systems, communications and power systems, lighting systems, elevators, plumbing systems (or water supply and waste disposal systems). They help to provide a comfortable environment.

Most houses have central heating systems. One heating unit, supplies heat for the entire house. Such houses are heated by warm air, steam, or hot water. In hot-air heating, a fan connected to the furnace blows warm air through ducts, or pipes, into the rooms. In steam or hot-water heats the steam or hot water passes through radiators that stand throughout the house. In radiant heating, hot-water pipes run under the floors or in the ceilings or walls.

Because of the increased use of sealed buildings with windows that cannot be opened, elaborate mechanical systems are provided for ventilation and air conditioning. Ventilation supplies fresh air to indoor places and removes stale air from these places. The air must not be too warm or too cool, and it must have the right amount of moisture. Ducts and pipes carry fresh air from central fan rooms and air conditioning machinery.

The widespread use of power, telephone, and of closed circuit television, intercommunication, and security and alarm systems has increased the amount of wiring that must be installed in buildings. Electrical wiring is the system of wires and cables that distributes electricity throughout a building. Main cables run vertically in open shafts, with branches at each floor. One of the most important tasks of such wiring is to supply electricity for lighting. It may also have to supply electricity to operate air conditioners, electric stoves, heaters, washing machines and many other appliances. A wiring system should be designed to meet all the expected demands for electric power at the least cost.
The electrical power required in buildings has increased with the number and complexity of environmental systems in operation. To offset the inconvenience of power failures, emergency power generators are installed in an increasing number of buildings.

High-speed, automatically controlled, cable-operated lifts, are the major forms of vertical transport in high-rise structures. Passenger lifts and freight lifts operate in many places and serve a variety of purposes. The passenger lifts commonly seen in office and residential buildings can carry from 900 to 1,800 kilograms. Some freight lifts can carry as much as 45,000 kilograms. Most lifts operate automatically. Only a few are run by attendants who ride in the cars.

Low-rise buildings and the lower floors of commercial buildings may also have escalators. For fire protection, it is necessary to provide at least two means of egress from every major space in a building. Therefore, in addition to lifts and escalators, all buildings, even the tallest, should have two enclosed and protected stairways for their entire height.

Buildings must have a piped-in water supply for a variety of purposes: drinking, washing, cooking, waste disposal, internal fire fighting (either through standpipes and hoses or through automatic sprinklers), and service to air-conditioning systems or boilers.

Notes:
fan – вентилятор; дуть, подавать воздух
sealed - герметический
shaft - шахтный ствол, шахта (напр. лифта)
cable - operated - управляемый тросом
hose - гибкий трубопровод; шланг; рукав
disposal - удаление

Comprehension Check

4. Decide which statements are true and which ones are false.

1. A modern building contains the space only for offices, classrooms, apartments.
2. Heating and cooling systems, communications and power systems, lighting systems, elevators, plumbing systems help to provide a
comfortable environment.
3. In steam or hot-water heating warm air passes through radiators that stand throughout the house.
4. The widespread use of power, telephone, and of closed circuit television, intercommunication, and security and alarm systems has increased the amount of wires and cables.
5. The most important task of electrical wiring is to supply electricity to operate air conditioners.
6. Passenger lifts and freight lifts are the major form of vertical transport in high-rise structures.

5. Complete the sentences.

1. Mechanical and electrical systems help to provide …
2. Ventilation supplies fresh air to indoor places and removes …
3. One of the most important tasks of such wiring is …
4. … can carry from 900 to 1,800 kilograms.
5. Low-rise buildings and the lower floors of commercial buildings may also….
6. All buildings, even the tallest, should have two enclosed and protected stairways for….
7. Buildings must have a piped-in water supply for a variety of purposes: …

6. Answer the questions on the text.

1. What space does a modern building contain?
2. What heating systems do most houses have?
3. Why are elaborate mechanical systems provided for ventilation and air conditioning?
4. What is electrical wiring?
5. Why are emergency power generators installed in an increasing number of buildings?
6. What are the major forms of vertical transport in high-rise structures?
7. What are the two main kinds of lifts?
8. Most lifts operate automatically, don’t they?
9. Why should all buildings have two enclosed and protected stairways for their entire height?
10. A piped-in water supply serves a variety of purposes. What are they?

**Vocabulary Practice**

7. Transform as in the models.

**Model 1: similar – similarity**
- electric – regular –
- secure – various –
- complex – stable –

**Adj. →N**
Model 2: form – formal  N→Adj
mechanic – environment –
electric – resident –
center – commerce –

8. Arrange the words according to the parts of speech (nouns, adjectives, adverbs).

Apartment, communication, comfortable, vertically, elevator, important, vertical, appliance, commonly, operation, structure, automatic, failure, inconvenience, electric, automatically, generator, addition.

9. Choose the right word or word-combination.

1. Most houses have … systems.
   a) escalators systems      b) air conditioning           c) central heating

2. In hot-air heating, a fan connected to the furnace blows … through ducts, or pipes, into the rooms.
   a) warm air                     b) steam                           c) hot water

3. Because of the increased use of sealed buildings with windows that cannot be opened, elaborate mechanical systems are provided for…
   a) lighting systems          b) hot-air heating          c) ventilation

4. Some … can carry as much as 45,000 kilograms.
   a) freight lifts                   b) passenger lifts          c) escalators

5. In addition to lifts and escalators all buildings, even the tallest, should have two enclosed and protected … for their entire height.
   a) alarm system               b) open shafts                c) stairways

10. Insert the right words.

   a) egress b) steam c) electrical wiring d) moisture e) power failures

   1. Most houses are heated by warm air, … or hot water.
   2. The air must not be too warm or too cool, and it must have the right amount of …
3. ...is the system of wires and cables that distributes electricity throughout a building.
4. Emergency power generators are installed in an increasing number of buildings to compensate inconvenience of ...
5. For fire protection, it is necessary to provide at least two means of ...

### Summarizing

11. Make a short summary of the text. Do it according to the following plan.

1. The title of the text is...
2. The text is devoted to ...
3. It consists of ...
4. The first passage deals with...
5. The second (third, forth, etc.) passage deals with...
6. The main idea of the text is...

#### Text B. Insulation for Heat Flow Control

1. **Skim the text and answer the questions below.**

   Thermal insulation is the most effective means of conserving energy and reducing its cost. It is accomplished by enveloping the house with a layer of insulating material. In homes and other buildings, insulation prevents heat from passing out of the structures during cold weather or into the structures during hot weather.

   Materials used for insulation include fibreglass, metal foil, rock wool fibres, and certain plastics. These materials are poor conductors of heat. When placed against a heated surface, they provide a barrier to the flow of heat. In addition, most insulation materials consist of fibres with cell-like spaces that block the motion of hot or cold air.

   In buildings insulation is installed in the areas where the greatest heat loss occurs. In most homes, these areas are the attic floor, the ceiling of an unheated basement, and the side walls. Insulation for the side walls is installed in the space between the interior and exterior walls. If a basement is heated, its side walls should be insulated.

   There are five chief kinds of insulation for buildings: (1) batts and
blankets, (2) loose-fill insulation, (3) cellular plastics, (4) rigid insulation boards, and (5) reflective insulation.

Insulation for heat control prevents heat from flowing through ceilings and walls to unheated parts of a house or to the outside. The insulation should be installed in the areas where such heat loss could occur.

Batts and blankets are soft, flexible units made of fibreglass and rock wool fibres. Batts are cut to certain sizes by the manufacturer. Blankets are sold in long rolls that can be cut to any size during installation. Batts and blankets are used between the joists, the beams that support the floor and ceiling, and between wall studs, which make up the vertical part of the building frame.

Loose-fill insulation consists of short fibres of cellulose, fiberglass, perlite, rock wool, or vermiculite. It is used chiefly in attics and side walls. Loose-fill insulation can be blown or poured into attics. It is installed between the interior and exterior walls by blowing it through small holes in one of the walls.

Cellular plastics are used to make plastic foam boards, which can be attached to a finished wall. These plastics are also used to make an insulating foam that can be injected into finished walls.

Rigid insulation boards are made from such materials as fibreglass, gypsum, and perlite. They can be attached to the ceiling, roof or walls.

Reflective insulation consists of thin sheets of aluminium foil. The sheets are arranged in layers separated by spaces that trap warm air. Reflective insulation is used between the joists and between wall studs.

Almost all insulation needs a vapour barrier to prevent moisture from penetrating the insulation and decreasing its effectiveness. A vapour barrier can be a sheet of foil, plastic, or treated paper. It must be put on the side of the insulation that faces the heated area.

The effectiveness of an insulation material is designated by its R-value, a measurement of the material's resistance to the flow of heat. Materials with high R-values have the greatest heat flow resistance.

Insulation should be fireproof and able to resist any physical or chemical changes that could reduce its effectiveness. It should also be resistant to destructive small animals, such as insects, mice, and rats.

Notes:

fibreglass – стекловолокно
perlite – перлит
plastic foam – пенопласт
vapour barrier - пароизоляция, паронепроницаемый слой

1. What does insulation prevent?
2. What do the materials used for insulation include?
3. What are five chief kinds of insulation for buildings?
4. Where are batts and blankets used?
5. What does loose-fill insulation consist of?
6. What are cellular plastics used to make?
7. What are rigid insulation boards made from?
8. Where is reflective insulation used?
9. What is R-value?

**Text C. Ventilating and Air-conditioning**

1. Scan the text and say what the purposes of ventilating and air-conditioning are.

Ventilating is the process of "changing" or replacing of air in any space to remove moisture, odors, smoke, heat, dust and airborne bacteria. Ventilation includes both the exchange of air to the outside as well as circulation of air within the building. It is one of the most important factors for maintaining acceptable indoor air quality in buildings. Methods for ventilating a building may be divided into mechanical/forced and natural types. Ventilation is used to remove unpleasant smells and excessive moisture, to introduce outside air, and to keep interior building air circulating, to prevent stagnation of the interior air.

"Mechanical" or "forced" ventilation is used to control indoor air quality. Excess humidity, odors, and contaminants can often be controlled via dilution or replacement with outside air. Natural ventilation is the ventilation of a building with outside air without the use of a fan or other mechanical system. It can be achieved with operable windows when the spaces to ventilate are small and the architecture permits. In more complex systems warm air in the building can be allowed to rise and flow out upper openings to the outside (stack effect) thus forcing cool outside air to be drawn into the building naturally through openings in the lower areas. These systems use very little energy
but care must be taken to ensure the occupants' comfort.

Air conditioning and refrigeration are provided through the removal of heat. The definition of cold is the absence of heat and all air conditioning systems work on this basic principle. Heat can be removed through the process of radiation, convection, and conduction using mediums such as water, air, ice, and chemicals referred to as refrigerants. In order to remove heat from something, you simply need to provide a medium that is colder - this is how all air conditioning and refrigeration systems work.

Central, “all-air” air conditioning systems are often installed in modern residences, offices, and public buildings, but are difficult to retrofit (install in a building that was not designed to receive it) because of the bulky air ducts required. A duct system must be carefully maintained to prevent the growth of pathogenic bacteria in the ducts. An alternative to large ducts to carry the needed air to heat or cool an area is the use of remote fan coils or split systems. These systems, although most often seen in residential applications, are gaining popularity in small commercial buildings.

Air-conditioned buildings often have sealed windows, because open windows would disrupt the attempts of the HVAC system to maintain constant indoor air conditions.

Notes:
HVAC system – система отопления, вентиляции и кондиционирования воздуха
condenser unit – автономный конденсатор

2. Render the text in Russian.

Text D. Electric wiring

1. Scan the text and say how the wiring system must be protected from excessive current.

Electric wiring is the system of wires and cables that distributes electricity throughout a home, store, factory or other building. Main cables run vertically in open shafts with branches at each floor. One of the most important tasks of such wiring is to supply electricity for lighting. It may also have to supply electricity to operate air conditioners,
electric stoves, washing machines, and many other appliances. In some houses, electricity also provides heat. A wiring system should be designed to meet all the expected demands for electric power at the least cost.

The wires are usually copper, although aluminum is also used, and are covered with thermoplastic insulation. The wires must be contained in conduit, which is either metal or plastic tubing.

Before construction starts, the builder determines the location and type of wiring. Wires vary in size, depending on the equipment in the house and how far the current must travel. Standard wiring is designed for 110 volt current. But builders often specify heavy-duty, 220-volt wiring if large electrical appliances, such as a stove and a water heater, or an air conditioning system are installed.

Electricians install wiring while carpenters build the frame. Wiring is done in a series of circuits. Each set of wires has several outlets. Electricians often place the wiring for a furnace on a separate circuit. This keeps the furnace running in case another circuit breaks down.

Electric wiring is designed to carry a known current. The wiring system must also be protected from excessive current by fuses. A fuse box usually holds all the fuses. If too much current flows through a wiring circuit, the wiring becomes overheated, which may result in a short circuit or even a fire. Electricians often install another protective device called a circuit breaker, instead of a fuse box. If the circuit becomes overloaded, the circuit breaker automatically cuts off the current.

Planning and installing electric wiring involves many factors. One of the most important is the safety factor. Short circuits resulting from inadequate and improperly installed wiring are a common cause of fires. Most countries set a minimum standard for acceptable wiring. It includes rules for the installation and construction of electrical outlets and appliances to eliminate fire hazards. Other factors include the various wiring methods and kinds of wire that may be used, and planning how to route the wires through a building.

Notes:
fuse – предохранитель

Section II. Lexical - Grammar Tests.
Для того чтобы правильно выполнить контрольные работы, необходимо усвоить следующий грамматический материал:

1. Инфинитив (Infinitive). Употребление инфинитива для выражения цели. Инфинитив в функции определения.
2. Употребление местоимения it и one. Эмфатическая конструкция it is… that.
3. Основные типы придаточных предложений. Союзное и бессоюзное подчинение.

**Test 1. Heating**

Heating systems may be classified as central or local. Central heating is often used in cold climates to heat private houses and public buildings.

Central heating systems have automatic controls, with a thermostat to regulate the temperature of the rooms heated by the system. The thermostat turns on the system when the temperature drops below the setting of the thermostat.

Another automatic control turns off the central heating system if any part of it becomes dangerously overheated. Still another control prevents the system from starting unless it can start safely.

There are two main kinds of central heating systems (1) direct and (2) indirect. They differ in the way they distribute heat. A direct system circulates the warm air throughout the area being heated. An indirect system circulates steam or hot water through pipes to convectors or radiators, which give off heat.

**Warm-air heating.** A warm-air heating system warms the air in a furnace and then forces it through a system of ducts to each room. Another system of ducts carries cool air from the rooms back to the furnace. An electrically driven blower in the furnace moves the air through the ducts, and filters remove dust particles from the air.

**Steam and hot-water heating systems.**

The pipes carrying steam or hot water are smaller than warm-air ducts and thus take up less space. Automatic valves can control the amount of hot water or steam flowing to convectors more easily than they can control warm air.

Steam heating works much like hot-water heating, except that water
changes to steam in a boiler. The steam passes to convectors, where it
gives up its heat to the room and becomes liquid again. The water then
flows back to the boiler.

**Radiant heating.**
Radiant heating is a method of equalizing temperature within a room.
A continuous loop of hot-water pipe or electric cable is installed in
the ceiling or floor. Heat radiates from these pipes and keeps the room
temperature nearly the same from floor to ceiling. Radiant heat provides
comfort at a lower room temperature than other heating systems.
Radiant electric heating uses a cable that produces heat from
electricity. The cable radiates heat to the room and may be installed in
the ceiling or floor or along the skirting board. A thermostat controls the
amount of heat produced by the cable.

**Heat pumps.**
A heating system that uses a heat pump operates much like a warm-
air system. But the heat pump uses a condenser, evaporator, pump, and
other equipment to get heat from outside air or the ground and "pump" it
into the building.

**Notes:**
furnace - печь, топка
duct - канал, проход
blower - вентилятор

**Test 2. Plumbing**

Plumbing is a system of pipes that carries water into and out of a
building.
A plumbing system consists of two separate sets of pipes, a water
supply system and a drainage system.

**The water supply system.** Water for a plumbing system comes from
two sources: (1) rivers and lakes, and (2) wells and reservoirs. Cities and
towns draw water from these sources and pipe it to treatment plants,
where it is purified. The purified water flows through large pipes called
mains, which run under the streets. The mains connect with smaller pipes
known as supply pipes, which lead into each building.
The water supply of every building has a shut-off valve. The shut-off
valve normally remains open, permitting water to enter the building. The
valve can be closed to turn off the water in order to repair the pipes or fixtures or in case of some other emergency.

Within a building pipes distribute water to the various plumbing fixtures and appliances, each with a valve to hold back the water until it is needed. With a direct system, cold water is taken directly to all the cold taps, to appliances using cold water, and to a water heater which is powered by either gas or electricity.

In an indirect system, cold water at mains pressure is piped to the cold tap at the kitchen sink to guarantee a pure supply for drinking and cooking. It is also piped to a high-level cold water storage tank. From there, water is distributed by gravity (natural flow) to other cold taps and appliances, and to a hot-water cylinder which is heated either directly by electricity or by a central heating system.

**The drainage system.** After water has been used, it flows out of the building through the pipes of the drainage system. This system also carries away solid waste from sinks, toilets, waste disposal units, and other fixtures and appliances.

The drainpipes from the fixtures and appliances slant downward, carrying water and sewage to a vertical pipe called the soil stack. The soil stack empties into a main drain beneath the building. This drain leads to a sewer or septic tank outside the building. The top of the soil stack extends up through the roof of the building, where it is vented to the open air.

In many communities, sewage flows from the main drain of each building into an underground system of pipes that carries it to a sewage treatment plant. The plant treats the sewage water and reduces the bacteria in it. The water can then be poured into a river or other body of water with minimum damage to the waterway.

**Notes:**
plumbing – водопроводно-канализационная сеть
plumbing fixtures – сантехника (в доме)
slant downward – располагаться под наклоном

**UNIT IV**

**CONSTRUCTION EQUIPMENT**
Section I. Reading material.

Pre-reading exercises

1. Read the following international words and guess their meaning. Mind the stress.

construction  wagon  platform
structure  front  excavator
material  bulldozer  manoeuvre
machine  horizontal  operation
tractor  vertical  position
wagon  bulldozer  manoeuvre
front  platform  platform
horizontal  bulldozer  manoeuvre
tractor  platform  platform
vertical  bulldozer  manoeuvre
position  platform  platform


1. construction equipment  a) изогнутый отвал
2. hand tool  b) фронтальный погрузчик
3. earth-moving machinery  c) пневмоколесный трактор
4. hoisting machinery  d) насосные машины
5. pumping machines  e) подъемные машины
6. crawler tractor  f) землеройные машины
7. steep slope  g) строительная бригада
8. rubber-tyred tractor  h) гусеничный трактор
9. curved blade  i) строительное оборудование
10. construction crew  j) кругой склон
11. power shovel  k) зубчатый нижний край
12. a tooth-shaped bottom edge  l) землечерпалка, экскаватор
13. face shovel  m) ручной инструмент
14. front-end loader  n) канатный скребковый экскаватор
15. dragline  o) одноковшовый экскаватор с прямой лопатой

3. Read the text carefully and translate it into Russian.

Text A. Earth-Moving Machinery (Part I)
**Construction equipment** is machinery used to build and demolish bridges, buildings, and other structures. These machines usually save labour, money, and time. One of them can do more work in an hour than a hundred workers using hand tools could do in a day. The chief kinds of building machines include (1) earth-moving machinery, (2) hoisting and material-handling machinery, and (3) pumping machines.

**Earth-moving machinery** is used to excavate, haul, and level earth and rock. These machines clear the way for the construction of bridges, buildings, and roads.

Construction workers use machines called tractors to push or pull trailers, wagons, and other equipment. Crawler tractors, or caterpillars, move on revolving crawler tracks, which resemble the treads of a tank. These tractors are used on soft ground and steep slopes and can move heavy loads. Rubber-tyred tractors carry lighter loads and can travel farther and at higher speeds.

Tractors that have heavy steel blades mounted in front are called bulldozers. The slightly curved blades clear away boulders, ground, trees, and underbrush. Bulldozers also excavate and level earth.

Machines called graders have a long, horizontal blade underneath. The operator can move the blade to either side of the machine and adjust it to a tilted or vertical position. Graders are used to grade and shape the surface of the ground.

Construction crews use scrapers to excavate and haul earth in dry, fairly flat areas. A blade under the machine digs up soil, which is loaded directly into the wagonlike part of the scraper for hauling. Some types of scrapers are pulled by a tractor, but others are self-powered.

The chief kinds of shovels used in excavation work include backhoes (or backacters), draglines, and power shovels. Each of these machines stands on a movable platform and has a large scoop bucket with a tooth-shaped bottom edge.

Construction crews often use backhoes to dig trenches for pipelines and sewers. Draglines are used to dig canals, ditches, and other excavations. Face or forward shovels dig away from the excavator. They are often used in quarry and hillside cuts.

Tractors called front-end loaders have a scoop bucket in front to dig and load material into trucks or wagons. They are easy to manoeuvre and have replaced power shovels for many kinds of construction operations.
Notes:
material handling machinery - погрузочно-разгрузочные машины
haul - передвигать; транспортировать
blade - отвал, нож (земляной машины)
self-powered - с автономным источником питания
backhoe - обратная лопата (экскаватор); канавокопатель с обратной лопатой

Comprehension Check

4. Decide which statements are true and which ones are false.

1. Graders move on revolving crawler tracks, which resemble the treads of a tank.
2. Bulldozers have heavy steel blades mounted in front.
3. Tractors are used to excavate and haul earth in dry, fairly flat areas.
4. Some types of scrapers are pulled by a tractor, but others are self-powered.
5. Construction crews often use bulldozers to dig trenches for pipelines and sewers.
6. Face or forward shovels dig away from the scraper.
7. Front-end loaders have a scoop bucket in front to dig and load material into trucks or wagons.

5. Complete the sentences.

1. The chief kinds of building machines include …
2. Construction workers use machines called tractors…
3. Graders are used to …
4. Some types of scrapers are pulled by …
5. Construction crews often use backhoes to …
6. Face or forward shovels are often used in….

6. Answer the questions on the text.

1. What are the chief kinds of building machines?
2. What kinds of machines do construction workers use to push or pull trailers, wagons and other equipment?
3. What is earth-moving machinery used to?
4. What tractors are called bulldozers?
5. What machines are called graders?
6. Do construction crews use graders or scrapers to excavate and haul earth in dry, fairly flat areas?
7. What kinds of machines are used in excavation work?
8. Construction crews often use tractors to dig trenches for pipelines and sewers, don’t they?
9. What tractors have a scoop bucket in front to dig and load materials into trucks and wagons?

Vocabulary Practice

7. Transform as in the models.

**Model 1: to construct – construction**  \( V \rightarrow N \)
- to direct –
- to excavate –
- to rotate –
- to create –

**Model 2: to work – worker**  \( V \rightarrow N \)
- to excavate –
- to trail –
- to operate –
- to scrape –

8. Arrange the words according to the parts of speech (nouns, adjectives, adverbs).

Construction, equipment, building, structure, usually, worker, trailer, slightly, horizontal, operator, vertical, position, grader, scraper, fairly, excavation, movable, sewer, excavator, loader.

10. Choose the right word or word-combination.
1. Construction machines can do more work in … than a hundred workers using hand tools could do in a day.
   a) 2 hours   b) an hour   c) 3 hours
2. Construction workers use machines called … to push or pull trailers, wagons, and other equipment.
   a) graders   b) scrapers   c) tractors
3. Tractors that have heavy steel blades mounted … are called bulldozers.
   a) in front   b) back   c) inside
4. Graders are used … and shape the surface of the ground.
   a) to compact   b) to clear   c) to grade
5. Shovels stand on a movable platform and has a large scoop … with a tooth-shaped bottom edge.
   a) boom   b) bucket   c) blade

11. Insert the right words.
   a) caterpillar b) scraper c) bridges d) graders e) bulldozers

1. Earth-moving machines clear the way for the construction of …, buildings, and roads.
2. … are used on soft ground and steep slopes and can move heavy loads.
3. Tractors that have heavy steel blades mounted in front are called …
4. Machines called … have a long, horizontal blade underneath.
5. A blade under the … digs up soil, which is loaded directly into the wagonlike part of the scraper for hauling.

12. Make a short summary of the text. Do it according to the following plan.

1. The title of the text is…
2. The text is devoted to …
3. It consists of …
4. The first passage deals with…
5. The second (third, forth, etc.) passage deals with…
6. The main idea of the text is…
Text B. Construction Machinery (Part II)

1. Skim the text and answer the questions below.

**Hoisting and material-handling machinery** is used to transfer construction materials from place to place. Construction crews working on tall structures use hoisting machines called cranes and derricks to lift steel beams and other parts.

Companies working on tall buildings use material lifts to raise crews, masonry, and various construction materials. The lifts consist of steel towers with hoist-operated platforms that travel up and down the side of a building.

Dumpers or dump trucks haul heavy loads of earth gravel, and sand over unpaved roads.

Other material-handling machines include mobile cement mixers and conveyor belts. Companies use mobile cement mixers to mix concrete while hauling it to work sites. Materials move on conveyor belts inside buildings or over rough ground.

**Pumping machines** are used in construction work to move water and other substances from one place to another. Pumps move clean water to mix with cement and remove dirty water from excavation pits.

Construction workers often use centrifugal pumps, which have blades that rotate at high speeds. The blades create suction that pulls water into the pump through an intake pipe. The water rotates with the blades and is forced out through an exit pipe.

Water that contains large amounts of solid waste is called slurry and can be moved by diaphragm pumps. Such pumps have a flexible plate called a diaphragm that moves back and forth, forcing the slurry through the pipes.

Another kind of water pump is the submersible pump. This pump operates under water. It is driven by an electric motor that has a waterproof covering.

Wet concrete is moved by concrete pumps to areas of a construction site where it is needed. These pumps have a piston that moves back and forth. The motion of the piston opens valves that allow concrete to pass through pipes to the site.

**Other construction machinery** prepares land and materials for
construction. Self-propelled or tractor-drawn rollers press down ground to make it more compact and stable before paving. The various types of rollers include smooth, steel drums; multityred wheels; and drum rollers.

Machines called crushers break large rocks into sand or gravel used to make paving material. Asphalt mixers and cement mixers combine sand and gravel with cement to make paving or building materials.

Devices called piledrivers drive piles (posts that support buildings and other structures) into the ground.

**Demolition machinery** is used to demolish structures and pavement. Construction crews often use a steel demolition ball to smash walls.

**Notes:**
masonry - каменная кладка
rotate - вращать(ся)
self-propelled - самоходный, самодвижущийся
1. What is hoisting and material-handling machinery used to?
2. What do dumpers or dump trucks haul?
3. Where are pumping machines used?
4. What are the main types of pumps?
5. What other construction machinery prepares land and materials for construction?
6. Demolition machinery is used to demolish structures and pavement, isn’t it?

**Text C. Earth-Moving Machines**

1. **Scan the text and speak on the main types of earth-moving machines.**

   Earth-moving machines is the equipment used in heavy construction, especially civil engineering projects, which often require the moving of millions of cubic metres of earth.

   The primary earth-moving machine is the heavy-duty tractor, which, when fitted with endless tracks to grip the ground and with a large, movable blade attached in front, is called a bulldozer. Bulldozers are used to clear brush or debris, remove boulders, and level the ground. A scraper is a machine that is pulled by a tractor or is self-powered. It consists of a blade and a box or container. Dirt is scraped by the blade
into the container; the dirt may then be released so as to form an even layer of a predetermined thickness, or be carried off for disposal elsewhere. Scrapers are used to level and contour land, as in road construction.

Somewhat similar to scrapers are graders, which are self-propelled, wheeled machines with a long, inclined, vertically adjustable steel blade. Graders are primarily finishing equipment; they level earth already moved into position by bulldozers and scrapers. Lightweight tractors fitted with wheels in place of tracks are used for comparatively light construction jobs. Equipped with a backhoe such a vehicle can dig shallow trenches; equipped with a front-end loader it can lift and carry gravel, stone, sand, and other construction materials.

Draglines and power shovels are the primary forms of excavation equipment. A dragline is fitted with an open scoop supported from the end of a long boom by a wire cable. The scoop is dragged along the ground by the cable until it is filled with earth, which is then dumped elsewhere. Draglines are used primarily to excavate deep holes. Power shovels are fitted with buckets called clamshells, which dig into the earth and shovel it up. The bottom of the clamshell opens to dump the dirt into a truck for removal.

Roller, farm implement used to break up lumps left by harrows and to compact the soil, eliminating large air spaces. The plain roller is often used to compact grassland damaged by winter heaving. Corrugated rollers, single or tandem, crush clods and firm the soil after plowing. A type usually called a roller-packer or land presser has heavy, wedge-shaped wheels about 3 feet (1 m) in diameter and is used in dry seasons to compress the soil after plowing.

Notes:

to grip - захватывать; зажимать; схватывать
adjustable - регулируемый; настраиваемый
finishing equipment - отделочное оборудование
trench - траншея; канава; шурф; котлован
plain roller - цилиндрический ролик, каток

Text D. A Concrete Mixer

1. Scan the text and speak on a concrete mixer.
A concrete mixer (also commonly called a cement mixer) is a device that homogeneously combines cement, aggregate such as sand or gravel, and water to form concrete. A typical concrete mixer uses a revolving drum to mix the components. For smaller volume works portable concrete mixers are often used so that the concrete can be made at the construction site, giving the workers ample time to use the concrete before it hardens. An alternative to a machine is mixing concrete or cement by hand. This is usually done in a wheelbarrow; however, several companies have recently begun to sell modified tarps for this purpose.

Today's market increasingly requires consistent homogeneity and short mixing times for the industrial production of ready-mix concrete. This has resulted in new technologies for concrete production. Worldwide, therefore, twin-shaft batch mixers are becoming more important for high-quality concrete production. They introduce very high turbulence into the mix and achieve about 95% homogeneity at only around 30 seconds mixing time per batch.

Special concrete transport trucks are made to transport and mix concrete from a factory to the construction yard. They are charged with dry materials and water, with the mixing occurring during transport. The interior of the drum on a concrete truck is fitted with a spiral blade. In one rotational direction, the concrete is pushed deeper into the drum. This is the direction the drum is rotated while the concrete is being transported to the building site. This is known as "charging" the mixer. When the drum rotates in the other direction, it forces the concrete out of the drum. From there it may go onto chutes to guide the viscous concrete directly to the job site. If the truck cannot get close enough to the site to use the chutes, the concrete may be discharged into a concrete pump connected to a flexible hose, or onto a conveyor belt which can be extended some distance (typically ten meters). A pump provides the means to move the material to precise locations, multi-floor buildings, and other distance prohibitive locations.

Notes:
portable – переносный; передвижной
ample – достаточный
homogeneity – однородность; гомогенность
turbulence - турбулентность
Section II. Lexical - Grammar Tests.

For that, to correctly perform control works, it is necessary to assimilate the following grammatical material:

1. Intransitive forms of the verb and constructions with them: complex subject (Complex Subject), complex object (Complex Object), infinitive phrases with the preposition for, non-predicative participial construction.

2. Subjunctive mood. Types of conditional sentences.

3. The repetition of basic grammatical constructions, representing the greatest difficulty for understanding and translation.

Test 1. Crane

Crane is a hoisting machine so constructed as to move loads both vertically and in other directions. Cranes are commonly employed in the transport industry for the loading and unloading of freight; in the construction industry for the movement of materials; and in the manufacturing industry for the assembling of heavy equipment. Cranes move heavy loads by means of ropes or cables that ride over pulleys. Nearly all of them move loads both vertically and horizontally. Machines that can only raise and lower loads are called hoists, or winches. Small cranes are operated by a hand crank, most large cranes are powered by electric motors or diesel engines. Originally large cranes were powered by steam engines.

A crane picks up a load by means of an attachment such as a hook, bucket or platform. A long arm called a boom moves the load about. On most cranes, the attachment is connected to a block and tackle, a system of pulleys and a cable. The end of the cable winds around a winch. Turning the winch raises or lowers the load. Various devices prevent the weight of the load from tipping the crane.

There are three types of cranes: (1) mobile cranes, (2) stationary cranes, and (3) traveling cranes. In mobile and stationary cranes, the cable that leads from the block and tackle passes around a pulley at the end of a boom, then winds around the winch. The entire boom can swing
about to move the load along an arc. In addition, all mobile cranes and some stationary cranes can raise and lower the boom. Raising the boom moves the load toward the base of the crane. Lowering the boom moves the load away from the base.

On most mobile cranes, the base is mounted on wheels or crawler tracks. To prevent tipping when the boom is extended, mobile cranes use counterweights, rollers, or long legs that extend outward from the base.

Stationary cranes also use these devices to prevent tipping. In addition, they use guy lines, long cables connecting the crane with a massive object such as a concrete column that has been driven into the ground.

A traveling crane has no boom. Its hoisting equipment is mounted in a trolley, a device that travels on wheels along a horizontal bridge. In overhead cranes, which are permanently installed in buildings, the bridge extends the entire width of a room. On the ends of the bridge are wheels that travel along elevated, horizontal tracks. These tracks extend the length of the room. In straddle carries, the ends of the bridge are attached to long, vertical columns. The columns are on wheels.

Notes:
hoist - подъемник
winch – лебедка
hook - грузоподъемный крюк
bucket - ковш
boom – вылет стрелы (крана)
block and tackle – веревка с блоком
pulley- ролик, блок
straddle carrier – контейнеровоз-погрузчик

Test 2. Types of Cranes

Cranes exist in an enormous variety of forms. Some are classified by shape, others by the function they perform, and still others by their form of mobility. Cranes are classified according to the greatest load they can move; on this basis they vary in size from one ton to over 250 tons.

Derrick is a special type of crane in which the distance from the end of the jib to the pillar can be changed. A guy derrick consists of a pivoted pillar that is braced by guy ropes, and a jib that is attached at the base of
the pillar. A tower derrick is similar to a guy derrick except that its jib is movable and may be secured at different heights on the tower, or pillar. Tower derricks are used mostly in building construction.

**Pillar crane** has a self-supported column, or pillar, that can be turned on its vertical axis. A horizontal or inclinable jib is attached to the pillar. The load is raised or lowered from the end of the jib.

**Portable jib crane** is small and is attached to the columns or walls of a building by means of simple adaptors, or brackets that are placed at the required locations. Portable jib cranes are particularly useful in various areas of shops and warehouses.

There are several types of **traveling cranes**. One of the most common is traveling jib crane. Its pulley system is suspended from a trolley that moves along the length of the horizontal jib. Traveling bridge cranes consist of two elevated tracks that are bridged by a girder that travels along the tracks on wheels. Gantry cranes are designed for use outdoors or where an overhead runway is not practical. Gantry cranes have a bridge that is supported at both ends by vertical columns, or legs. The legs are mounted on wheels or rollers so that the entire structure can move along rails or tracks.

**Truck crane** is mounted on a truck that moves on large wheels or on tractor caterpillar treads. Cranes that travel on caterpillar treads are often called crawler cranes. Truck cranes are quite versatile because they are self-propelled and can be equipped with accessory booms, or jibs, to extend to about 46 meters high. Locomotive cranes are similar to truck cranes, but are designed to travel on standard gauge tracks.

Hoisting and transporting cargo to and from ships are often done with **floating cranes**, which are mounted on pontoons or barges. Floating cranes are also used for water work such as driving piles and raising sunken vessels and other objects.

Materials such as earth and rocks are often lifted and transported by **cable cranes**. The load is carried in buckets attached to a cable that moves between two towers.

**Notes:**

jib (boom)- стрела грузоподъемного крана
pillar- стойка; колонна; вертикальная станина; вертикальная опора
guy derrick- вантовый деррик
pillar crane - мачтовый кран, башенный кран
portable jib crane - переносной дерикк-кран
traveling jib crane - подвижной мачтовый кран
gantry crane - порталный кран
truck crane - автомобильный кран
locomotive crane - железнодорожный кран
floating crane - плавучий кран
cable crane - кабельный кран

SUPPLEMENTARY TEXTS

House

House is a building that provides shelter, comfort, and protection. Houses vary in size from one-roomed mud huts to many-roomed mansions. They may have only one storey (floor), or several storeys. They stand in cities, towns, and villages, and in both suburban areas and the country. Types of houses vary with the needs and wealth of the inhabitants, and with the building materials that are available. Many large buildings are divided into flats, or apartment. Each flat is a complete, self-contained home on one storey. Houses may also be divided into self-contained maisonettes, each occupying two or more storeys.

Styles of houses vary widely from country to country. And, in many countries, the style of new houses has changed with passing time. Many house styles are named after the country or period of their origin. Others are named after the architects who created them. European historical styles include Romanesque, Gothic, Renaissance, Baroque, and Rococo. Architects who founded styles used for houses include the Italian Andrea Palladio and the Adam brothers of Britain.

The factors that influence the size and design of houses include climate, social customs, building techniques and materials, fashion, and wealth. Religious beliefs also influence style. For example, houses in some countries of eastern Asia have roofs that curve upwards at the eaves. The people believe that these roofs protect them from evil spirits. Other house styles are a result of social conditions. For example, in Britain during the early 1800’s, many wealthy people and the nobility commissioned the best architects to design their homes. They built fine,
graceful houses suited to a leisurely life requiring large domestic staffs. But, today, most new houses are easy to maintain and comfortable for small families.

Local styles of houses are now less common than in earlier times. House styles have become more uniform in most parts of the world, because of new building materials and methods. A factory may produce prefabricated parts for houses to be erected quickly on site, instead of being built in stages.
Environment

Environment has an important effect on the houses that people build. In areas of great heat or cold, houses must be built to protect people from extreme temperatures. The traditional houses of the Eskimo people of the Arctic were built of blocks of snow. These snowhouses, called *igloos*, provided excellent insulation against the very low temperatures outside. In the extreme heat of the deserts of the Middle East, nomadic people called Bedouins lived in large tents made of fabric woven from the hair of their camels or goats. The thick material protected the people from the sun but could be opened at the sides so that air could circulate. Since the mid-1900’s both of these traditional styles of house have been replaced by housing built of more modern materials.

In Japan, houses were traditionally made from light materials, such as paper and bamboo. These *paper houses* collapse harmlessly if there is a volcanic eruption or an earthquake. Then the people can quickly and cheaply rebuild them. The *stilt houses* of Southeast Asia are also well adapted to their environment. People build these houses on tall poles in areas where floods might wash away ordinary houses, or where insect pests might invade them.

In alpine regions, where much snow falls, houses have steeply sloping roofs. As a result, the snow falls off easily. Sloping roofs are also needed in places where heavy seasonal rains fall. But, in hot, dry countries many houses are box-like, with flat roofs. The houses remain cool in the intense heat because the shuttered windows are small and the thick walls are painted white to reflect the sunlight.

In towns and cities, land is expensive, and much housing must occupy a small area. As a result, builders may construct tall blocks of flats or long, continuous rows of *terraced houses*. But, in the country, more land is available and *detached houses* and single-storey *bungalows* stand in their own large gardens or grounds. The suburbs of many British cities have *semi-detached* houses, each of which is linked to a similar house.

Materials

Materials used to build houses vary from mud and grass for tribal huts to factory-made one-room units for blocks of flats. Kinds of materials may be divided into two types: traditional, and modern.

*Traditional materials* include snow, mud, wood, bark, twigs,
creepers, grass, leaves, dried blood, and stones. They may be used as they are found. Generally they are not strong materials. As a result, houses built from them must be small. But bamboo is strong and light and it may be split and joined easily. Large jungle leaves give good protection from heavy rain. Mud seals cracks in walls and prevents draughts. A mixture of mud and animals blood dries to make a solid floor.

Traditional materials also include wood, stone, timber, slate, tile, bricks, mortar, and plaster. They include natural and manufactured materials that are fashioned with tools. All heavily wooded countries have many timber houses. These houses are warm in cold weather, because wood is a good insulator. Stone houses are common in areas where stone can be quarried locally. But stone is a bad insulator and stone walls must be thick. Slate and factory-made tiles make strong, permanent roofs.

Wood has long been a popular building material because it is usually more plentiful and cheaper than other materials. Wood can be cut and shaped to provide a variety of house styles. Wood is also popular because so many different types are available. Wood is also used for such interior features as stairways, cabinets, floors, and doors. Wood can be natural, stained, painted, or carved.

Brick is one of the oldest and most common building materials. Brick wears well and, like wood, is usually easy to obtain. Bricks are available in a number of colours and finishes.

Concrete block and stone make strong, attractive houses. Concrete blocks are made by pouring a mixture of cement into a mould. They make durable houses that are relatively cheap to maintain. Builders also make houses of stone that has been taken from quarries and split into usable sizes. Because stone is an expensive building material, it is usually applied in a veneer, or coating, over an inner wall of brick or concrete block.

Modern materials in today’s houses differ greatly from those of 100 or even 50 years ago. Industries have developed new materials that help architects design better, longer-lasting houses. For example, builders once used iron for gutters and pipes. The iron rusted. Today, builders can use plastic, which does not rust. Aluminum, which does not rust, and nonrotting plastic materials such as PVC can be used instead of wood or metal for window frames and doors.
Older houses usually had small windows that let in only a small amount of light. Their window frames were loosely constructed and were not always airtight. Houses today have improved, airtight window frames to conserve heat.

**Building stone**

Building stone is one of the world's most important construction materials. It comes from natural stone deposits in the earth and is mined through quarrying. It is used as crushed stone or as dimension stone.

Crushed stone is generally limestone or dolomite that has been crushed and graded by screens to certain size classes. It accounts for about 99 per cent of all building stone. It is widely used in concrete and as a surfacing for roads.

Dimension stone is cut from large blocks and slabs into definite shapes and sizes. It is used most often for finishing and decorating all types of structures. Constructors expect good dimension stone to last more than 100 years. Dimension stone includes granite, limestone, sandstone, marble, and slate.

Granite is one of the strongest building stones. But it is difficult to cut and handle because it is so hard. It is used in the construction of many public buildings. Granite can be polished to a glossy finish and is an excellent background for carvings and lettering.

Limestone is a hard and lasting building stone that can be cut easily and shaped with saws, planes, and even lathes. These stones are sometimes placed over the rough stonework of a building to make an attractive surface. Limestone is also used to tile floors, and for sills, steps, and trimming.

Sandstone is easy to work and is used for the same purposes as limestone. Sandstone that is well-cemented with silica is a durable and weather-resistant material.

Marble is white, streaked with veins of black, gray, green, pink, red, and yellow. Builders use marble to decorate stairways, hearths, floors, and as paneling.

Slate is fine-grained rock that can be split easily into thin slabs and used for roofing shingles and flagstone flooring.

**Brick**

Brick is a rectangular building block made of clay, shale, or various other materials. Bricks are strong, hard and resistant to fire and damage
Bricks are used to build such structures as houses, commercial and public buildings, fireplaces, and furnaces.

Bricks are divided into two general classes: building bricks and refractory bricks.

Different categories of building bricks are used for load-bearing walls, for structures carrying exceptional loads and where appearance is important. The highest-quality and most attractive building bricks are called face bricks. They are used in highly visible areas of structures, such as the interior or exterior walls of houses. Face bricks come in a variety of colors and surface textures. Most are made from high-grade fire clay or low-grade shale.

Refractory bricks can withstand temperatures between 2000° and 4000° F. (1093° and 2204° C), They are also highly resistant to chemical damage, physical wear and thermal changes. Refractory bricks are used in a wide variety of structures, including fireplaces and industrial furnaces.

The methods used to make bricks vary according to the raw materials used, the intended use of the bricks and other factors. However, the production of bricks generally involves four basic steps: (1) preparing the ingredients, (2) forming bricks, (3) drying bricks, and (4) firing brick.

Glass

Glass is one of the most important and useful materials in the world. Few manufactured substances add as much to modern living as does glass. Yet few products are made of such inexpensive raw materials as silica sand (silica, or silicon dioxide), soda ash (sodium carbonate), and limestone (calcium carbonate). These constituents need to be very pure for the glass to be clear. Glass can take many different forms. It can be spun finer than a spider web or molded into a disk. It can be stronger than steel, or more fragile than paper. Most glass is transparent. Glass can also be colored to any desired shade.
There are many kinds of glass. The float glass is made in the form of flat sheets. It is used chiefly in windows, in mirrors, room dividers. It provides the best qualities of the old plate glass with more than ten times the productivity of the plate glass process. It is also significantly more energy efficient and can be produced in a full range of thicknesses. The electro-float process led to the mass production of solar-control glass or tinted windows, which reduce solar heat gain and glare in buildings. One of the newer and most fascinating products of glass manufacture is fiber glass. It can be laminated with plastics or toughened, or a wire mesh can be sandwiched into glass sheets to provide strength or fire-resistant properties. Fiberglass insulates the walls of many homes. Foam glass, when it is cut, looks like a black honeycomb. It is filled with many tiny cells of gas. Each cell is surrounded and sealed off from the others by thin walls of glass. Foam glass is so light that it floats on water, like cork. It is widely used as a heat insulator in buildings, on steam pipes, and on chemical equipment. Foam glass can be cut into various shapes with a saw.

Glass building blocks are made from two hollow half-sections sealed together at a high temperature. Glass building blocks are good insulators because they withstand high temperatures on the inside and low, outdoor temperatures at the same time, because of the dead-air space inside thus making suitable block for building purposes. The blocks are laid like bricks.

Timber

Timber is one of the earliest construction materials and one of the few natural materials with good tensile properties. Hundreds of different species of wood are found throughout the world, and each species exhibits different physical characteristics. Only a few species are used structurally as framing members in building construction. In the United States, for instance, out of more than 600 species of wood, only 20 species are used structurally. These are generally the conifers, or softwoods, both because of their abundance and because of the ease with which their wood can be shaped. The species of timber more commonly used in the United States for construction are Douglas fir, Southern pine, spruce, and redwood. The ultimate tensile strength of these species varies from 5,000 to 8,000 psi (350 to 560 kg/sq cm). Hardwoods are used primarily for cabinetwork and for interior finishes such as floors.
Because of the cellular nature of wood, it is stronger along the grain than across the grain. Wood is particularly strong in tension and compression parallel to the grain, and it has great bending strength. These properties make it ideally suited for columns and beams in structures. Wood is not effectively used as a tensile member in a truss, however, because the tensile strength of a truss member depends upon connections between members. It is difficult to devise connections which do not depend on the shear or tearing strength along the grain although numerous metal connectors have been produced to utilize the tensile strength of timbers.

Green lumber has a natural moisture content ranging from 35 to 40%. It subsequently dries, or seasons, to a moisture content of 5 to 25%, depending on the relative humidity of the atmosphere. As a result of the shrinkage of the cells caused by this change in moisture content, wood shrinks (primarily across the grain) as it dries. This shrinkage produces defects in lumber, such as the bow in a plank and cracks, or checks, parallel to the grain. Another natural defect that somewhat reduces the strength of wood boards is the knot, which represents the origin of a branch.

Ceramics

Ceramics are one of the three most important types of engineering materials that are primarily synthetic. The other two are metals and plastics. Ceramics include such everyday materials as brick, cement, glass, and porcelain. Most ceramics are hard and can withstand heat and chemicals. These properties give them a wide variety of uses in industry.

Manufacturers make common ceramics from such minerals as clay, feldspar, silica, and talc; these minerals, called silicates form most of the earth's crust. Clay is an important silicate. But it is not used in all ceramic materials. Glass, for example, is made from sand. Most ceramic products, like their mineral ingredients, can withstand acids, gases, salts, water, and high temperatures. But not all ceramic products have the same properties. Common ceramics are good insulators - that is, they conduct electricity poorly. However, certain ceramics lose their electrical resistance and become superconductors when they are cooled. Some ceramic materials are magnetic.

The properties of ceramics make them especially suitable for certain products. Products made of ceramic materials include abrasives
(materials used for grinding), construction materials, dinnerware, electrical equipment, glass products, and refractories (heat-resistant materials).

**Cement**

Cement is a fine, gray powder. It consists chiefly of calcium silicates and is used primarily in making concrete. Cement is mixed with water and materials such as sand, gravel, and crushed stone to make concrete. Cement and water form a paste that binds the other materials together as the concrete hardens. Nearly all the cement used today is portland cement which is a hydraulic cement, or one that hardens under water. Portland cement is used chiefly to make concrete. But it can also be mixed with soil and water to form soil-cement, which is used in road paving and dam construction and for lining reservoirs.

Portland cement contains about 60 per cent lime, 25 per cent silica, and 5 per cent alumina. Iron oxide and gypsum make up the rest of the materials. In the plants, the materials go through a chemical process that consists of three basic steps: (1) crushing and grinding, (2) burning, and (3) finish grinding.

**Aluminum**

Aluminum is the oldest and best known light metal. Aluminum is the most plentiful metallic element in the earth's crust and the third most common of all the elements, after oxygen and silicon. But unlike some other metals, such as gold and silver, aluminum never occurs free (uncombined) in nature. It is always chemically combined with other elements.

People had no way of separating aluminum from these elements until the 1800’s. Scientists then developed processes for separating the elements and producing aluminum. Aluminum, with its alloys, has many valuable properties that make it an exceptionally useful metal. These properties include (1) light weight, (2) strength, (3) corrosion resistance, (4) electrical conduction, (5) heat conduction, and (6) light and heat reflection.

The world uses more aluminum than any other metal except iron and steel.

Low weight and resistance to corrosion combine with its toughness to make aluminum very suitable for the bodies of vehicles and
also for castings-gear-boxes, pistons, cylinder heads. It is used for making cooking utensils, ladders, refrigerators, wrapping material. The construction industry uses aluminum in such items as gutters, panels, residential roofing, tubes for electric wires and window. Its shiny surface reflects heat, and aluminum foil is used for the heat insulation of houses. Buildings with aluminum roofs reflect much of the sun's heat and so stay cooler in hot weather.

Aluminum paint protects ironwork from rust, obliterates dark paint, and reflects light. Some important aluminum alloys are magnesium and duralumin (95% aluminum + 4% copper -f 1/2% manganese + 1/2% magnesium) which is only half as dense as steel but twice as strong; unlike aluminum, it can be tempered by heat treatment; it is used for making aircraft, houses, furniture and motor pistons.

Aluminum can be shaped by almost any metalworking process. It can also be bolted, glued, riveted, soldered, welded, and otherwise joined by most methods used for other metals. Finally, aluminum can be recycled.

**Iron and steel**

Iron and steel are the world's cheapest and most useful metals. These hard, durable metals are used in making thousands of products, from paper clips to automobiles.

The word iron can refer to both an element and a number of alloys (mixtures) of iron and other metallic elements.

Steel is produced by refining (purifying) iron and alloying it with other metals. Iron may be thought of as a basic material of steel, and steel may be considered the refined product of iron.

The properties of any kind of iron or steel depend largely on the chemical composition of the alloy.

Cast iron is any iron alloy that contains from 2 to 4 per cent carbon and from 1 to 3 per cent silicon, because of its high carbon content, solid cast iron cannot be shaped, no matter how hot it is heated. This kind of iron is made into useful objects by pouring the liquid metal into molds and letting it harden. Cast iron's hardness, low cost, and ability to absorb shocks make it an important construction material.

Steel finds its use in corrugated sheets for roofing, for girders, frames, etc. Various shapes are employed in construction.
Types of construction

In bearing-wall construction, the walls transmit the load to the foundation. In skeleton construction, all loads are transmitted to the foundation by a rigidly constructed framework made up of beams, girders, and columns. This skeleton carries the roof, walls, and floors, together with their loads. Bearing-wall construction is usually most economical for buildings less than four stories high, but skeleton construction is better for taller buildings. All buildings in the skyscraper class are of skeleton construction. The 10-story Home Insurance Building in Chicago was one of the first buildings to have a skeleton construction. Completed in 1885, this building is often considered the world's first metal-framed skyscraper.

Many parts of a building have no structural function. Nonbearing walls and curtain walls carry only their own weight and serve to divide the interior of a building or to keep out the elements. Such walls are called non-bearing partitions. Other nonbearing parts include windows, doors, stairs, elevators, and other equipment.

In one method of construction, called tilt-up construction, concrete wall panels are formed at ground level. Cranes or derricks then lift them into position.

Classification of building

Buildings are classified by construction as fire-resistive, noncombustible, ordinary, or frame. The most important factor in this classification is resistance to fire. A standard fire test is used in testing samples of materials. In this test, the samples are exposed to a fire of specified intensity. The materials are graded for their ability to withstand the fire. For example, a two-hour rating is given a material that withstands the test for two hours.

Fire-resistive construction is that in which the walls of a building are of masonry or reinforced concrete, and the major structural parts are steel or reinforced concrete and so insulated as to have a four-hour rating. Other parts of the building must have a three-hour rating. Large cities require most buildings in the business districts to be fire-resistive.

Noncombustible construction is similar to fire-resistive construction. However, the major structural parts have a two-hour rating.

Ordinary construction is that in which the exterior walls are masonry or reinforced concrete, and in which the interior structural
members are partly or entirely of wood in smaller dimensions than required for heavy timber or steel construction.

**Frame construction** is that in which exterior walls are wholly or partly of wood. It includes brick or stone veneer, stucco, or sheet metal over wood.

**Interior Construction. Doors.**

A door is a panel or barrier, usually hinged, sliding, or electronic, that is used to cover an opening in a wall or partition going into a building or space. A door can be opened to give access and closed more or less securely. The term door is also applied to the opening itself, more properly known as the doorway.

Doors are nearly universal in buildings of all kinds, allowing passage between the inside and outside, and between internal rooms. When open, they admit ventilation and light.

The purpose of a door closure is primarily to give occupants of a space privacy and security by regulating access. For this purpose doors are equipped with a variety of fittings ranging from simple latches to locks.

The door is used to control the physical atmosphere within a space by enclosing it, excluding air drafts, so that interiors may be more effectively heated or cooled. Doors are significant in preventing the spread of fire.

Doors also have an aesthetic role in creating an impression of what lies beyond. They are also used to screen areas of a building for aesthetic purposes, keeping formal and utility areas separate. They act as a barrier to noise.

Doors are often symbolically endowed with ritual purposes, and the guarding or receiving of the keys to a door, or being granted access to a door can have special significance. Similarly, doors and doorways frequently appear in metaphorical or allegorical situations, literature and the arts, often as a portent of change.

When framed in wood for snug fitting of a door, the doorway consists of two vertical jambs on either side, a lintel or head jamb at the top, and perhaps a threshold at the bottom. When a door has more than one movable panel, one of the panels may be called a leaf.
Excavating Machines

Excavating Machine, any machine, usually self powered, that is used in digging or earthmoving operations of some kind; the power shovel, bulldozer and grader are examples.

Power shovel, digging and loading machine consisting of a revolving deck with a power plant, driving and controlling mechanisms, sometimes a counterweight, and a front attachment, such as a boom or crane, supporting a handle with a digger at the end. The whole mechanism is mounted on a base platform with tracks or wheels. Power shovels are used principally for excavation and removal of debris. Mechanical cable-operated shovels apply engine power to the base and to the attachment by means of clutches, gears, shafts, winch drums, and cable. Electric cable-operated shovels have several electric motors supplied with current by a power line, or more rarely, by a deck-mounted generator, replacing the engine and most of the clutches, gears, and shafts of the mechanical shovel. Hydraulic shovels have engine-driven pumps to provide pressure for rams and motors. Mechanical shovels may include some electrical or hydraulic functions.

Bulldozer, also called DOZER, powerful machine for pushing earth or rocks, used in road building, farming, construction, and wrecking; it consists of a heavy, broad steel blade or plate mounted on the front of a tractor. Sometimes it uses a four-wheel-drive tractor, but usually a track or crawler type, mounted on continuous metal treads, is employed. The blade may be lifted and forced down by hydraulic rams. For digging, the blade is held below surface level; for transporting, it is held at the surface level; and for spreading, it is held above the surface level, as the tractor moves forward. Bulldozers are used for shallow digging and ditching; short-range transportation of material; spreading soil dumped from trucks; rough grading; removing trees, stumps, and boulders; and cleaning and leveling around loading equipment. A bulldozer alone can do many types of excavation, and it is useful in combination with other machinery in most excavation work.

Grader, in excavation, precision finishing vehicle for final shaping of surfaces on which pavement will be placed. Between its front and rear wheels a grader carries a broad mechanically or hydraulically controlled blade that can be extended from either side. Either end of the blade can be raised or lowered. Graders may be used for shallow
ditching, but most models are used to assist other earth-moving equipment and to smooth roads, fills, and cuts.