МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

ЦЕНТРАЛЬНОУКРАЇНСЬКИЙ НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ

КАФЕДРА ІНОЗЕМНИХ МОВ

Методичні рекомендації для студентів ЗВО всіх форм навчання

Англійська мова для студентів спеціальності «Будівництво та цивільна інженерія»

Частина 2

Затверджено на засіданні кафедри:

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Англійська мова для студентів спеціальності «Будівництво та цивільна інженерія» всіх форм навчання. Методичні рекомендації. Частина 2. /Укладач: Щербина С.В., доцент кафедри іноземних мов ЦНТУ. – Кропивницький, 2022. 3,5 ум. друк. арк. – 73 с.

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Методичні рекомендації призначені для вдосконалення вивчання англійської мови як мови професійного спрямування для студенів спеціальності будівництва та цивільної інженерії. Для ознайомлення та обговорення пропонуються тексти та завдання різного рівня складності. Структурно розробка складається з трьох частин.

До кожного тексту пропонуються запитання та завдання, які сприяють кращому розумінню обговорюваного матеріалу; вправи на переклад з української мови на англійську, що в комплексі з читанням, перекладом та обговоренням текстів сприяє розвиткові комунікативної мовленнєвої компетенції студентів та забезпечує діяльнісно-орієнтований підхід до вивчення іноземної мови.

Розробку рекомендовано для використання студентами денної, очної, заочної та дистанційної форм навчання.

TEXT № 13

METHODS OF CONSTRUCTING WALLS FOR BUILDINGS

Before-Reading

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

- What types of walls do you know?
- Is there a great difference between types of walls? Explain and try to prove your own point of view.

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

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

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

While-Reading

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

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

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

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

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

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

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

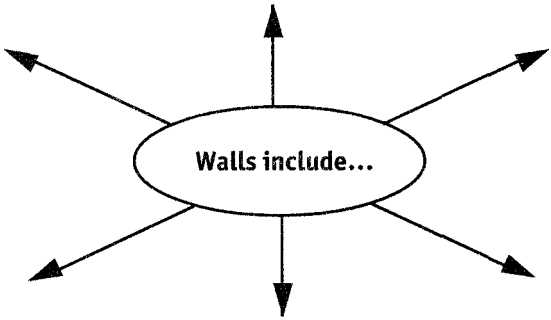
- What are exterior walls?
- Do walls often contain doors and windows, which provide for controlled passage of environmental factors and people through the wall line?
- When are wall planks and floor fixed?
- How are wall planks designed?
- What are two sizes of external doors?
- What are the lining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

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

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

• The external walls	• are designed to be weatherproof and to support the outer cladding.
• The steel frame	• are made of brick cladding wall planks, windows, door, heads and sills.
• The lining panels	• are closed in casings.
• The walls planks	• are capable of being removed to give access to the services.
• The stanchions	• is being erected.

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



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

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

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

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

After-Reading

Grammar focus

1. Write all the following nouns in plural:

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

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

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

external		
capable		
wide		
different		
hard		
internal		
electrical		
lining		
environmental		
skirting		

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

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

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

6. Translate from Ukrainian into English:

Стіни робляться різних форм і з різних матеріалів з метою виконати декілька функцій. У стінах є отвори — вікна і двері, які забезпечують контрольований прохід людей через кам'яну кладку.

Get talking

1. Make up a plan to the text.

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

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

TEXT № 14

MASONRY

Before-Reading

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

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

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

• brick	• зміцнення
• cement	• місце
• inner	• пруть
• metal tie	• внутрішній
• quality	• металевий зв'язок
• reinforcement	• цемент
• rod	• якість
• space	• виробляти
• standard	• товщина
• thickness	• цеглина
• veneer	• стандарт
• to manufacture	• пошкодження
• damage	• фанера

While-Reading

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

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

We have mentioned about some methods of constructing walls for buildings. All walls are made of different materials. For example, walls are made of brick. The brick walls are laid up with a space between separate vertical parallel walls and connected with occasional cross bricks or metal ties. This method provides «cavity walls.»

In areas of possible earthquake damage the «cavity» in brick work and the open cells in concrete units is reinforced with standard reinforcing rods and fully grouted with a soupy mixture of concrete. Normal spacing for vertical reinforcement is #4 at 24" with #4 at 48" horizontal fully, encased in grout up to 10" high. Reinforcement requirements should be shown on the drawings for other situations.

But it is a special part of building called masonry. Masonry is installed with cement mortar at bed and end joints, usually 3/8" or 1/2" thick. The masonry includes a stone or brick work and concrete units. The concrete units are laid in a similar manner, but obviously there is no open space between inner and outer shells. Each unit has an open core. The concrete units are used primarily as foundations, exterior or fire-separation walls. The brick and concrete units are manufactured in standard sizes. Though a stone may be any size, thickness, quality or color.

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

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

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

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

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

- This method provides "cavity rooms".
- In areas of possible earthquake damage the "cavity" in brick work.
- Masonry is installed with cement mortar at exit and end joints.
- Brick and concrete units are manufactured in substandard sizes.
- Masonry includes plastic work, brick, and others.
- Normal spacing for vertical reinforcement is #4 at 24".
- Concrete units are laid in a similar manner.
- Brick walls are laid up with a space between frames.

After-Reading

Grammar focus

1. Write all the following nouns in plural:

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

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

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

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

- Masonry includes stone work, brick and concrete units.
- Brick and concrete units are manufactured in standard sizes.
- Masonry is installed with cement mortar at bed and end joints.
- Reinforcement requirements should be shown on the drawings for other situations.
- Brick walls are laid up with a space between separate vertical parallel walls.

Get talking

1. Make up dialogues about:

a) What is masonry?

b) Why is it necessary to study a material about masonry?

The dialogues should last for about a minute and include between 10—20 phrases.

TEXT № 15

BRICKWORK

Before-Reading

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

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

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

• shade	• глина
• glaze	• зразок
• dump	• звалище
• ash	• праця
• lintel	• перемичка
• pattern	• глина
• installation	• підмостки
• labor	• зола
• scaffold	• установка
• pavement	• тротуар
• clay	• тінь

While-Reading

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

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

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

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

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

- What is a brick?
- When was the brick invented?

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

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

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

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

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

After-Reading

Grammar focus

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

Цегла буває різної форми, кольорів і розмірів. Цеглину використовують для кладки стенів, камінів і ін. Від вигляду цеглини залежить вартість будівельних робіт. При будівництві повинні витримуватися певні норми. Стіна, викладена хорошою цеглиною, стоїть довше.

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

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

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

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

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

Get talking

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

TEXT № 16

PANEL HEATING

Before-Reading

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

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

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

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

Maximum score – 8

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

to heat (нагрівати), ***to require*** (вимагати), ***emphasis*** (акцент), ***to contaminate*** (забруднювати), ***ambient air*** (навколишнє повітря), *rate* (норма), ***to obtain*** (отримати), ***evaporation*** (випар), ***moisture*** (вологість), ***fuel*** (паливо), ***to burn*** (гореть), ***pipe*** (труба), ***steam*** (пара).

While-Reading

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

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

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

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

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

There are two most common systems of heating: hot water and steam. There the fuel is burned in one place, from which steam, hot water or warm air is distributed to adjacent and remote spaces to be heated. Both systems are widely used nowadays. A hot-water system consists of the boilers and a system of pipes connected to

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

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

But, to do comfortable atmosphere is to use heating and ventilation together. Heating and ventilation are concerned with providing a required atmospheric environment within a space to produce a desired temperature for maintaining comfort, health or efficiency of the beings. Nowadays air-conditioning is closely related to both heating and ventilation.

3. ***Read the text again and speak about common system of heating.***

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

- What is a system of heating-hot?
- How does it work?
- How many boilers do in panel heating enter?
- Why is it necessary to design the pipes?
- Which system of heating is the most widely used?
- What systems of heating do you know?
- What returns to the boiler either by gravity or by a pump?
- Which method of introducing heat to rooms do you know?
- Which other sources for heating buildings do you know?
- What is a panel heating?

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

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

- ...factors must be considered...
- ...system of heating is the central heating...
- Insufficient attention was paid formerly...
- ..for heating buildings they include...
- Ceiling panels release the largest...
- A hot-water system consists...
- ...cooled water...
- There are two most...
- Besides masonry...

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

- By heating the external air of walls, ceiling or floor the rate of heat loss from the body is controlled.

- Panel heating is a room of introducing heat to rooms in which the emitting surfaces are usually completely concealed in the floor, walls, or ceiling.
- The proportion of heat disseminated by radiation and convection is also dependent to some extent upon panel-surface temperatures.
- There are ten most common systems of heating-hot water and steam.
- Heating and ventilation are two songs of engineering.
- The human being also gets heat by conduction (through his clothes).
- A cold-water system consists of the boilers and a system of pipes connected to radiators suitably located in rooms to be heated.
- The pipes, usually of steel or copper, feed hot water to radiators or convectors which give up their heat to the room.
- The steam gives down its heat to the radiators and the radiator to the room and the cooling of the steam condenses it to water.
- The air valve on each radiator is necessary for air to escape.

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

• Heating and ventilation are two	• is a method of introducing heat to branches of engineering rooms in which emitting surfaces are usually completely concealed in the floor, walls, or ceiling.
• Air-conditioning is closely related to	• which are very closely connected.
• There are two most common systems of heating:	• the boiler either by gravity or by a pump.
• A hot-water system consists of	• both heating and ventilation,

• Panel heating	• the boilers and a system of pipes connected to radiators suitably located in rooms to be heated.
• The steam is led to the radiators	• through or by means of steel or copper pipes.
• The condensate is returned to	• hot water and steam

After-Reading

Grammar focus

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

H__ing, v_nt_lation, atm_sp_eri_, _nv_ronm_nt, temp rat__e, _qui_ment,

D_strib_ti_n, r_di_tio_n, c_nve_ti_n, h__ting, _lim_te, _le_tri__ity, c_n__tor,

C_nd_ns_te, k_owle__e, _ontam__nat__n, ev_por__ti_n.

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

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

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

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

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

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

6. Translate from Ukrainian into English:

- Опалювання і вентиляція — дві зв'язані між собою галузі.
- Опалювання призначене для нагрівання повітря до певної температури.
- Вентиляція охолоджує і очищає повітря.
- У наш час існує два види систем опалювання.
- У містах широко застосовується система центрального опалювання.
- У кожному радіаторі знаходиться повітряний клапан для підтримки температури.

- Нагрівальні елементи приховані в підлозі, стінах або стелі.
- Стельові обігрівачі дають більше тепла, чим всі інші.
- Перед установкою обігрівача необхідно врахувати положення меблів в квартирі.
- Опалювальна система складається з казанів, труб і радіаторів в квартирах.

Get talking

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

2. ***Work in pairs. Discuss:***
   a) What is panel heating?
   b) Why is panel heating necessary?
   Your talks should include 20 phrases.

TEXT №17

HEAT TREATMENTS

Before-Reading

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

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

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

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

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

While-Reading

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

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

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

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

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

HEAT TREATMENTS

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

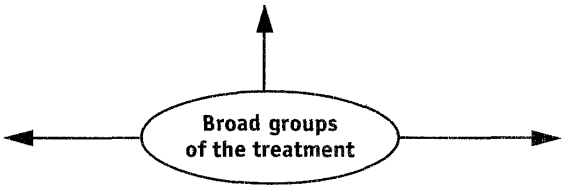
The treatment falls into three broad *(groups, parts):* annealing, quenching and tempering.

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

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

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

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



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

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

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

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

After-Reading

Grammar focus

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

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

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

internal		
	longer	
previous		
	less seveie	
	larger	
	faster	
brittle		
final		
	higher	
	lower	

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

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

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

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

Get talking

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

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

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

TEXT № 18

BUILDING MATERIALS

Before-Reading

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

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

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

Building materials (будівельні матеріали), ***loads*** (вантажі), ***building components*** (будівельні компоненти), ***Rod materials*** (матеріали з лозин), ***sheet material*** (листовий матеріал).

While-Reading

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

We have mentioned about building materials as one of the *components* of building. It is high time to tell about them. It is important for an engineer to know that all building materials are used in two basic ways. In the first way they are used to support the loads on a building and in the second way they are used to divide the space in a building. But it is more important to realize that building components are made from building materials. At the same

time the form of a component is related to the way in which it is used. We can see how this works by considering three different types of any construction:

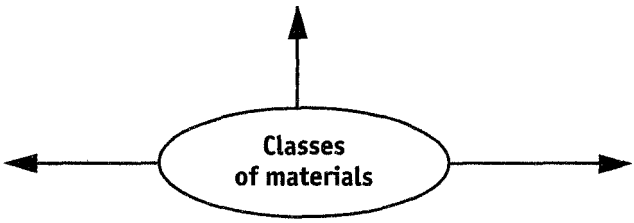
1. The first type of a construction is made of building materials such as a brick, a stone or concrete. They are called blocks. The blocks arc put together to form solid walls. These materials are heavy. They can support the structural loads because they have the property of high compressive strength. At the same time the walls made up of blocks support the building and divide the space in the building.

2. The second type of a construction is made of sheet materials. They are used to form walls which act as both space-dividers and structural support. Timber, concrete and some plastics can be made into large rigid sheets and fixed together to form a building. Such kind of buildings is lighter and faster to construct than a building made up of blocks.

3. The third type of a construction is made of rod materials. They can be used for structural support but not for dividing spaces. There timber, steel and concrete can be formed into rods. Usually rod materials are used as columns because of high tensile and compressive strength. On the other hand, they can be fixed together to form framed structures. The spaces between the rods can be filled with light sheet materials which act as space dividers but do not support structural loads.

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

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



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

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

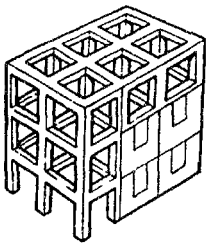
5. ***Copy and complete this table by putting ticks in the boxes to show the functions of the components:***

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

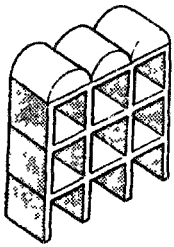
After-Reading

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

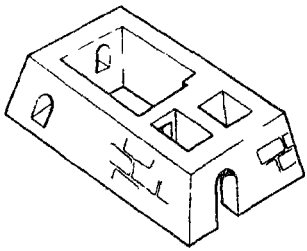
a) planar construction
b) frame construction
c) mass construction



Frame construction



Planar construction



Mass construction

Grammar focus

1. Complete the following words from the text:

B__lding, m_ter__1, str_ct_ral, c_nstr_c _ on, s__et, t_mb_r, c_nc__te, t_ns_le.

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

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

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

Get talking

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

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

Your talks should include 20 phrases.

TEXT №19

THE MOST IMPORTANT AND WIDELY USED BUILDING MATERIALS

Before-Reading

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

- What materials are used in building construction?

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

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

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

While-Reading

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

2. Read and translate about Portland cement.

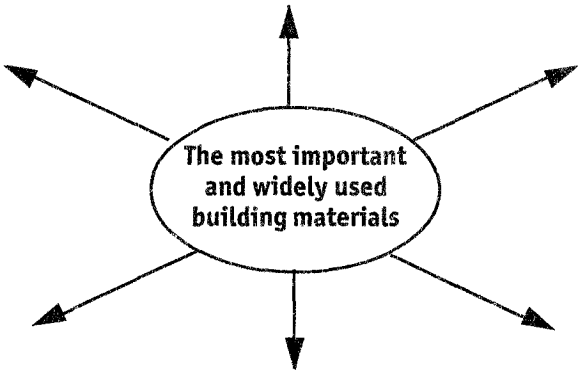
3. ***Find and translate all the sentences containing the following words:***

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

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

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

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



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

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

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

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

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

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

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

After-Reading

Grammar focus

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

a d__ign_r, a c_nst__ct_on, a r_su_t, a c_oi_e, an eng_ne_r,

a f_ct_r, a co_t, a p__po_e, a str_ctu__, an _mpr_vem_nt,

a q_alit_, an __ntr_duct__n, a r_te, a r__ctin, an a__lication,

a s_o_e, a d_vel_pme_t, a c_p_cit_, an ob_ec_,

an a_ten__ion, a m_th_d, a _ro_ortio_, a c_nstr_ction, a _olu_e,

a m_asure_ent, a wo__ab_li_y, a t_st, a __ief.

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

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

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

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

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

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

- These factors include availability, cost, physical properties of materials and others.
- Timber, steel and concrete all vary, sometimes over considerable ranges in the properties desired by the engineer.
- Lime, gypsum and cement are the three materials most widely used in building construction for the purpose of binding together masonry units, such as a stone, a brick.
- Cement is furthermore the most important component of concrete.
- Another important class of cement is high alumina cement.
- Portland blast-furnace cement has greater resistance to some forms of chemicals.

- The most important building materials may now be considered to be structural steel and concrete.
- The most accurate method of measuring proportions is to weigh the required quantities of each material.
- It is also widely used in large building construction.
- To be able to undergo high compressive loads is a specific characteristic of this material.

Get talking

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

2. Work in pairs. Discuss:
a) The most important and widely used building materials.
b) The most accurate method of measuring proportions.
Your talks should include 15—20 phrases.

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

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

TEXT № 20

THE CHOICE OF MATERIAL

Before-Reading

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

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

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

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

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

- mass production
- reinforced concrete elements
- compressive loads
- bending loads
- brittle
- розтягуюча напруга
- крихкий
- теплопровідність
- жорсткий
- смола

- thermal conductivity
- volume weight
- rigid
- wide application
- construction site
- mechanical properties

- стискуючі навантаження
- навантаження, що вигинають
- залізобетонні елементи
- приємний зовнішній вигляд
- широке вживання
- будівельний майданчик

While-Reading

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

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

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

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

Reinforced concrete is a building *(material, window)* in which the joint functions of concrete and steel are advantageously utilized. Being brittle, concrete cannot withstand pensile stresses, and it cannot therefore be *(used, cleaned)* in structures subjected to tensile stresses under load. But if steel is introduced into concrete it changes the property of the *(monolith, desk).* Like any other *(stone, light)* material, concrete offers a good resistance to compressive loads.

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

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

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

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

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

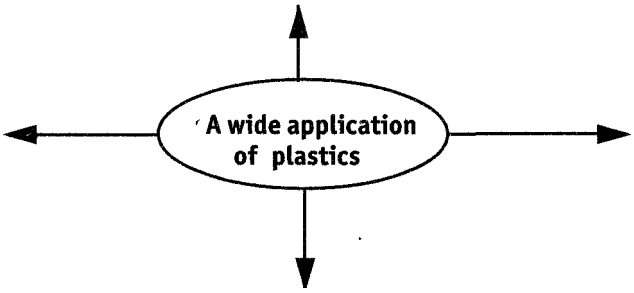
- The main characteristics of concrete.
- The chief principles of plastics classification.
- Factors that influence mass production of prefabricated large-side concrete and reinforced-concrete structural elements.
- New tendencies in the choice of building materials.
- The advantages of reinforced concrete.

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

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

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

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



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

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

After-Reading

Grammar focus

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

an advantage, a brick, a fact, a volume, a field, a conductivity, an industry, a temperature, a polymer, a load, a production,

a development, a concrete, a factor, a choice, a work, a function, an appearance, a steel.

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

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

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

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

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

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

Get talking

1. Make up a plan to the text.

2. Work in pairs. Discuss:

a) an application of two kinds of reinforced concrete.
b) Using bricks in construction.
Your talk should include 15—20 phrases.

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

TEXT №21

PROPERTIES OF MATERIALS

Before-Reading

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

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

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

• ensity	• вага
• weight	• кількість
• a volume	• об'єм
• an amount	• щільність
• stiffness	• жорсткість
• rigidity	• твердість
• a force	• сила
• strength	• міцність

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

density (щільність), ***weight*** (вага), ***volume*** (об'єм), ***stiffness*** (жорсткість), ***to yield strength*** (підтримувати опору), ***fracture*** (межа текучості), ***break*** (перелом, злам), ***ductility*** (ковкість),

brittle (крихкий), ***toughness*** (міцність), ***resistance*** (опір), ***crack*** (тріщина), ***creep resistance*** (стійкість до повзучості), ***gradual*** (поступовий), ***permanent*** (постійний), ***engine*** (двигун).

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

x	**s**	**t**	**i**	**f**	**n**	**e**	**s**	**s**	**i**
u	**d**	**e**	**f**	**o**	**r**	**m**	**s**	**t**	**d**
w	**i**	**z**	**u**	**r**	**o**	**o**	**a**	**r**	**g**
p	**e**	**e**	**r**	**c**	**w**	**z**	**y**	**l**	**e**
x	**i**	**s**	**t**	**e**	**e**	**1**	**o**	**g**	**h**
w	**y**	**o**	**o**	**l**	**l**	**a**	**z**	**l**	**g**
s	**s**	**e**	**n**	**h**	**g**	**u**	**o**	**t**	**n**
f	**r**	**a**	**c**	**t**	**u**	**г**	**e**	**h**	**c**

While-Reading

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

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

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

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

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

- Is density (specific weight) the amount of mass in a unit volume?
- Is it measured in kilograms per cubic meter?
- Is density important in any application where the material must not be heavy?
- Is stiffness (rigidity) a measure of the resistance to deformation such as stretching or bending?
- Is strength the force per unit area (stress) that a material can support without failing?
- Is toughness the resistance of a material to breaking when there is a crack in it?
- Is creep resistance the resistance to a gradual permanent change of shape?

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

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

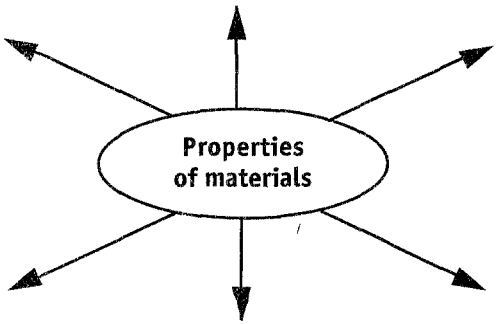
Strength is the *(force, column)* per unit area (stress) that a material can support without failing. The units are the same as those of stiffness, but in this case the *(deformation, local)* is irreversible. The yield strength is the *(stress, point)* at which a material first deforms plastically. For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

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

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

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

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



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

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

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

- Density (specific weight) is not the amount of mass in a unit volume.
- Aluminium alloys, with typical densities around 3000 kg/m^3 are considerably less dense than steels, which have typical densities around 7800 kg/m^3.
- Density is not important in any application where the material must not be heavy.
- The Young modulus is a measure of the resistance to simple stretching or compression.
- It is the ratio of the applied force per unit area (stress) to the fractional elastic deformation (strain).

- Strength is the force per unit area (stress) that a material can support without failing.
- Many materials have not a higher strength in compression than in tension. Ductility is the ability of a material to deform without breaking.
- Toughness is the resistance of a material to breaking when there is a crack in it.
- It is measured in a kilogram per cubic meter.

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

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

After-Reading

Grammar focus

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

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

- **Density** (specific weight) is the amount of mass in a unit volume.

- **Stiffness** (rigidity) is a measure of the resistance to deformation such as stretching or bending.
- **Toughness** is the resistance of a material to breaking when there is a crack in it.
- **Ductility** is the ability of a material to deform without breaking.
- **Strength** is the force per unit area (stress) that a material can support without failing.

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

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

Get talking

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

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

TEXT № 22

MANUFACTURED BUILDING MATERIALS

Before-Reading

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

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

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

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

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

a production of brick (виробництво цеглини), ***a timber technology*** (технологія обробки лісоматеріалу), ***an industrial method*** (промисловий метод), ***a small building*** (невелика будова), ***an innovation in building construction*** (інноваційний метод в будівництві), ***a production development*** (розвиток виробництва), ***a mechanical process*** (механічний процес).

While-Reading

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

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

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

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

Rapid development of timber technology was in the 19th century in North America. It was explained large softwood fir's forests and pine trees. There they were used as industrial methods. Steam- and water-powered sawmills began producing standard-dimension timbers in the 1820s. The production of cheap machine made nails in the 1830s. It provided other necessary ingredient — a balloon frame. That made possible a major innovation in building construction. The first example was a warehouse erected in Chicago in 1832 by George W. Snow. There was a great demand for small buildings of all types settled on North American continent. Light timber frame provided a quick, flexible, inexpensive solution to this problem. Heavy timbers and complex joinery were abandoned in the balloon

frame system. The building walls were framed with 5 x 10-centimetre (2x4-mch) vertical members. They were placed at 40 centimeters (16 inches) from the centre. This supplied a roof and floor joists, usually 5x25 centimeters (2x10 inches) and placed 40 centimeters (16 inches) apart and were capable of spanning up to six meters (20 feet).

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

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

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

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

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

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

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

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

- These were not mass-produced by a mechanical extrusion process in which clay was squeezed by "pressed" through a rectangular die as a continuous column and sliced to size by a wire cutter.
- There was also a proliferation of elaborately shaped and stamped masonry units.
- Timber technology underwent rapid development in the 20th century in North America, where there were large forests of softwood fir and pine trees that could be harvested and processed by industrial methods; steam- and water-powered sawmills began producing standard-dimension timbers in quantity in the 1920s.
- The production of cheap machine-made nails in the 1830s provided the other necessary ingredient that made possible a major innovation in building construction, the balloon frame; the first example is thought to be a warehouse erected in Chicago in 1832 by George W. Snow.

After-Reading

Grammar focus:

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

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

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

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

- The production of brick industrialized in the 19th century.
- These mass-produced by a mechanical extrusion process in which clay squeezed by "pressed" through a rectangular die as a continuous column and sliced to size by a wire cutter.

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

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

Get talking

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

TEXT № 23

ADVANCED COMPOSITE MATERIALS

Before-Reading

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

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

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

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

3. ***Match the following words withtheir Ukrainian equivalents:***

- clay
- straw
- a brick
- iron
- copper
- linoleum
- plasterboard

- солома
- залізо
- мідь
- пластмасовый аркуш
- глина
- цеглина
- лінолеум

- light-weight honeycomb structure
- metal powder
- plastic
- glass fibers
- superior quality

- легко-пориста структура
- скловолокно
- вища якість
- пластичний
- металевий порошок

While-Reading

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

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

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

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

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

During the 1930"s and 1940"s light-weight honeycomb structures, machine parts made from compressed metal powders and plastic

reinforced with glass fibers became commercial realities. These developments marked the beginning of the modern era of composite engineering materials. It was mentioned growing and using composite materials. The consumption of the fiber reinforced plastics, for example, has been increasing at the phenomenal rate of 25 per cent annually. Nevertheless, the emergence of a strict discipline and technology of composite materials is barely 20 years old.

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

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

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

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

- There are three major reasons for the current interest in composite material.
- Composite materials are among the oldest and newest of structural materials.
- Although the new composites are not usually more costly than conventional

- Materials, they can't be and more sparing, because of their superior qualities.
- Men discovered early that when two or more materials are used together as one.
- The combination often behaves better than each of the materials alone.
- These developments didn't mark the beginning of the modern era of composite.
- Engineering materials.

After-Reading

Grammar focus

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

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

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

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

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

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

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

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

Get talking

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

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

TEXT № 24

EFFICIENCY OF EASY METAL DESIGNS OF BUILDINGS

Before-Reading

1. Discuss the following:

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

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

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

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

While-Reading

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

2. Read the text and translate it.

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

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

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

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

placed. The design has no internal skeleton. Its durability is reached due to the certain orientation of fibers.

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

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

Every construction has its own advantages and disadvantages. Advantages of a fast metallic construction are obvious. A cost of a building from a metallic construction is 30–40% less, than on construction of a similar building, using traditional materials. Naturally, the given statement is correct only under condition of the certain identity of quality of external and internal furnishing. For example, the building constructed from the cheapest brick without additional external furnishing, will be cheaper than a construction from a fast metallic construction with a facade trimmed with dark glass. The essential economy, while using a metallic construction, is reached to decrease in expenses of a zero cycle approximately on 50%. Today a fast metallic construction is a leader among all building designs, first of all, because of its low price. On the other hand, it has the shortest terms of erection. The economy of time can become very significant and essentially important for any

customer. Besides the price and terms of assembly, fast metallic constructions have more important advantage. The matter is that a metallic construction is not only quickly gathered, but also can be disassembled fast and without special financial expenses.

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

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

- ...is very wide.
- A very important distinctive feature of fast...
- ...old-fashioned.
- The given statement...
- ...more important advantage...
- ...which are delivered to a building site...
- For example,...
- ...with the help bolt connections...
- All cultures...
- ...is a leader among all building designs...
- It is a high degree...
- In particular...
- ...as "sandwich".
- ...delivered to a building site.
- The economy of time...

After-Reading

Grammar focus

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

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

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

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

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

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

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

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

- Architecture, history, its, own, has.
- Today, is, fast, a, leader, all, construction, among, metallic, building, designs, a.

- Further, to, it, possible, facing, use, any, is.
- Advantages, Every, and, has, construction, own, its, disadvantages.
- It, metal, a, skeleton, is.

Get talking

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

2. ***Make up dialogues about:***

a) Advantages of fast metallic construction;
b) metal skeleton.

They should last for about a minute and include between 10-20 phrases.

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

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Англійська мова для студентів спеціальності
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