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Учебное пособие по английскому языку  
**CONSTRUCTION: THEN AND NOW**

Нижний Новгород  
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**CONSTRUCTION: THEN AND NOW**

Утверждено редакционно-издательским советом университета  
в качестве учебного пособия

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Цель учебного пособия – формирование базовых знаний по специальности, ознакомление с терминологией специальности, овладение профессионально-ориентированным языком, формирование профессиональной, коммуникативной и социокультурной компетенций в рамках профессиональной подготовки специалистов.

Предназначено для студентов I, II курсов очной и заочной форм обучения, направления подготовки 08.03.01 «Строительство» и 07.03.01 «Архитектура».

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## **Введение**

Учебное пособие по английскому языку «Construction: then and now» предназначено для студентов I, II курсов, обучающихся по направлению подготовки 08.03.01 «Строительство» и 07.03.01 «Архитектура» очной формы обучения. Также данное пособие может использоваться для слушателей магистратуры.

Целью учебного пособия является формирование базовых знаний по специальности, ознакомление с терминологией специальности, овладение профессионально-ориентированным языком, формирование профессиональной, коммуникативной и социокультурной компетенций в рамках профессиональной подготовки специалистов.

Учебное пособие состоит из 8 модулей, включающих актуальные строительные темы. Каждый модуль имеет текстовую описательную часть и набор заданий, содержащих вопросы и темы для устных сообщений на практическом занятии с последующим обсуждением в форме дискуссии, а также краткий тематический словарь.

## **Unit 1**

### ***HISTORY OF ENGINEERING***

#### *1. Read the text about the history of engineering.*

Since the early times of mankind, man has been searching for a better living and it is due to his spirit for fighting that he has gone a long way in Engineering. In this manner the wheel appeared as one of the engineering achievements of the primitive man.

Some of the first evidences of engineering works were the Great Egyptian Pyramids in the third century B.C., other works of the time were the Great Chinese Rampart and constructions, roads and hydraulic works of Babylon. Some centuries later, the architectural works and roads from Greeks and Romans, the magnificent Gothic cathedrals in Europe in the Middle Ages from XIII to XVI centuries and the Incan and Mayan pyramids and aqueducts in America probably built between the X and XV centuries were beautiful examples of the above stated.

However formal engineering, as we know it now, appeared in the last part of the XVIII century in France with Napoleon Bonaparte, who developed military strategies based on time and motion studies, had to construct bridges, roads and fortifications that enabled him to get his conquests. Almost at the same time in England Civil Engineering came out, which is the oldest engineering branch applied to build edifications and other works that were necessary for the development of society in peaceful times. Later in 1775, the industrial revolution emerged in this country, which brought up the invention of machinery for production of goods and transportation; this was the origin of Mechanical Engineering. One century later, the search for new and better goods gave birth to Chemical Engineering. At the same time, Electrical Engineering came with the inventions of Thomas Alva Edison in the United States; and Industrial Engineering based on Frederick W. Taylor theories in the last part of the XIX century.

Nowadays, Engineering has a multitude of branches in several specialized fields and it has been developing very fast. Everyday new and sophisticated equipments seek to help man in his struggle for making a happier and lasting life. Some examples

of this are the great communication systems by satellite, the atomic energy, computers, solar energy utilization, the great space ships, biomedical Engineering, and the submarine train that connects Great Britain with Europe, and so on. All these engineering works have been possible thanks to the spirit that man has within himself and moves him to obtain the best from his intelligence.

Nevertheless the above stated, man is still facing great challenges and problems such as overpopulation, lack of food, the damages to the environment, new and unknown sicknesses, etc., which will give birth to new and better improvements in the engineering of tomorrow.

*2. Fill the blanks with the proper words to complete the sentences*

1. Some of the branches of engineering are \_\_ , \_\_\_\_\_ , \_\_\_\_\_ , and \_\_\_\_\_
2. The industrial revolution happened in \_\_\_\_\_ in 1775.
3. Frederick W. Taylor developed \_\_\_\_\_ engineering in the last part of XIX Century.
4. The \_\_\_\_\_ connects Great Britain with Europe.
5. The \_\_\_\_\_ of food is one of the problems, man is facing now.

*3. Read the text and answer the questions:*

1. What was an engineering work of primitive man?
2. State some evidences of the first engineering works.
3. When did formal engineering appear?
4. Name some of the works Napoleon Bonaparte made to get his conquests.
5. What is the oldest engineering branch?
6. What was the origin of Mechanical Engineering?
7. What was the origin of Chemical Engineering?
8. How did Electrical Engineering appear?
9. What was Industrial Engineering based on?
10. Describe some of the latest engineering works.

*4. State some of the challenges of the engineering of tomorrow.*

5. *Prepare a short presentation about development of engineering in Russia.*

**My glossary:**

1. aqueduct - акведук, водопровод
2. sophisticated – сложный
3. rate processes – кинетический процесс
4. fluid mechanics – гидромеханика, гидравлика

**Unit 2**

***BUILDING TYPES***

1. *What building types do you know? Discuss in your group.*

2. *Read the text and compare your ideas with the information from the text.*

The world is very detailed and complex. Architecture develops types or categories of buildings. Your very own house fits into the category of housing, or residential or domestic buildings. The place you shop and buy things that you need are in the commercial typology. Where those things are made and stored fuels our economy. This type is industrial. Where you go to school or take classes is considered to be an educational facility. Where you see your doctor for a test or an operation is called a medical facility. Going out to eat at a restaurant or traveling and staying in hotels puts you in a hospitality building. Cities, states and countries are governed by politicians and leaders in governmental buildings. Places that are sacred where people gather to worship are called religious buildings. Governmental buildings and religious buildings are often central to cities, towns and villages. Of course, places to live and work also come together in the cluster. Places where people go to hear music, see art and experience plays are called cultural institutions. So many places to visit. So many building types to identify.

### 3. Read the text.

#### *Domestic Buildings*

Most of us live in houses. But our houses are probably different. All over the world people make houses. From the time of the cave dwellers, to the migrant populations, houses have provided shelter. Patterns of settlement are often formed around types of houses. Sizes of homes vary widely around the world as well. From small homes to palaces, domestic architecture creates patterns of urbanization and density. You might find it difficult to imagine how many people live in a house, an apartment building, a mid rise multi housing unit or a high rise housing building. Designers and developers learn to read a building for its building density. Houses are built on the water, underground, in the ground, on the ground and above ground! There are single family homes from small to large. Some single family homes are set on extensive grounds while others are jammed together in densely populated urban areas. Town homes often line both sides of a street and offer multi-story living. Duplexes, triplexes and quads offer housing for two families to four families. Low-rise apartment buildings are usually one to four stories tall. Mid-rise apartment or condominium buildings are four stories to eight stories or so. High rise are ten stories or taller. Can you imagine living on the 100th floor of a skyscraper?

#### *Industrial buildings*

Industrial buildings are buildings that build, produce and/or manufacture large to small scale products. Heavy industrial factories such as steel plants house large complexes that do large production of heavy objects, systems and materials. Light industry is businesses that manufacture, store or prepare for transport smaller items, systems and components.

### 4. Read the text and say the statements are true or false.

1. Houses have provided shelter.
2. Domestic architecture creates patterns of urbanization and density.
3. Houses are not built on the water, underground and in the ground.

4. Low-rise apartment buildings are usually one to seven stories tall.
5. Mid-rise apartment or condominium buildings are four stories to ten stories.
6. Industrial buildings are buildings that build, produce and/or manufacture large to small scale products.

5. *Speak about one building type in details.*

6. *Learn the difference between single-family homes, condos, and townhouses, and decide which is right for you.*

### *Single-Family Home*



Single-Family Home (often abbreviated as SFH) are homes built on a single lot, with no shared walls. Sometimes there's a garage, attached or detached.

<i>Pros</i>	<i>Cons</i>
<p>Single-family homes tend to offer more privacy and space than other types of homes, and frequently come with private front and back yards. Since you don't share the property with anyone else, you are free to express yourself with any type of</p>	<p>This home type generally requires a lot more maintenance, and all of the cost for that falls on the shoulders of the homeowner. With condos and townhomes, you share the costs involved with yard maintenance, plumbing, roofing and building</p>

home design you choose. You'll also have a more reliable resell value than condos and townhomes.	amenities.
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### *Condominium*

Condominiums (or condos for short) are single units within a larger building or community. Condos share a wall or two with other units, and generally come with homeowners' associations (HOAs), which require the residents to pay monthly or yearly dues. They are popular in urban, high-density areas, where there are many restaurants and shops.



<i>Pros</i>	<i>Cons</i>
There is minimal responsibility on the homeowner's part to contribute to maintenance and upkeep. For example, if the roof goes out, you share the costs with other residents instead of paying for the whole thing yourself. Additionally, some condos offer gyms, lounge areas, pools and	Condo homeowners' associations often limit the types of remodeling you can do, and there can be pet and rental restrictions as well. HOAs want uniformity and safety; you don't want one homeowner replacing doors and windows if they're not to a high standard, or safely installed! In

<p>other amenities that you might not be able to afford or have space for in a single-family home.</p>	<p>addition, because you share a space with others, there's not as much privacy, and you need to be extra cautious of disturbing your neighbors because they are so close.</p>
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### *Townhouse*

Townhouses are a hybrid between a condo and a single-family home. They are often multiple floors, with one or two shared walls, and some have a small yard space or rooftop deck. They're generally larger than a condo, but smaller than a single-family home.



<i>Pros</i>	<i>Cons</i>
<p>Townhomes often have more privacy than a condo might afford. Some have HOAs or joint maintenance agreements to share upkeep costs. They tend to be more affordable than a single-family home.</p>	<p>Townhomes don't usually have shared amenities like a gym or a pool, but they're not as private as a single-family home.</p>

## *My Glossary*

1. domestic – домашний, местный
2. hospitality – гостеприимство
3. cave – пещера
4. dweller – житель
5. pattern – модель
6. density – плотность
7. skyscraper – небоскрёб
8. low rise building – малоэтажное здание
9. mid rise building – здание средних размеров
10. high rise building – высотное здание
11. to offer – предлагать
12. privacy – конфиденциальность, приватность
13. maintenance – обслуживание
14. plumbing – водопровод, сантехника
15. roofing – кровля, кровельные работы
16. amenities – благоустройство, коммунальные удобства
17. upkeep – содержание в исправности; содержание

## UNIT 3

### *ELEMENTS OF CONSTRUCTION*

1. *What are the basic structural elements of a building?*
2. *Translate the words in bold.*

Architects must understand limitations of their medium. Without an understanding of **construction**, architects cannot understand a building's possibilities and limitations. There are several features that all buildings have in common. Among them are **foundations**, **roofs**, walls and **openings**.

Every building begins with a solid foundation. Most buildings have either a **slab-on-grade** or **pile-driven foundation**. From here, the **structure** of the building begins to take shape.

There are two main types of building structure. In **solid construction**, the walls **support** the building. In **framework construction**, a light **framework** holds the building together. This framework may be made of wood, metal, or even concrete.

Architects must know the difference between different types of walls. **Load bearing walls** are integral to the structures of the building. Architects must plan in advance for openings like doors and windows. Non-load bearing walls provide much greater design flexibility. **Curtain walls** are exterior non-load bearing walls. Curtain walls allow an immense range of creative freedom.

3. *Read the text. Choose the correct answers.*

1. What is the text mainly about?

- A. a comparison of construction elements from different eras
- B. the pros and cons of a particular type of construction
- C. an analysis of different construction materials
- D. an introduction to structural parts of a building

2. Which of the following does NOT support a building's weight?

- A. a curtain wall
- B. a pile-driven foundation
- C. a slab-on-grade
- D. a load bearing wall

3. According to the passage, what is true of framework construction?

- A. It is supported by load bearing walls.
- B. It can be constructed with multiple types of materials.
- C. It is generally built on a pile-driven foundation.
- D. It is not recommended when using curtain walls.

4. *Match the words and phrases (1-9) with the definitions (A-1).*

- |               |                           |
|---------------|---------------------------|
| 1. roof       | 6. construction           |
| 2. structure  | 7. framework              |
| 3. opening    | 8. solid construction     |
| 4. foundation | 9. framework construction |
| 5. support    |                           |

- A. to bear weight or prevent something from collapsing
- B. the base of a building that touches the ground
- C. a skeleton-like internal structural system
- D. a basic system that holds something together
- E. a building process in which the walls support weight
- F. the external protective structure at the top of a building
- G. a building process in which a skeleton-like structure supports weight
- H. the process of assembling a building
- I. an empty space that people or things can move through

*5. Read the text and then answer the questions below.*

**Foundations** are structures that transfer weights from walls and columns to the ground. There are two types of foundations: shallow foundations and deep foundations. Shallow foundations are usually embedded a metre into the soil, whereas deep foundations are embedded more in depth. They are recommended in case of very large design loads, a poor soil at shallow depth or site constraints, such as property lines. There are different types of deep foundations and they can be made of timber, steel and reinforced or pretensioned concrete. Geotechnical engineers design foundations to ensure that they have an adequate load capacity with limited settlement. When designing foundations, it is also important to consider scour (when flowing water removes supporting soil from around a foundation) and frost heave (when water in the ground freezes and forms ice lenses).

1. What are foundations? How many types of foundations are there?
2. What are the main features of shallow foundations?
3. What are the main features of deep foundations?
4. What do geotechnical engineers design?
5. What must be considered?
6. What are scour and heave?

6. Read the text and translate the words in bold.

**Walls.** Building walls support the superstructures of building (roofs and ceilings), separate space and give protection against intrusion and the weather. They usually have about **three** separate components: structural elements, insulation, finish elements or surface.

Walls can be loadbearing or non loadbearing depending on their providing **structural** support to the building or not. Exterior loadbearing walls carry ceiling, roof **or upper floor** loads to the foundation. Some bearing walls are inside buildings: they support **joists at mid span and** transfer loads down to the foundation.

Usually conventional house walls have an inner wooden **framework that may support** part of the house, but does not support wall coverings, windows **and doors**. **It contains electrical** wiring, plumbing insulation and other utilities.

7. Read the text and decide if the sentences below are true (T) or false (F).

- a. Walls can define and protect areas, support the superstructures of building and delineate a space.
- b. There are two kinds of structural walls.
- c. Exterior boundary walls give protection against intrusion and weather.
- d. Loadbearing walls can only be exterior walls.
- e. Conventional house walls contain electrical wiring and plumbing.

8. Read the text and translate the words in bold.



**Roofs.** Roofs can be divided in **cut roofs**, where a carpenter measures, cuts and places every length of wood needed for the frame; and **fixed roofs**, made of pre-built and assembled **trusses**. Trusses are **custom-designed** by computer so as to adapt to the typical weather conditions of the house. As they generally rest only on outside walls, they leave the inside free to *move* walls and to accommodate different room sizes.

When the frame of the roof is ready, a waterproof membrane is placed over it and it is held in place by battens (long pieces of wood) that are nailed into the truss and are the supporting system for the tiles. **Tiles** are then nailed to the wood. The top of the roof is finished off with ridge tiles that cover both sides of the roof's top row of tiles. Then the end of the wood at the bottom of the roof is covered by a fascia. The fascia allows air to flow safely through the membrane. To take away the water from the building, guttering is attached to the fascia. As heat can go straight out of the roof, insulation is also necessary.

When designing the roof structure it must be remembered that all the load on the roof has to be transferred to the supporting beams, bearing walls, building foundation and the earth.

9. Read the text and decide if the statements below are true (T) or false (F).

1. Trusses are designed to adapt to the typical weather conditions of the house.
2. Battens are long pieces of wood supporting the tiles.
3. The top of the roof is finished off with a waterproof membrane.
4. Then the end of the wood at the bottom of the roof is covered by the guttering.

10 Make a report about main construction elements.

11. Write about the house you live in details: describe construction elements and building materials of your house.

### **My Glossary:**

1. slab-on-grade foundation – ленточный фундамент
2. pile-driven foundation – свайный фундамент
3. solid construction – монолитная конструкция
4. framework construction – каркасная конструкция
5. load bearing wall – несущая стена
6. curtain wall - ненесущая (навесная) наружная стена, стена из лёгких навесных панелей
7. support weight – поддерживать вес
8. shallow foundations - фундамент мелкого заложения
9. deep foundations - фундамент глубокого заложения
10. embedded – вставленный, заделанный
11. scour – размыв, подмыв
12. frost heave - пучение (грунта) при замерзании
13. intrusion – внедрение, проникание
14. joist - несущая балка (перекрытия, настила, пола, крыши) 2) вспомогательная балка 3) брус; доска
15. pretensioned concrete - предварительно напряженный железобетон,
16. settlement – оседание (фундамента)

17. utilities – коммунальные услуги
18. carpenter – плотник, столяр
19. assembled truss – сборная ферма
20. custom-designed – изготовленный по заказу
21. batten – планка, вагонка
22. tile - кровельная черепица 2) керамическая облицовочная плитка; кафель
23. fascia - валик; поясок; карниз
24. guttering - кровельные желоба

## **Unit 4**

### ***HOUSE SYSTEMS***

1. *What house systems do you know? Discuss in your group.*
2. *Read the text.*

#### *Plumbing System*

The plumbing system, consisting of pipes and fixtures, concerns the distribution of tap water and the removal of waterborne waste in a building.

Plumbing installation must follow some regulations to ensure safe, quality construction.

Water systems of ancient times used pipes or channels made of clay, lead or stone. Today water supply systems use high pressure pumps and pipes made of non-toxic materials, such as copper, brass, steel, cast iron and plastic. The domestic hot water supply is provided by means of water heater appliances, or through district heating.

Used water and wastes are carried away by the drainage, waste and vent system.

3. *Read the text and answer the questions below.*

What does a plumbing system consist of?

What materials were used in water systems of ancient times?

What materials are used in water systems today?

4. *Read the text.*

## Electrical Systems

An electrical system includes the electrical service, lighting outlets and hard-wired appliances. The electrical service is usually between 100 and 200 amps. Electrical lines run from the street to a meter box (situated outside the house), then to the electric panel board which contains the switches to control the electricity in each room of the house. It is there that the amps are divided up across circuits to supply the different areas of the house with electricity. Electrical systems must follow a number of safety measures including, for example, circuit breakers, ground fault circuit interrupters and smoke alarms.

If you have specific needs, you can ask your electrician for advanced wiring systems, which may also include modern computer lines to help you work at home.

5. *Read the text and decide if the statements below are true (T) or false (F).*

- a. An electrical system and an electrical service are the same thing.
- b. A meter box should not be placed inside the house.
- c. There is an electric panel board in each room of the house.
- d. There are many circuits for supplying the different areas of the house with electricity.
- e. Modern computer lines can be installed by an electrician.

6. *Read the text about heating system in Russia and translate the words in bold.*

### ***Heating System in Russia***

Heating means providing consumers with heat energy by the **heat carrier**, including maintaining power to save the comfortable conditions for people. There are many different types of heating. Among them are: steam heating, electric heating, fire heating, air heating and infrared heating. The most common in the world today is water heating. And it is used as **district heating** (DH) in many countries, including Russia.

This kind of system has its own advantages and disadvantages. The advantages are the rather low temperature of **space heaters** (good conditions in the space). In

such system energy meters can be applied. Water heating systems are rather **durable** and the system is rather quiet because of water flow.

The disadvantages of water heating systems are very serious. Firstly, it is a big amount of metal in the system, which makes the whole system very expensive. Secondly, steel in these systems is **susceptible** to the corrosion, which causes frequent need for repairs. Thirdly, there is **high pressure** in the system, and in the event of an accident it can be dangerous for the people.

Russia ranks as the world's largest district heating nation, and work is under way to **upgrade** and modernize its huge heating system. With improved efficiency, district heating could enable a **sustainable energy future** for Russia.

District heating accounts for more than 70 percent of all heat distributed in Russia and ranks as the nation's single largest product market, worth an estimated 33 billion US dollars in annual sales. A majority of Russia's citizens live in houses and work in workplaces that depend on district heating. It is a huge industry, and one that is facing a lot of change in coming years.

District heating is a way to heat a town or part of a city. The heat is produced in a **power plant** and then transported through **pipes** to individual buildings in the form of hot water or steam. District heating is used mainly in places where the climate is relatively cold and population density high, such as in northern Europe.

No country is as dependent on district heating as Russia. Most of the heating network was, however, built during Soviet times and is now operating **with low efficiency** and a lot of **leakage**. Today the networks are in need of modernization **to improve efficiency and distribution**.

In some areas, this has already begun to happen. Investments in recent years have improved the situation, particularly in the big cities. Overall, about 30 percent of the system has been upgraded, mainly reflecting improvements made in major cities such as Moscow and St Petersburg.

## *7. Answer the questions.*

1. What does heating mean?

2. What does district heating mean?
3. What are advantages of district heating?
4. What are disadvantages of district heating?
5. What are the main problems of heating system in Russia?

8. *Prepare a report about a heating system of other countries.*

9. *Read the text and label the pictures with the words in bold from the text.*

### **Ventilation and Air Conditioning**

Ventilation - the exchange of indoor air with outdoor air - is important to reduce indoor moisture, odours, and other pollutants.

Contaminants such as volatile organic compounds, and radon (that may cause health problems) can accumulate in poorly ventilated homes. Excess moisture needs to be removed before high humidity levels lead to physical damage to the home.

There are three main types of ventilation:

- **Natural ventilation** which is uncontrolled air movement through cracks and small holes (infiltration) and through vents such as doors and windows. The disadvantage of this is that it is uncontrollable.
- **Spot ventilation** which means using localized fans in the rooms where contaminant substances are generated (for example kitchen extractor fans and bath fans).
- **Whole-house ventilation** is a system that works thanks to fan and duct systems to exhaust stale air and supply fresh air to the house. Whole-house ventilation systems are usually classified as exhaust ventilation when the air is forced out of the house, supply ventilation if it is forced inside and balanced ventilation if the same amount of air is forced inside and outside the house.



10. Read the text again and answer the questions

1. Why is ventilation important?
2. What happens if too much moisture is not removed from the inside of your home?
3. What is the disadvantage of natural ventilation?
4. What is spot ventilation?
5. How does whole-house ventilation work?

### My Glossary

1. pipe – труба
2. fixture – крепление, арматура, приспособление
3. pump – насос
4. brass – медь
5. cast iron – чугун
6. outlet – розетка
7. hard-wired – соединённый кабелем
8. hard-wired appliances – проводные устройства
9. meter box – счётчик
10. electric panel – панель с электрообогревом
11. circuit – электрическая цепь; циркуляция
12. safety measures – техника безопасности
13. circuit breakers - автоматический выключатель
14. smoke alarm - тревожная сигнализация о появлении дыма

15. wiring system - система (внутренней) электропроводки
16. moisture – влажность
17. odours – запах
18. pollutant / contaminant - загрязняющее вещество
19. crack – щель, трещина
20. spot ventilation - локальная вентиляция
21. duct system - система воздуховодов
22. exhaust ventilation - вытяжная вентиляция

## **Unit 5**

### ***TRADITIONAL BUILDING MATERIALS***

Building materials can be divided into two main groups: natural and man-made. Stone and timber are natural materials, used by man since ancient times. Man-made materials include bricks, cement, concrete, steel, glass, metal and more modern materials including plastic and synthetics.

*1. Read the text.*

#### ***Stone***

Stone walls are one of the oldest construction methods known to mankind. The first stone walls were made laying up stones without any mortar. With this method stones are held together by gravity. These walls are usually larger at the base. In Ireland and north-eastern UK counties this kind of wall was made by farmers to create fences. It was quite a long and labour-intensive method, but with no costs. When cement appeared, the first mortared stone walls were created, where cement paste fills the gaps between the stones. The first cements were made using burnt gypsum or lime, mixed with water.

Concrete includes Portland cement mixed with sand, gravel and water, which makes it resistant to cracking. To make it even more resistant, steel reinforcing bars can be added. Most stone walls today are made using this method, because it is fast and cheap.

2. *Read the text and match the two parts of the sentences*

1. The first stone walls were made
2. When cement appeared
3. The first cements were created using
4. Concrete is Portland cement
5. Steel reinforcing bars can be added

- a. burnt gypsum or lime, mixed with water.
- b. to make concrete even more resistant.
- c. the first mortared stone walls were created.
- d. without any mortar.
- e. mixed with sand, gravel and water.

3. *Read the text.*

### **Wood**

The two main categories of wood are:

- hardwood - usually from deciduous trees, which lose their leaves in autumn, although some hardwood (for example, tropical hardwood) comes from other types of tree;
- softwood - from coniferous trees, which remain green throughout the year.

In engineering, wood can be categorized as:

- solid wood - softwood or hardwood that has been sawn into specific shapes and sizes, but whose natural structure, consisting of grain and knots, remains intact;
- engineered wood - made by bonding (sticking together) layers of solid softwood or hardwood, or by mixing quantities of wood particles and bonding them with resin.

4. *Read the text and match the two parts to make correct sentences about wood.*

*In each case, there is more than one possible answer.*

1. Engineered wood
2. Softwood

### 3. Solid wood

- a. comes only from coniferous trees;
- b. comes only from deciduous trees;
- c. can come from either coniferous or deciduous trees;
- d. specifically describes single pieces of timber, not multiple pieces that have been bonded together;
- e. is always made from multiple pieces or particles.

### 5. *Read the text.*

#### ***Timber***

Timber framing and conventional wood framing are two different forms of construction. Timber framed structures use fewer, larger timbers with dimensions from 15 to 30 cm and mortice and tenon or wooden pegs as fastening methods, whereas conventional woodframed buildings have a greater number of timbers with dimensions from 5 to 25 cm, and nails or other mechanical fasteners are used to join the timbers. Today timber structures are often surrounded in manufactured panels, such as Structural Insulating Panels (SIPs). They are made up of two rigid wooden-based composite materials with a foamed insulating material inside. This method is used because these structures are easier to build and they provide more efficient heat insulation.

Timber-framed construction offers a lot of advantages. It is kind to the environment (when the wood used is taken from sustainable forests) and the frames can be put up quickly. Its design is elegant and simple, and also both practical and adaptable. It can give a house character, both inside and outside. Thanks to its strength, large open spaces can be created, something which is not so easy to obtain with other techniques. It is very versatile, so timber-framed houses can also be clad with stone or brick. This offers two more advantages: the house can blend in with the surrounding area (both urban and rural) and it is very energy-efficient. Timber is also cheaper than other materials.

6. *Read the text about timber framing and answer the questions.*

1. Do timber-framed structures use larger or smaller timbers compared to conventional wood framing?
2. Which fastening methods do the two different methods use?
3. What structures have been recently used? How are they made up?
4. What are the advantages of this method?

7. *Read the text.*

*The text is taken from a technical handbook about structural timber - wood intended to support loads in a structure.*

### ***Solid structural timber***

Generally, timber is cut to the required section - the width and depth that determine its crosssection - at a sawmill, where a range of section sizes are produced. Timber from sawmills is generally supplied in rough-sawn sections. This refers to the surface texture produced by sawing timber with a circular saw. If the timber needs to have a smooth finish - for example, because it will be visible in the structure - it can subsequently be planed to smooth its surface.

Because the strength of wood varies, structural timber must be stress-graded. This means its strength is tested in order to give it a stress grade - a standard strength value which an engineer can use for design calculations. Timber can be mechanically stress-graded, where its strength is checked by machine. It can also be visually stress-graded, where the wood is examined by an inspector who looks for potential weaknesses - in particular, the position of knots.

8. *Complete the sentences below using words and expressions from the text.*

1. Wood has a smooth finish after it has been ... .
2. Wood cut with a circular saw is called ... timber
3. After timber is tested for strengths and weaknesses, it is given a ... .
4. When timber is inspected by a person who looks for weaknesses, it is ...
5. When timber is inspected by a machine which tests its strength, it is.....

9. Read the text and then write the list of advantages and disadvantages offered by brick.

### ***Brick***



Masonry construction is a method that has been used for centuries around the world. It is usually used for walls of buildings, retaining walls and monuments. The most frequent type of masonry is brick, but concrete block is also becoming more and more popular. Brick was one of the first building materials that man used and has been used since the times of the ancient Egyptians because it offers a great number of advantages. First of all, it has an affordable price and it is made of accessible raw material, which has long durability and good insulating properties. It is a strong material and is perfect for load-bearing systems where the loads are compressive. It is the size of a man's hand and therefore simple to use.

The appearance of the final work depends on the ability and expertise of the bricklayer. Another advantage of using brick is that, like stone, it offers increased comfort in the heat of the summer and the cold of the winter. Being heat resistant, this material also offers good fire protection.

One of the disadvantages of using this material is that masonry must be built on a firm foundation to prevent settling and cracking, and in the presence of expansive soils the foundation may need to be elaborate. Moreover, this is a heavy material, consequently the structural requirements will have to be increased, especially if the area is subject to earthquakes.

<i>Advantages</i>	<i>Disadvantages</i>
Affordable prices	

10. Read the text.

### ***Cement and Concrete***

Cement is a key material in construction. It consists of a very fine powder. When water is added to cement, a chemical reaction occurs, and the cement begins to set - it starts to become solid. The most widely used cement-based material is concrete, which is made from cement, fine aggregate (sand), coarse aggregate (gravel) and water. After concrete has set, it needs time to reach its structural strength - the strength needed to perform effectively. Generally, engineers consider that this strength is reached after 28 days - a point called 28-day strength.

Concrete mix designs, which are specified by engineers, state the proportions of cement, fine aggregate and coarse aggregate to be used for specific structures. For example, a 1:2:4 (one – two - four) mix consists of one part cement, two parts fine aggregate and four parts coarse aggregate. For mixing precise quantities — known as batching - proportions are measured by weight. Mix designs also specify the water-cement ratio - the amount of water added relative to the amount of cement used. Excess water reduces the strength of concrete, so the quantity of water is kept to a minimum. But as drier concrete is more difficult to work with, an additive (added chemical substance) called a plasticizer is often used. This helps the concrete to flow more easily. Other additives can also be used - for example, a retarder may be added to delay setting, which gives workers more time to pour (place) the concrete.

11. Read the text, and then find words and expressions to match the descriptions.

1. gravel used in concrete
2. sand used in concrete
3. powder that enables concrete to set
4. mixing concrete accurately

5. specification of concrete ingredients
6. effective structural capability of concrete
7. affects the wetness and strength of concrete
8. different types of chemical put in concrete
9. allows concrete to stay wet for longer
10. makes drier concrete easier to work with

*12. Read the text.*

The most common type of cement is Portland cement, which is the basic ingredient of concrete and mortar. It is made of Portland cement clinker (calcium silicates, aluminium and other compounds) and other minor constituents. Portland cement clinker is produced by heating a mixture of raw materials up to 1450° C in a kiln.

There are three production stages:

- preparation of the raw mixture,
- production of clinker,
- preparation of concrete.

Limestone is the main raw material for the production of clinker, followed by sand, shale, iron ore, bauxite, fly ash and slag. About 2% gypsum is also added and then the mixture is pulverized. The resulting powder will react when water is added.

Portland cement is commonly used to produce concrete , which is made of gravel, sand, cement and water.

Blocks of cinder concrete, ordinary concrete and hollow tile are known as Concrete Masonry Units (CMU). They are larger than ordinary bricks and used for applications where appearance is not very important, such as in factory walls, garages and industrial buildings. One of the advantages of concrete blocks is that they can be reinforced, grouting the voids, inserting rebar or using grout, so that they are stronger than typical masonry walls.

13. Read the text and choose the best alternative.

1. Portland cement is the basic ingredient of *concrete/aluminium*.
2. The main raw material for the production of clinker is *brick/limestone*.
3. Portland cement is used to produce *gravel/concrete*.
4. Concrete Masonry Units are larger than ordinary *bricks/stones*.
5. Concrete blocks can be *reinforced/industrial*.
6. Reinforced concrete blocks are stronger than masonry *industries/walls*.

14. Match the words with their definitions.

- |              |   |
|--------------|---|
| 1. masonry   | a. a mixture of cement, sand, small stones and water                |
| 2. brick     | b. brick work   |
| 3. concrete  | c. white rock often used for making cement                          |
| 4. mortar    | d. a mixture of sand, water and cement or lime                      |
| 5. limestone | e. a reddish-brown rectangular block used to build walls and houses |

15. Read the text.

**Reinforced concrete (RC)** structures contain steel bars. Steel reinforcement is needed mainly because concrete is weak in tension - that is, bad at resisting stretching forces. As steel is strong in tension, reinforcing bars overcome this weakness.



In order to form the different parts of structures, formwork - sometimes also called shuttering - is used. This consists of moulds of the required size and shape, made from steel or timber, which are used to contain the concrete until it has set. When wet concrete is cast (placed) in its final position, it is called in-situ concrete. Instead of being cast in-situ, reinforced concrete elements can also be precast - cast at a factory - then delivered to the construction site ready for assembly. Sometimes,

precast concrete is also prestressed. With prestressing, tension is applied to the reinforcing bars, by machine, usually before the concrete is poured. The bars are then held in tension while wet concrete is poured around them. After the concrete has fully set, the bars become 'trapped' in tension. This increases the concrete's ability to resist bending forces.

*16. Read the text and answer the questions.*

1. What do reinforced concrete (RC) structures contain?
2. Why is steel reinforcement needed?
3. What is shuttering?
4. What does in-situ concrete mean?

*17. Divide into groups. Each group chooses one material from this unit (stone, wood, timber, brick, cement and concrete). Use your own words to describe it to the other groups.*

**My glossary:**

1. timber – строевой лес, древесина
2. mortar - известковый раствор; строительный раствор
3. gravity – гравитация, сила тяжести
4. labor-intensive – трудоемкий
5. lime – известь
6. concrete – бетон
7. Portland cement – портландцемент
8. gravel - гравий; галька, галечник
9. cracking - растрескивание, образование трещин
10. reinforcing bar - арматурный стержень
11. hardwood - твёрдая древесина
12. softwood - мягкая древесина
13. solid wood – плотная, цельная древесина
14. grain – текстура, волокно

15. knot - узел; узловая завязк
16. bonding - соединение, присоединение; связывание; крепление, прикрепление; сцепление
17. mortise - 1) паз; канавка; прорезь || прорезать паз или канавку 2) гнездо; отверстие; углубление для шипа || соединять шипом
18. tenon - выступ, шпоночный выступ; торцовая шпонка || соединять с помощью выступа и паза
19. peg - штифт; штырь; нагель; деревянный гвоздь || фиксировать штифтом; соединять штифтами
20. fastening - скрепление; крепление (напр. гвоздями, скобами, скрепами, клеем и т. п.)
21. Structural Insulating Panels – СИП-панель
22. versatile - универсальный; широкого назначения
23. rigid - жёсткий; негибкий; неподатливый
24. sawmill - лесопилка; лесопильный завод
25. batching - формирование партий; комплектование партий
26. sawing timber – пиломатериал
27. circular saw – дисковая пила
28. stress-graded – сортированный о прочности
29. to plane – строгать
30. masonry – каменная кладка
31. concrete block – бетонный блок
32. settling - оседание
33. fine powder – тонко измельченный порошок
34. fine aggregate – мелкий заполнитель
35. coarse aggregate – крупный заполнитель
36. plasticizer - пластификатор
37. retarder – замедлитель
38. cement clinker – цементный клинкер,
39. shale - глинистый сланец, сланцеватая глина

40. bauxite - боксит, алюминиевая руда
41. fly ash - летучая зола, зольная пыль, унос
42. slag – шлак
43. cinder concrete - шлаковый бетон
44. hollow tile - пустотелая плитка
45. Concrete Masonry Units – бетонный блок
46. to grout – заливать жидким раствором,
47. void - проем в перекрытии
48. rebar - арматурная сталь; арматурный пруток; арматурный профиль (для железобетона)
49. reinforced concrete – железобетон
50. reinforcement - усиление; упрочнение; армирование
51. shuttering - опалубка, перекрытие
52. cast – отливка, заготовка
53. in-situ concrete – монолитный бетон
54. precast - заводского изготовления; готовый
55. prestressing - создание предварительного напряжения (напр. в железобетоне)

## **Unit 6**

### ***MODERN BUILDING MATERIALS***

*1. Read the text.*

#### ***Steel***

Steel is resistant to corrosion, rusting and general deterioration. It can be used both for exterior as well as internal infrastructure. Compared to conventional concrete buildings, steel buildings offer a longer lifetime and they cause less harm to the environment thanks to the resistance and durability. Because steel buildings are usually pre-fabricated or made in sections and parts that are assembled on the construction site, they are cheaper than conventional buildings. The quantity of carbon contained in steel determines whether the alloy is hard or soft. Nowadays

steel buildings are often appreciated for their design. In fact, the flexibility of this material allows different forms and shapes. More than any other building material, steel has a high strength-to-weight ratio. This means that it is easy and cheap to span large distances elegantly eliminating columns. Thanks to this, it is easier to subdivide and customize office and warehouse space.

*2. Read the text and complete the sentences with words from the text.*

1. Steel can be used both for the exterior and the interior ... of a building.
2. Steel is ... to corrosion, rusting and general deterioration.
3. Steel buildings have a longer ... compared to conventional concrete buildings.
4. Steel buildings are usually ... than ... buildings.
5. It is easy and cheap to span large ... elegantly.
6. By eliminating ... , it is easier to subdivide and customise office and warehouse space.

*3. Read the text again and match the words to their definitions.*

1. Rusting
  2. Flexibility
  3. Alloy
  4. Deterioration
  5. Lifetime
  6. To customize
- a. a composite metal made by mixing other metals together
  - b. the period of time for which a building is expected to last
  - c. when a metal becomes reddish brown because of air and water
  - d. to change the appearance or characteristics of something according to someone's taste or needs
  - e. becoming worse in quality or condition
  - f. being bent easily without breaking

4. This extract from an article in an engineering journal is about different types of steel. Read the text.

Steel is the most widely used engineering material. Technically, though, this well-known alloy of iron and carbon is not as simple as one might think. Steel comes in a huge range of different grades, each with different characteristics. For the inexperienced, it can be difficult to know where to begin.

A good place to start is with the two main types of steel. The first, carbon steels, consist of iron and carbon, and contain no significant quantities of other metals. Carbon steels can be divided into three main grades:

-Mild steel - the most widely used grade - is a low carbon steel which contains up to approximately 0.3% carbon.

-Medium carbon steel contains between approximately 0.3% and 0.6% carbon.

-High carbon steel contains between approximately 0.6% and 1.4% carbon.

Note: The chemical symbol for iron = Fe, and carbon = C.

### ***Alloy steels***

The article goes on to look at alloy steels.

The second main category of steel is alloy steels, which consist of iron, carbon and one or more alloying metals. Specific grades of alloy steel include:

-low alloy steels, which contain 90% or more iron, and up to approximately 10% of alloying metals such as chromium, nickel, manganese, molybdenum and vanadium

-high strength low alloy steels (HSLA), which contain smaller quantities of the above metals (typically less than 2%)

-stainless steels, which contain

chromium as well as other metals - such as nickel - and which do not rust.

tool steels, which are extremely hard, and are used in cutting tools.

They contain tungsten and/or cobalt. A widely used grade of tool steel is high-



speed steel, which is used in cutting tools that operate at high temperatures, such as drill bits.

*Notes:* The terms carbon steel and alloy steel can cause confusion, as carbon steels are also alloys, and alloy steels also contain carbon.

The chemical symbol for chromium = Cr, cobalt = Co, nickel = Ni, manganese = Mn, molybdenum = Mo, tungsten = W, and vanadium = V.

5. *Decide whether the sentences below are true or false, and correct the false sentences.*

1. Steel is an alloy of iron and carbon.
2. Mild steel is a high carbon steel.
3. Alloy steels contain carbon.
4. Chromium and nickel are used as alloying metals in steel.
5. Low alloy steels contain more chromium than iron.
6. Stainless steel is an alloy steel.
7. Tungsten is added to steel to make it softer.

6. *Read the text and match each paragraph with the heading.*

### ***Glass and Metals***

**A.** Advantages and disadvantages of different kinds of metals

**B.** Transparent buildings: problems and possible solutions

**C.** An interesting experiment

1

Glass is a fashionable material in contemporary architecture. Transparent buildings and structures are very popular in contemporary architecture. Structural glass components such as columns and beams are often required, but this material seems structurally unsafe because of its brittleness. For this reason a new construction technique has been developed using:

- very long overlapping glass segments to create glass beams. These are made by bonding the segments adhesively;

- a small stainless steel profile that has been added to the layout of the glass beam to reinforce it.

2

To prove that glass structures can be as safe as reinforced concrete, an experimental transparent pavilion has been designed (with dimensions 9 x 9 x 3.6) that combines a number of innovative ideas. Many different kinds of glass and glass systems have been used. The outermost and the tripled-layered insulating glass units have been tempered and sometimes laminated and some glass has also been coated with solar control glass to reflect some of the unwanted sunshine outwards. In other cases glass can be heated electrically and glass panes free of iron oxide have been used to make the inside light more natural.

3

Painted, stainless, hot dip galvanized and weather resistant steel, as well as aluminium, have also been used for supporting structures. Aluminium has some advantages (it is light, resistant to corrosion and easy to work) but also some disadvantages (its thermal expansion and conductivity are high and it has low elastic modulus and fire resistance). Stainless steel also offers some advantages (it has good fire resistance and it is easy to keep) but its high price is a major disadvantage. Both hot dip galvanised and painted steel are not as expensive, but they are difficult to work on site and are not resistant to corrosion.

*7. Read the text again and decide if these statements are true (T) or false (F).*

1. Glass is very popular in contemporary architecture.
2. There is no way to create a glass structure that is as safe as reinforced concrete.
3. A transparent pavilion has been recently designed as an experiment that uses some innovative ideas.
4. There is only one type of glass in this pavilion.
5. Glass has also been used for supporting structures.
6. Hot dip galvanised steel is not resistant to corrosion.

8. Match the words with their definitions.

1. Outmost
  2. Stainless steel
  3. Galvanized
  4. Brittleness
  5. Pane
- a. A metal made from steel that does not rust
  - b. Fragility
  - c. External
  - d. Flat sheet of glass
  - e. Coated with zinc to protect it from rust

9. What do you know about non-ferrous metals? Read the text.

### ***Common non-ferrous engineering metals***

These website extracts look at the engineering applications of some non-ferrous metals - that is, metals that do not contain iron.

Aluminium is widely used, often in alloy forms. An example is duralumin, an alloy used in aircraft manufacturing, which also contains copper (4.4%) and magnesium (1.5%). Aluminium can also be alloyed with titanium to produce very strong, lightweight metals.

Copper is an excellent electrical conductor, which makes it ideal for use in electric wires. Good ductility also makes it suitable for pipes. Copper is widely used in alloys, notably brass (copper and zinc) and bronze (copper and tin, and sometimes lead).

Silver is a precious metal - a reference to its high cost. It is a better electrical conductor than any other material, so it is often used for electronic connections. Another precious metal - gold - is also an excellent conductor, and is highly corrosion-resistant.

10. Prepare a short report about non-ferrous metals: How are non-ferrous metals used in your industry? Or in industry you are familiar with?

11. Read the text.

### ***Plastic***

Plastic products offer a number of ecological advantages: they save resources, have a low maintenance cost and can be recycled. Furthermore they contribute to save energy (plastic foams are used for thermal insulation in many applications). Plastic is also useful for noise protection and insulation.

The main fields of application of these materials are pipes, insulation, wall covering, flooring (both in houses and in public areas) and, quite recently, window frames (made of PVC).

PVC stands for Polyvinyl Chloride and it is the plastic which has seen the most rapid growth in recent times in industry.

PVC is often used in piping systems because of its good chemical resistance to corrosive fluids. PVC pipes are used for a great number of applications: to drain waste, for natural gas distribution, for electrical and communications wiring, for municipal water.

As it is the newest primary construction material and entirely man-made, plastic is extremely versatile. Improvements made through research have increased its acceptance among designers, contractors and building code officials.

12. Read the text and choose the correct option.

- A. industry
- B .materials
- C .resources

1. Plastic insulation is also useful for ... protection.

- A recycled
- B resources
- C noise

2. PVC is the plastic whose use has grown more ...

A recently

B slowly

C primary

3. The ... fields of application of these materials are in flooring.

A alternative

B main

C useful

4. PVC has good ... resistance to corrosive fluids.

A physical

B public

C chemical

5. PVC pipes are used for ... gas distribution.

A natural

B chemical

C piping

*13. Read the text again and answer the questions.*

1. What are the advantages offered by plastic products?

2. How can plastic save energy?

3. What is plastic insulation useful for?

4. What are the main fields of application of plastic?

5. What does PVC stand for?

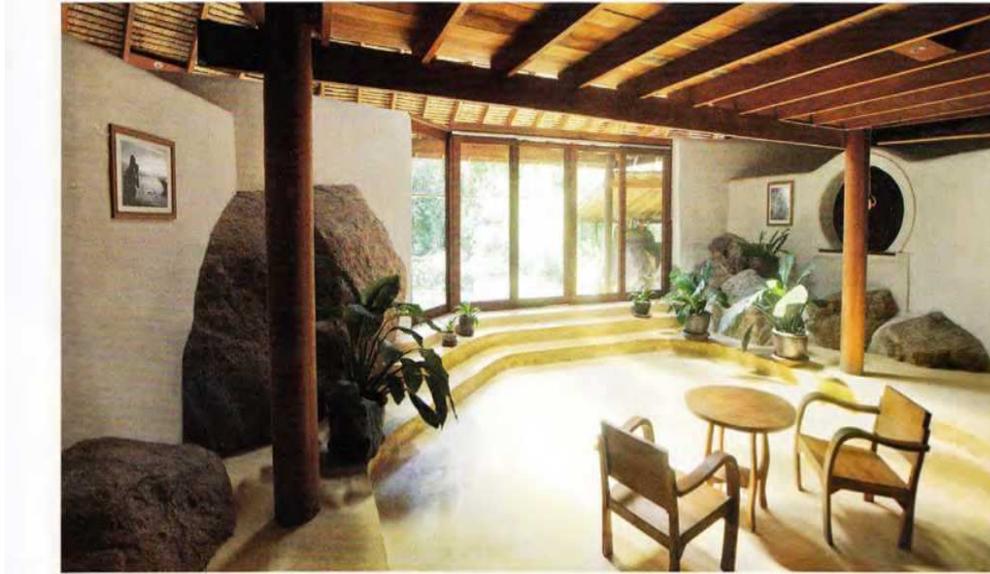
6. What are PVC pipes used for?

*14. Make a list of advantages and disadvantages of each material.*

	<i>Steel</i>	<i>Glass and Metals</i>	<i>Plastic</i>
Advantages			
Disadvantages			

15. Read the text.

### *Sustainable Materials*



Due to the rise in global population and prosperity over the last few decades, one of the consequences of this phenomenon has been the increase in volume and variety of the materials used (such as raw materials, food, manufactured products and waste) with a consequent increase in the transport distances. This has created a series of negative effects on the environment, especially different kinds of pollution, leading to an ecological emergency and growing preoccupation about health. This is why the aim of eco-design is to create buildings with low ecological impact, where people can live in a comfortable, healthy way.

This is possible by using building materials that are traditionally considered eco-friendly and sustainable: timber from forests that have been certified; quickly renewable plant materials (such as straw or bamboo); some typical traditional materials such as brick, stone, clay and cork; non-toxic, renewable and recyclable materials (natural paints, waxes and varnishes). Waste materials can also be reused as a resource for construction purposes.

16. Read the text and answer the questions below.

1. What has happened to population and wealth in the last few decades?
2. What has been one of the results of this?

3. What is the aim of eco-design?
4. Can you name some eco-friendly and sustainable materials you have found in the text?

*17. What is your opinion of modern building materials? Which would you use if you could build your own house?*

**My glossary:**

1. rusting – ржавчина
2. deterioration – разрушение
3. pre-fabricated - изготовленный заводским способом; сборный
4. carbon – углерод
5. alloy – сплав, примесь
6. strength-to-weight ratio - отношение предела прочности к массе
7. customize - изготавливать (напр. станок) по специальным требованиям заказчика, изготавливать (напр. станок) по специальным техническим требованиям
8. carbon steel - углеродистая сталь
9. mild steel - мягкая, малоуглеродистая сталь
10. low alloy – низко легированный сплав
11. molybdenum – молибден
12. vanadium – ванадий
13. tungsten – вольфрам
14. overlapping - перекрытие; совмещение; наложение
15. dip galvanized - горячее цинкование погружением (в расплав)
16. non-ferrous – не содержащий железа
17. brass - латунь, жёлтая медь
18. tin – олово
19. lead – свинец
20. straw – солома

## Unit 7

### ***DESIGN AND PLANNING***

#### *1. Read the text.*

##### *Sketch stage and working drawings*

Designing a project involves a number of vital stages: sketch design, design development and working drawing. During the design development stage all kinds of helpful information are gathered, so that materials and methods proposed for the project can be checked. The working drawing stage is the most demanding, because every project is unique as far as design and assembly of the parts are concerned. At this stage all the architectural drawings, schedules and specifications required for building consent are prepared. Sometimes all this material is also needed to get prices from builders. In some cases 2D or more commonly 3D formats are used to describe the building. The builders will need working drawings, consisting of plans; sections, elevations, details, schedules, specifications and other consultants' documents. During this stage all the architectural drawings are produced using the most recent computer design software, which is very similar to the software used by other consultants. This way all the information can be coordinated easily. It is important to make very precise drawings because they must conform to all the latest building standards, otherwise the council will not give building consent. Another reason is that this will help builders know as much information as possible, thus reducing their guesswork.

Engineering graphics are very important for engineers because it is the language with which they think and communicate. Years ago the AutoCAD replaced the old T-square and. more recently, the 3D parametric solid modeling software has been used to learn graphics.

#### *2. Read the text and decide if the statements below are true or false.*

- 1 . The first stage when designing a project is sketch design.
- 2 . The specifications necessary for obtaining building consent are drawn up during the working drawing phase.

3. Builders will never provide a price until they have these documents.
4. These documents help builders to work as accurately as possible.
5. Building consent to start work on building depends on the accuracy of these drawings.
6. AutoCAD is the latest form of software in this field.

3. *Find the synonyms of these words in the text.*

1. step
2. controlled
3. cost
4. technique
5. papers
6. newest
7. essential
8. estimation

4. *Read the text.*

### ***AutoCAD***

At the beginning of the 1980s Computer-Aided Design (CAD) programs drastically cut the needs of draftsmen. Today students in universities do not learn drafting techniques; they learn computer-aided design instead. But what exactly is CAD and what is it used for? CAD is software which allows the use of computer technology for the development of design and design documentation. It is used to design curves and figures in two-dimensional space or curves, surfaces and solids in 3D objects.

CAD has a great number of applications: automotive, shipbuilding and aerospace industries, industrial (in the design of tools and machinery and throughout the engineering process from conceptual design and layout of products) and architectural design (of all types of buildings), prosthetics and also computer animation for special effects in movies, advertising and technical manuals.

Moreover, it is used for the creation of photo simulations often required in the preparation of Environmental Impact Reports.

The objects and features created are adjustable and modern CAD can also allow rotations in 3D, so that the designed object can be viewed from any angle. Nowadays CAD systems exist for all the major platforms and no special hardware is required for most CAD software (except for some systems that do graphically and computationally- intensive tasks and require a modern graphics card). The human-machine interface is usually via a computer mouse or a pen and a digitizing or graphics tablet. The advantages of CAD are lower product development costs and a greatly shortened design cycle.



*5. Read the text and answer the questions.*

1. What does CAD stand for?
2. What is it exactly? What is it used for?
3. When did a drastic change in design take place?
4. What was the consequence of this change?
5. Can you name a few CAD applications?
6. Is there any need for special hardware if you use CAD?
7. Can you explain what the 'human machine interface' is?
8. What are the main advantages of this design program?

*5. Read the following text about planning. What is it? What do planners typically do?*

***Town Planning***

Planning is a balancing act between constructing modern communities and conserving our natural and built heritage to create sustainable places where people can live, work and play. It implies decisions about transport, facilities, the development of new shops, schools, dwellings, parks, etc. It supports our ongoing use of the environment.

Some of the things that planners do include:

- developing and creating affordable housing;
- regenerating socially-deprived areas;
- requalifying historic buildings;
- creating policies for managing the traffic and improving energy efficiency;
- discussing with communities about how to improve their quality of life.

6. *Read the text.*

### ***Master Plan***

A Master Plan is a document describing how a city is developed and how it can develop in the future. It is written by city planners and experts after examining the land.

Here is an example of the aims of a Master Plan:

- to create a structure for the best quality City Centre;
- to create the best possible environment for all users;
- to find key problem areas;
- to treat improvements as priorities;
- to create an attractive area for businesses;
- to develop existing resources.

Modern city planning is increasingly concerned with the social and economic aspects of city living.

The process of city planning usually involves a series of surveys and studies, development of a land-use and transportation plan, preparation of a budget, and the approval of a unified Master Plan by various agencies or legislative bodies. City planners have to tackle problems of traffic, pollution, security, fire and sanitation services, limitations and other regulations, and the problems of funding. In recent years planners have worked closely with community groups who wanted to take part in the planning of their own neighbourhood.

7. *Read the text and answer the questions below.*

1. Who writes a Master Plan?
2. What does it include?
3. What are its aims?
4. What does modern city planning include?
5. What problems do city planners have to tackle?
6. What are the trends in recent years?

8. *Find the synonyms of these words in the text.*

1. Specialist
2. Inspecting
3. Structured
4. Suggestions
5. Enhancements
6. Restrictions

9. *Read the text and explain the meaning of the word “scale”.*

### ***Drawing types and scales***

In engineering, most design information is shown on drawings. Today, drawings are generally not drawn by hand. They are produced on computer, using CAD (computer-aided design) systems.

A key factor on a drawing is the scale - that is, the size of items on the drawing in relation to their real size. When all the items on a drawing are shown relative to their real size, the drawing is drawn to scale, and can be called a scale drawing. An example of a scale is 1:10 (one to ten). At 1:10, an object with a length of 100 mm in real life would measure 10 mm on the drawing.

Most engineering designs consist of a set of drawings (a number of related drawings):

- General arrangement (GA) drawings show whole devices or structures, using a small scale. This means objects on the drawing are small, relative to their real size (for example, a 1:100 drawing of an entire building).

- Detail drawings show parts in detail, using a large scale, such as 1:5 or 1:2. Small parts are sometimes shown in a detail as actual size (1:1), or can be enlarged to bigger than actual size (for example, 2:1).

For electrical circuits, and pipe and duct networks, it is helpful to show designs in a simplified form. In this case, schematic drawings (often referred to as schematics) are used.

*10. Do you know anything about BIM technologies? Share your ideas about it with your group mates.*

*11. Read the text and compare your ideas with the information from it.*

BIM (Building Information Modeling) is a design technique applicable to new construction or reconstruction. It involves the creation of a three-dimensional parametric model with all networks and equipment, providing comprehensive information about the object under construction — the exact number of materials used, their prices and suppliers, terms of construction by stages etc. Engineering networks and connected equipment are assembled in the integrated model, which allows eliminating conflicts at networks setup and achieving accuracy even at the initial phase of designing.

In the process of architectural and construction designing, a computer model of a new building is created, providing overall information about the future object. BIM technologies allow visualizing the building's systems, calculating different variants of the layout from the point of view of environmental protection, and bringing them into compliance with norms and standards, as well as modeling and analyzing the operational characteristics of future buildings (heat loading, lighting, heat energy, etc.), and easing the choice of the optimal solutions.

To increase the efficiency of organizational and technological design, it is necessary to create adequate models that allow clearly and repeatedly modeling and testing organizational and technological processes in the course of the project development. BIM increases the efficiency of architects and designers work, shortens

the time spending on designing and altering the documentation, and providing projects with additional information.

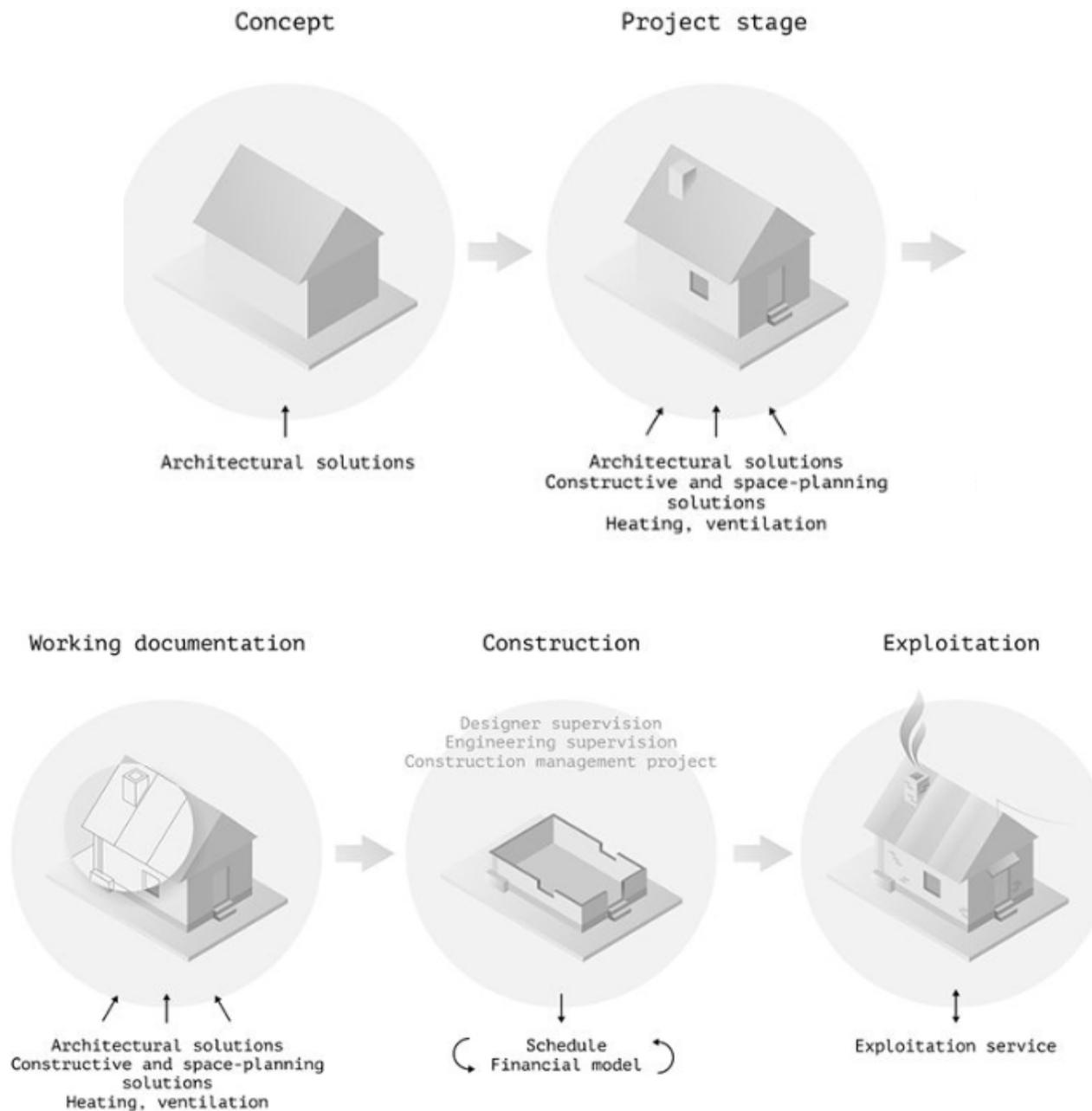
Since the digital model of the building is created from the first steps of work, it becomes possible to organize the team's operating processes where all specialists are involved to work together from the earliest stages of the project, when the costs of research and modification are minimal, and the results of such changes are most significant. Joint design becomes possible, which purpose is to achieve high quality and make the project cost-effective.

*12. Answer the questions.*

- a. What does BIM mean?
- b. What does BIM involve?
- c. What do BIM technologies allow to do?
- d. What are advantages of BIM technologies?

13. Describe the scheme of BIM technologies.

### BIM Model



### My glossary:

1. specifications - задание, технические требования
2. AutoCAD - программа [система проектирования] AutoCAD, система автоматизированного проектирования, САПР
3. draftsman – чертёжник, конструктор

4. scale – масштаб
5. general arrangement (GA) - компоновочный чертеж
6. three-dimensional – трёхмерный
7. supplier – поставщик
8. comprehensive – всесторонний, комплексный
9. eliminate – устранять
10. setup - настройка

## Unit 8

### ON THE BUILDING SITE

1. Match the following words for civil engineering tools and equipment with an appropriate image:

Construction crane  
Bulldozer  
Track excavator  
Back hoe

Dump truck  
Back hoe  
Wheel Loader  
Cement truck

Shovel  
Dredger  
Motor grader  
Road Roller

Earth Mover



2. Read the text and label the pictures with the words in bold in the text.



A **tower crane** is used to build tall buildings. Its short arm carries a counterweight of concrete blocks and its long arm carries lifting gear. The operator can sit in a cabin at the top of the tower just below the horizontal boom or control the crane by radio remote control from the ground. The lifting hook is controlled by a system of sheaves.

**Digging machines** are used for digging trenches for subterranean utility lines, storm sewers. etc. They use a vehicle (such as a front loader) and digging elements such as a bucket-style backhoe or a rotary digging one. The rotary digging instruments use a rotating structure that is rotated along an elongated path.

A **concrete mixer** (or cement mixer) mixes cement aggregate (such as cement or gravel) and water to form concrete. There are also portable concrete mixers for smaller volume work.

3. Read the text again and answer the questions.

1. What is a tower crane used for? How does it work?
2. Where can the operator sit?
3. What are digging machines used for?
4. What do the rotary digging instruments use?
5. What does a concrete mixer do?
6. What is usually used for smaller volume work?

4. Find the words in the text for the following definitions.

1. a person who is employed to operate or control a machine;
2. a curved device used for catching or holding things;
3. narrow holes which are dug into the ground;
4. longer and narrower than is normal;
5. small enough to be easily carried or moved.

5. Match the safety signs with their meaning.



1. Danger high voltage
2. Harmful or irritating substances
3. Inflammable substances
4. Mandatory safety helmet
5. Protective footwear required
6. No unauthorised entry

7. Protective gloves required
8. Suspended loads
9. Wear safety harness.

6. Read the text and answer the questions below.

The improvement of safety, health and working conditions depends upon governments, managers, supervisors and workers. Construction and maintenance of safety facilities, installation of safety signs, testing of lifting machinery, emergency and evacuation plans must all follow precise safety procedures. The aim of all this is to avoid accidents and ill health by eliminating potential dangers. The materials, equipment and tools on the site should also meet some safety standards. The main safety measures involve:

*Work platforms:* every work platform must be provided with safe access and have enough strength to bear the load placed on it. It must also be secured to avoid separation from the supporting structure to which it is attached.

*Scaffold stability:* scaffolds must be assembled with the vertical members plumb and be secured to a building if their height is over 3 times their minimum base dimension. Their bases must have bearing plates resting on a solid surface and strong enough to support their weight.

*Electrical hazards:* a scaffold must be grounded if it is situated near a high voltage source.

1. What do site safety procedures concern?
2. What should also meet some safety standards?
3. What is the main aim of these measures?
4. What must every work platform be provided with? Why must it also be secured?
5. How must scaffolds be assembled? What must their bases have?
6. When must a scaffold be grounded?

### ***My Glossary***

1. backhoe – экскаватор, обратная лопата

2. dump truck – самосвал
3. front loader / wheel loader – фронтальный погрузчик
4. cement truck – цементовоз
5. shovel - лопата, экскаватор
6. dredger – земснаряд
7. motor grader – автогрейдер
8. road roller – дорожный каток
9. earthmover - землеройная машина
- 10.counterweight – противовес; балласт
- 11.lifting gear - подъёмный механизм
- 12.boom – стрела
- 13.sheave – блок
- 14.trench – ров, котлован
- 15.subterranean utility lines – подземные коммуникации
- 16.storm sewer - ливнёвая канализация
- 17.suspended loads – подвешенные грузы
- 18.scaffold - строительные леса

## GRAMMAR REVISION

### *Active Voice*

<i>Tenses</i>	<i>Aux. verb</i>	<i>Past</i>	<i>Present</i>	<i>Future</i>
<b>Simple</b>	to do	Ques.& negative: did + infinitive without „to“	Ques.& negative: do, does + infinitive without „to“	will + infinitive without „to“
<b>Continuous</b>	to be	was, were + Ving	am, are, it +Ving	will be +Ving
<b>Perfect</b>	to have	had + past participle	have, has + past participle	will have + past participle
<b>Perfect Continuous</b>	to have been	had been + Ving	have been, has been + Ving	will have been +Ving

**Exercise 1.** *Use a proper Present Simple form of a main verb in brackets and put an adverb in a right place:*

1. You ..... to learn the skill if you want to create any sort of profitable website or blog. (**always, to have**)
2. A cousin keyword is essentially any term that ..... similar search results. (**to produce, usually**)
3. Phrases that ..... many of the same words or even the exact same words in a different order are the easiest cousin keywords to identify. (**to contain, occasionally**)
4. Although the term “lawnmower” ..... to term “landscaping”, this ..... that these two keywords are viewed as related to each other by a search engine. (**sometimes, to relate, not to mean**)
5. Knowing how to effectively target cousin keywords ..... the difference between an unsuccessful blogger and a big-time affiliate marketer. (**to make, often**)

**Exercise 2.** Use the Simple Past Tense for the verbs in brackets at the end of each sentence:

1. Two years ago, on 11 March 2011, in Japan the strongest earthquake accompanying by tsunami ..... (**happen**)
2. The tsunami ..... the accident at the Nuclear Power Plant Fukushima-1. (**cause**)
3. The accident at the NPP Fukushima-1 ..... immediately after the earthquake and tsunami. (**occur**)
4. On 18 March 2013 in the evening a new accident caused by failure of cooling systems of spent nuclear fuel pools of Units 1, 3, 4 .... . (**take place**)
5. On 19 March the company TEPCO .... to put into run the cooling system of Unit 1. (**manage**)
6. Following the accident at the Fukushima NPP on 11 March 2011, the European Union ..... the Implementing Regulation on 26 October 2012. (**approve**)

**Abbreviations:** IAEA – International Atomic Energy Agency

TEPCO –Tokyo Electric Power Company

NPP – Nuclear Power Plant

**Exercise 3.** Put verbs in brackets at the end of each sentence into correct tense:

1. Search Engine Optimization (SEO)..... to maximize profitable traffic from search engines to websites. (**to aim**)
2. Graduate students at Stanford University, Larry Page and Sergey Brin, .a mathematical algorithm for a search engine to rate the prominence of web pages. (**to develop**)
3. Page Rank.....the likelihood that a given page will be reached by a web user who randomly .....the web. (**to estimate, to surf**)
4. Page and Brin ..... Google using the developed algorithm for searching in 1998. (**to found**)
5. Google ..... immediately the growing number of Internet users due to its simple design. (**to attract**)

6. Many sites .... on exchanging, buying, and selling links, often on a massive scale. **(to focus)**
7. In 2007, Google ..... a campaign against paid links that transfer Page Rank. **(to announce)**
8. Adding relevant keywords to a web page meta data ..... to increase traffic to the page. **(to tend)**

**Exercise 4.** Make questions beginning with given expressions in **bold**:

1. The success and popularity of a search engine is determined by its ability to produce the most relevant results to any given search. **WHAT ... BY?**
2. Search engines with more complex ranking algorithms, taking into account additional factors have been evolved. **WHAT ALGORITHM ... WITH?**
3. The number calculated by the algorithm, has been named Page Rank after Larry Page. **WHO ... AFTER?**
4. In Google off-page factors as well as on-page factors are considered. **WHAT FACTORS ...?**
5. Webmasters had developed link building tools to influence search engine results. **WHAT TOOLS...?**
6. Google Instant, real-time-search, was introduced in late 2009 in an attempt to make search results more timely and relevant. **WHEN ...?**
7. Site administrators have spent months or even years optimizing a website to increase search rankings. **HOW MUCH TIME ...?**
8. A variety of methods can increase the prominence of a webpage within the search results. **CAN ...?**
9. Cross linking between pages of the same website or blog may improve its visibility. **MAY ...?**
10. Updating content keeping search engines crawling back frequently can give additional weight to a site. **CAN ...?**

### *Passive Voice*

TENSE	Past	Present	Future
Simple	was/were installed	am/are/is installed	will be installed
Continuous	was/were being installed	am/are/is being installed	
Perfect	had been installed	Have/has been installed	

**Exercise 5.** *Transform Active Voice sentences into Passive Voice sentences.*

Example: *ACTIVE:* High oil prices **impact** even China in 2011.

*PASSIVE:* Even China **was impacted** by high oil prices in 2011

1. In 2011 China alone **contributed** to 80% of the world growth of electricity consumption.
2. A sensory screen **enables** the control of the eReader functioning.
3. Immediately after the accident at the Fukushima plant the management **implemented** measures to stabilize situation.
4. The increase of the coal share for electricity production **caused** the growth of CO2 emissions in the G20 countries.
5. Enerdata, an independent Research & Consulting firm, **carried out** this analysis.
6. The Tolino Shine eBook reader **provides** a size of letters tuning.
7. In 2011 high oil prices **resulted** in a decrease of oil demand in European countries, the USA and Japan.

**Exercise 6.** *Rewrite the sentences below. Instead of using somebody/people/they write a passive sentence.*

1. Somebody composed the text using excerpts from the Enerdata press release of 30 May 2013 in Grenoble.
2. They elaborated the analysis of *the trends in energy demand, based on 2011 data for G20 countries.*

3. People observed strong alternations in using gas and coal in the USA and in Europe.
4. People characterized the world energy demand. In 2011 by bullish growing Chinese and Indian markets.
5. In the United Kingdom they increased the share of using coal for electricity production from 30% to 40%.
6. They built the Tolino Shine eReader within a partnership among three Germany's leading companies.
7. People control the eReader functioning through a sensory screen.

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