МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ЧЕРНІГІВСЬКИЙ НАЦІОНАЛЬНИЙ ТЕХНОЛОГІЧНИЙ УНІВЕРСИТЕТ

АНГЛІЙСЬКА МОВА В БУДІВНИЦТВІ ТА ЦИВІЛЬНІЙ ІНЖЕНЕРІЇ

МЕТОДИЧНІ ВКАЗІВКИ

для самостійної роботи
студентів денної форми навчання
спеціальності 192
“Будівництво та цивільна інженерія”
І частина

Обговорено і рекомендовано
на засіданні кафедри
іноземних мов професійного спрямування
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Англійська мова в будівництві та цивільній інженерії. Методичні вказівки для самостійної роботи студентів денної форми навчання спеціальності 192 «Будівництво та цивільна інженерія» І частина / Укл:. Пермінова В.А., Сікалюк А.І., Литвин С.В. – Чернігів : ЧНТУ, 2019. − 80 с.

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Зміст

Передмова

Методичні вказівки для самостійної роботи студентів денної форми навчання напряму підготовки 192 «Будівництво та цивільна інженерія» призначені для аудиторної та самостійної роботи студентів.

Метою методичних вказівок є підготовка студентів до застосування англійської мови в професійній сфері, що досягається за допомогою відповідних текстових і відеоматеріалів зі спеціально розробленою методикою. При цьому використовуються аутентичні матеріали і вправи, спрямовані на роботу над усіма видами мовленнєвої діяльності (читання, письмо, аудіювання і говоріння) в об'єктивних сучасних навчальних програмах з англійської мови для немовних вищих закладів освіти.

Методичні вказівки також містять додаток з читання з аутентичними текстами з тем, які вивчаються в основних розробках. В розділі представлені додаткові тексти без завдань, які можуть бути використані як для роботи в групі, так і для самостійної роботи студентів. Вони або розширюють інформацію з будівництва, або представляють нові проблеми в області будівництва.

Тексти, відео-фрагменти і візуальні матеріали методичних вказівок запозичені з сучасних журналів, довідників, Інтернет-ресурсів з будівництва і спрямованості на відтворення типових ситуацій. Текси актуальні, відповідають сучасним реаліям будівництва, що викликає і підтримує інтерес майбутніх спеціалістів.

Кожен розділ містить кілька тестів до текстів з системою попередніх і наступних вправ, задачі на укріплення вивченої лексики за спеціальностями, груповими творчими завданнями для розвитку навичок, відео-фрагментів і практик розвитку навичок аудиту і задач для активізації провідного матеріалу в письмовій формі.

Інтерактивні задачі, націлені на обговорення проблематики текстов, забезпечують розвиток комунікативної компетенції, необхідної в сучасних умовах, а також дозволяють студентам навчитися висловлювати думки англійською мовою, розуміти проблеми, давати аргументовану відповідь при аналізі інформації.

Лексичі вправи спрямовані на ознайомлення студентів з професійною лексикою. Активна лексика відбиває найважливіші поняття і явища, представлені в літературі зі спеціальності. Термінологічна лексика закреплена в різноманітних завданнях, які подані за принципом «від простого до складного» - від рівня слова, словосполучення, речення до рівня надфразової єдності.

Відео-сюжети монологічного і діалогічного характеру з мережі Інтернет безпосередньо пов'язані з темою занять. Контроль розуміння здійснюється за допомогою запитань-відповідей, шляхом заповнення таблиць / схем та ін. Мета завдань полягає в розумінні загального розуміння прослуховування тексту, наближення або виведення конкретної інформації, яка є основою для короткого викладу аудіотекста, дискусії по темі.

Методичні вказівки підготовлені з метою підготовки фахівців, здатних представити проекти англійською мовою на міжнародних конференціях, брати участь в дискусіях з професійної тематики, налагоджувати міжнародні зв’язки з іноземними партнерами.

Переважна частина методичних вказівок має формат міжнародних іспитів (FCE, CAE, IELTS), що дозволить студентам навчитися виконувати типові екзаменаційні завдання вже на базових заняттях з англійської мови у ВНЗ. Це відіграє певну роль при підготовці студентів до іспитів міжнародного формату, які користуються великим попитом в наш час.

CAREER IN CONSTRUCTION

Exercise 1. Discuss these questions with your groupmates.

1. What construction occupations in your country do you know?
2. What are some construction jobs that you think would be hard to get?
3. Are women suitable for construction occupations?
4. What are some questions that are frequently asked at a job interview for a construction position?
5. What do you think you will be responsible for as a civil engineer?
6. What do you like most about construction education?
7. What do you think would be the most interesting job (the most boring) in the construction industry?

Text A

Exercise 2. Match the words with their meanings.

1. Construction industry.	A. Кавліфікований.
2. To vary.	B. Відповідати за правові питання.
3. Tiersofcareers.	C. Ремесло.
4. Educationalbackground.	D головний тнженер проекту.
5. Common.	E. Навчання кандидатів специальності без видриву вид виробнийтва
6. Unskilled.	F. Середньокваліфікований
7. Semi-skilled.	G. Геодезист.
8. General site labourer.	H. Загальноприйнятій
9. Construction qualification.	I. Працівнік будивельного майданчика.
10. Skilled.	J. Керівнік будівельного майданчика
11. On-site manager.	K. Кваліфікація в будівельнійгалузі
12. Craft.	L. Професійно-техничний
13. Personnel.	M. Будівельна промісловість
14. Vocational.	N. Сходинки в карьєрі
15. “On the job” apprenticeship training.	O. некваліфікованій
16. To commence.	P. Змінюватісь
17. Civil engineer.	Q. Штат співробітникив
18. Building services engineer.	R. Инженер-будівельній
19. Project manager.	S. Починати

20. Quantity surveyor. T. Спеціальст з инженерного забезпечення
21. To hold more legal responsibility. U. Освіта

Exercise 3. Read and translate the text.

CONSTRUCTION CAREERS

There are many routes to different careers within the construction industry which vary by country. However, there are three main tiers of careers based on educational background which are common internationally:

unskilled and semi-skilled – general site labourers with little or no construction qualifications; skilled – on-site managers who possess extensive knowledge and experience in their craft or

profession; technical and management – personnel with the greatest educational qualifications, usually graduate degrees, trained to design, manage and instruct the construction process.

Fig. 1. Tiers of Careers in Construction

Skilled occupations in the UK require further education qualifications, often in vocational subject areas. These qualifications are either obtained directly after the completion of compulsory education or through “on the job” apprenticeship training. In the UK, 8500 construction-related apprenticeships were commenced in 2007.

Technical and specialized occupations require more training as greater technical knowledge is required. The professions, like a civil engineer, a building services engineer, a project manager, a quantity surveyor, a structural engineer and others hold more legal responsibility.

Exercise 4. Answer the questions.

1. Are construction careers the same in different countries?
2. What is the first tier of construction careers characterized by?
3. What is specific about the second tier of construction careers?
4. What is the third tier of construction careers based on?
5. How are further education qualifications obtained in Britain?
6. How many construction-related apprenticeships were commenced in Britain in 2007?
7. What professions require more legal responsibility?

Exercise 5. Complete the table. Use information in the text.

CAREER TIERS	**QUALIFICATION**
(1) …	little or no construction qualifications.
Skilled	**(2) …**
Technical and **(3) …**	**(4) …**
(5) …	hold more legal responsibility.

Exercise 6. Match the beginning of the sentence to its ending.

1. There are many routes to different careers within the construction industry…
2. Skilled occupations in the UK require…
3. Technical and specialized occupations require more training as greater…
4. In the UK, 8500…

5. The professions like a civil engineer, a building services engineer, a project manager, a quantity surveyor, a structural engineer and others…

A. further education qualifications, often in vocational subject areas.

B. hold more legal responsibility.

C. which vary by country.

D. further education qualifications, often in vocational subject areas.

E. construction-related apprenticeships were commenced in 2007.

Exercise 7. Translate from Russian into English.

1 Головний інженер проекту повинен мати спеціальну освіту згідно із загальними вимогами більшості будівельних організацій.

2. Існує безліч будівельних кваліфікацій, на які може претендувати як кваліфікований, так і середньокваліфікованої і некваліфікований працівник.

3. Які щаблі кар'єри проходить інженер-будівельник?

4. Геодезист - це фахівець, який не повинен відповідати за правові питання в будівництві.

5. Дуже важливо навчати штат співробітників спеціальності без відриву від виробництва.

6. Він почав свою будівельну кар'єру з будівельного майданчика.

Exercise 8.Group work to brainstorm vocabulary. Each student is going to have one of the following tasks:

Student A asks “Where do you work?” over and over again.

Student B gives a different answer each time.

Student C notes down each of student B‟s answers.

Then students C have to read out any answers they guess are wrong. The class can correct them.

Repeat the activity several times so that everybody has been an observer, a questioner and an answerer.

Text B

Exercise 10. Match the words with their definitions.

1) contractor; 9)to obtain;

2) sewer; 10) an order;

3) highway; 11) property;

4) carpentry; 12) partition;

5) plumbing; 13) to maintain;

6) to omit; 14) a glazier;

7) to subcontract; 15) insulation;

8) crew; 1 6) demolition.

1. To leave out, to drop.
2. A main road, especially one that connects towns or cities.
3. Someone whose job is fitting glass into windows and doors.
4. The act of deliberately destroying it, often in order to build something else in its place.
5. To get, to achieve.
6. A wall or screen that separates one part of a room from another.
7. A company pays other people to do part of their work for them.
8. Method, regularity, symmetry, regular arrangement, disposition.
9. A person or company that does work for other people or organizations.
10. Wealth, estate, goods, possessions, one's own, thing owned.
11. A thick layer of a substance that keeps something warm, especially a building.
12. To sustain, to support, to preserve, to keep.

13. The activity of making and repairing wooden things.

14. Company, band, crowd.

15. The work of fitting and repairing water pipes, baths.

16. A large underground channel that carries waste and rain water away, usually to a place where it is treated and made harmless.

Exercise 11. Give each group of words its correct heading from the list.

Electrical systems	Infrastructure	Types of construction work
Construction professions	Materials	

1. General contractor, trade contractors, architect, trade worker, brick masons, paperhangers, plasterers, roofers.

2. Sewers, roads, highways, bridges, tunnels.

3. Carpentry, painting, plumbing, electrical work, heating.

4. Brick, panels, concrete block, stone.

5. Lighting, climate control, security, communications.

Exercise 12. Read and translate the text.

OCCUPATIONS IN THE CONSTRUCTION INDUSTRY

The construction industry is divided into three major segments. The construction of buildings segment includes contractors called general contractors who build residential, industrial, commercial and other buildings. Heavy and civil engineering construction contractors build sewers, roads, highways, bridges, tunnels, and other projects related to infrastructure. Specialty trade contractors perform specialized activities related to all types of construction such as carpentry, painting, plumbing, and electrical work.

Construction is usually done or coordinated by general contractors who specialize in one type of construction such as residential or commercial buildings. They take full responsibility for the

complete job, except for specified portions of the work that may be omitted from the general contract. Although general contractors may do a portion of the work with their own crews, they

often subcontract most of the work to heavy **Fig. 2. The onsite work** construction or specialty trade contractors.

Specialty trade contractors usually do the work of only one trade, such as painting, carpentry, or electrical work, or two or more closely related trades, such as plumbing and heating. Beyond fitting their work to that of the other trades, specialty trade contractors have no responsibility for the structure as a whole. They obtain orders for their work from general contractors, architects, or property owners.

Construction trade workers are employed in a large variety of occupations that are involved in all aspects of the construction industry. **Brick masons** build and repair walls, floors, partitions and other structures with brick, panels, concrete blocks, stone and other masonry materials. **Carpenters** construct, erect, install, or repair structures made of wood, such as partitions, put in doors and windows, build stairs, and lay floors. **Electricians** install, connect, test, and maintain building electrical systems which can also include lighting, climate control, security, and communications. **Glaziers** are responsible for selecting, cutting, installing, replacing, and removing all types of glass. **Insulation workers** cover structures with insulating materials. **Painters** and **paperhangers** stain, varnish, and apply decorative coverings to walls and ceilings. **Plumbers** install, maintain, and repair many different types of pipe systems. They may also install heating and cooling equipment and mechanical control systems. **Plasterers** apply plaster, concrete, and similar materials to interior and exterior walls and ceilings. **Roofers** repair and install roofs made of tar or asphalt and gravel, rubber or thermoplastic, metal or shingles. **Reinforcing iron and metal workers** place and install iron and steel girders, columns, and other structural members to form completed structures or frameworks of buildings, bridges, and other structures. Lastly, **construction laborers** perform a wide range of physically demanding tasks at construction sites, such as excavation, waste removal, and demolition. Many construction trades workers perform their services with the assistance of helpers. These workers assist trade workers and perform duties requiring less skill.

First-line supervisors and **managers of construction** oversee trades workers and helpers and ensure that work is done well, safely, and according to the code. They plan the job and solve problems as they arise. Those with good organizational skills and exceptional supervisory abilities may advance to construction management occupations, including project managers, field managers or superintendents. These workers are responsible for getting a project completed on schedule by working with the architect‟ s plans, making sure that materials are delivered on time, assigning

work, overseeing craft supervisors, and ensuring that every phase of the project is completed properly. They also resolve problems and make sure that work proceeds without interruptions.

Exercise 13. Answer the questions.

1. What segments is the construction industry divided into?

2. What are the general contractors‟ responsibilities?

3. What is the difference between a general contractor and a specialty trade contractor?

4. What areas of the construction industry are construction trades workers employed in?

5. Who assists construction trades workers?

6. What are construction managers‟ duties?

7. Who is responsible for completing a project on schedule?

Exercise 14. Is it True or False?

1. The construction industry is divided into four major segments.

2. Heavy and civil engineering construction contractors build partitions, walls and floors.

3. Specialty trade contractors perform general activities related to all types of construction.

4. Contractors take full responsibility for the complete job.

5. Construction trade workers are involved in all aspects of the construction industry.

6. Construction laborers perform a wide range of intellectually demanding tasks at construction
sites.

7. Many construction trades workers perform their services with additional assistance.

8. First-line supervisors and managers ensure that work is done well, safely, and according to the code.

Exercise 15. What is the best heading for each paragraph?

§1…….

§2…….

§3…….

§4…….

§5…….

A. Management in construction.

B. Functions of general contractors.

C. Different types of contractors.

D. Various occupations in the construction industry.

E. Who are specialty trade contractors?

Exercise 16. Match the words with their definitions.

1 _ contractor; 5 _ laborer;

2 _ carpenter; 6 _ electrician;

3 _ foreman; 7 _ mason.

4 _ HVAC technician;

A. A person who uses physical strength and abilities to earn money.

B. A person skilled in installing and repairing heating, venting, and air conditioning systems.

C. A person who runs a company that is hired to build and repair a building.

D. A person who is trained to wire buildings and repair electrical problems.

E. A person who is trained to use wood to create buildings and other structures.

F. A person who builds structures with stone or brick.

G. The leader of a construction work crew.

Exercise 17. Choose the correct word and fill in the blanks.

roofer, semiskilled, painter, subcontractor, skilled, unskilled

1. The contractor hired a(n) _____ to install the HVAC system in the building.
2. An electrician is considered a(n) _____ professional.
3. Hire a(n) _____ to paint the exterior walls.
4. _____ workers usually have some training, but are paid less than highly-skilled workers.
5. The contractor used _____ workers to move building materials.
6. Call a(n) _____ to fix the damage to the roof.

Exercise 18. Complete the job interview by filling in the blank spaces.

A. Different companies.

B. Work experience.

C. In charge of.

D. A little bit of.

E. Any given day.

F. For example.

G. Supervise.

Fig.3. A Job Interview

Manager: It‟ s my pleasure. Could you tell me about your previous 1. _____ _____?

Applicant: Sure.I‟ ve actually done a 2. _____ _____ _____everything. Altogether I have about five years of experience as a foreman.

Manager: I see. And that was for 3. _____ _____?

Applicant: Yes. 4. _____ _____, I was a foreman at the site of the new office building on Grand Avenue. AUK Construction built in.

Manager: Ah, I know the one. How many workers did you 5. ____ there?

Applicant: I was 6. _____ _____ _____ most of the unskilled labourers. They were about twenty on 7._____ _____ _____.

Manager: That sounds like a lot to handle. What was your greatest challenge?

Applicant: Just making sure everyone was in the right place at the right time. You know, doing their jobs but also being safe.

Exercise 19. Act out the roles below. Use the following word-combinations:

I have ___ years of experience …

For example, …

What was your greatest challenge…

Student A: You are a construction company manager. Talk to Student B about: experience needed for a job; a specific job Student B has done; the biggest challenge at a previous job.	Student B: You are a job applicant. Talk to Student A about experience needed for a job.

Exercise 20. Go online at the “Construction Worker Salary” and answer the following questions.

http://money.usnews.com/careers/best-jobs/construction-worker/salary

1. What is the median salary of a construction worker?
2. What was the highest and the lowest pay earned in this profession in 2014?
3. What was the average salary?
4. What were the best paid metropolitan areas in the USA?
5. What was the highest paid construction profession?
6. Why do you think construction managers are so well-paid?
7. How much do construction workers earn in our city?

Text C

Exercise 21. Match the words with their meanings.

1. Military engineer. A. Скоротити витрати.
2. Coast defense system. B. долучитись.
3. Submarine mine system. C Гидравличний акумулятор.
4. Mortar. D. Чавунний циліндр.
5. Employment. E. Властивости бетону.
6. Property of concrete. F. Модуль крупності заповнювача.
7. Fineness modulus. G.Визначення співвідношення води та цементу
8. Definition of water-cement ratio. H. Плунжер.
9. Electric automotive brake. I. Сигнал, що спрацьовує при появі пішоходів
10. Traffic light. J. Коксова піч.
11. Pedestrian actuated signal. K. Підприємство.
12. Coke-fired furnace. L. Система підводних мін.
13. Enterprise. M. Розчин для цегельної кладкт.
14. To cut costs. N. Використання, задиіння.
15. To attach. O. Відомій, прославленный.
16. Hydraulic accumulator. P. Електричне автомобільне гальмо
17. Cast-iron cylinder. Q. Світлофор.

18. Plunger.	R. Важка вага.
19. Heavy weight.	S. Військовий инженер.
20. Illustrious.	T. Берегова оборонна система.

Exercise 22. Match the words. Then read the text and check your answers.

1) to stand;	a) operations;
2) seacoast;	b) engineer;
3) concrete;	c) after;
4) mining company;	d) arch;
5) coal-mining;	e)characteristics;
6) fellow;	f) executive;
7) sought;	g) tower;
8) triumphal;	h) out;
9) water.	i) mortar.

Exercise 23. Read and translate the text.

WORLD‟ S TOP TEN FAMOUS CIVIL ENGINEERS

Civil engineers are responsible for creating and designing bridges, buildings, roadways, and other pieces of infrastructure that are important within a society. There are some names that really stand out in this field. Continue reading to learn about ten famous civil engineers and what their inventions have brought to the world.

1. **Henry Larcom Abbot** – a military engineer, he served in the U.S. Army Engineers. He was responsible for creating the Army's Engineer School of Application and his influence can be seen in a lot of elements of the coast defense systems of the U.S., especially in the submarine mine system, and in the employment of seacoast mortars.

2. **Duff A. Abrams –** a researcher in the area of organization and properties of concrete, he was responsible for coming up with the necessary methods for testing concrete characteristics that we still use. President of the American Concrete

Association for a year, he discovered the concept of fineness modulus and the definition of water-cement ratio.

3. **Charles Adler –** Charles Adler was an American inventor and civil engineer. An inhabitant of Baltimore, he invented several signals, some we still use today. He got a patent on an electric automotive brake, discovered modern traffic lights, and invented the first pedestrian-actuated signal.

4. **Truman Heminway Aldrich –** a civil engineer, Truman Heminway Aldrich was a mining company executive, as well as a paleontologist. He investigated the existing coal-mining operations around the Cahaba coalfield and provided fuel for the first triumphant coke-fired furnace in the Birmingham District.

5. **Bernard Amadei –** a professor of civil engineering at the University of Colorado, Bernard is the creator of Engineers without Borders (U.S.) in addition to being the director of the MortensonCenter in Engineering for Developing Communities. Although it started out small, the Engineers without Borders organization now has more than 12,000 members in 225 chapters.

6. **Sir David Anderson –** a Scottish civil engineer and lawyer, he joined an enterprise with fellow engineers Basil Mott and David Hay and created the company Mott Hay and Anderson. He was ultimately elected President of the Institution of Civil Engineers.

7. **Othmar Hermann Ammann –** a Swiss-born American structural engineer, he designed the Bayonne Bridge, the Verrazano-Narrows Bridge, and the famous George Washington Bridge. He also designed more than half of the 11 bridges that attach New York City to the rest of the country. During the Depression, he was able to cut costs with his bridge projects while still keeping them safe and this made him very popular and sought after. As well as his work on bridges, he planned the construction and directed the building of the Lincoln Tunnel.

8. **Apollodorus of Damascus –** a Greek civil engineer, sculptor, designer, and architect, he constructed Trajan's Bridge over the Danube, designed the Forum Trajanum in Rome, designed the triumphal arches of Trajan at Beneventum and is credited as the architect of the Pantheon.

9. **William Armstrong –** Armstrong was in charge of creating the hydraulic accumulator. He often built tall water towers when water pressure wasn‟ t available. He created the hydraulic accumulator with a plunger that supported a heavy weight.

10. **Dr. John Job Crew Bradfield –** Bradfield was a well-known Australian engineer who is

most famous for designing the Sydney Harbour Bridge, one of Australia‟ s most illustrious symbols.

Exercise 24. Answer the questions.

1. Where did Henry Larcom Abbot serve?
2. What was he responsible for?
3. What did Duff A. Abrams discover?
4. What did Charles Adler discover? What patent did he get?
5. What is Truman Heminway Aldrich famous for?
6. What positions did Bernard Amadei have?
7. What did Sir David Anderson create?
8. What did Othmar Hermann Ammann design? What other achievements did he have?
9. Who is credited as an architect of Parthenon?
10. What was William Armstrong in charge for?
11. What was Dr. John Job Crew Bradfield famous for?

Exercise 25. Put the words in the correct order to make complete sentences.

1. Army / U.S. / served/ in/ / he / Engineers/ the
2. concept/ discovered / definition/ the/ he/ water-cement/ fineness/ of/ modulus/ of/ and/ the/ ratio
3. brake / he/ automotive/ got/ patent/ electric/ an/ a/ on
4. cut / his/ costs/ able/ he / to / was / with / bridge / projects
5. the / charge / creating / was / in / of / accumulator / Armstrong / hydraulic

Exercise 26. Translate the following word-combinations. The text above will help you.

1. Дизайн і конструювання мостів.
2. Важливий для суспільства.
3. Бути видатним в певній сфері.

4. Його вплив можна побачити.
5. Дослідник.
6. Поняття.
7. Житель Балтімора.
8. Винаходити.
9. Працівник компанії з виробництва хв.
10. Беззастережно.
11. Зберігати.

Exercise 27. Make 13 sentences using the word-combinations above.

Exercise 28. Watch the video 1.1 and answer the questions. Translate the words in *italics* before listening.

CAREERS IN CONSTRUCTION:
https://www.youtube.com/watch?v=xTiqFF9MjLA

rewarding backgrounds to earn a good living to secure the future artistic „craft" career hands-on skills

1. What opportunities does the construction career provide for any person?
2. What do the craftsmen enjoy about doing their work?
3. Who are technicians according to the video?
4. How long has the site manager been working? What career is he going to get in ten years" time?
5. What does the surveyor do according to the speaker?
6. What is the most satisfying part of the job according to the words of a town planner?

Exercise 29. Go online at the "National Careers Service" and choose one of the job profiles you like and make a three-minute presentation about your preferable occupation.

https://nationalcareersservice.direct.gov.uk/advice/planning/jobfamily/Pages/construction.aspx

Exercise 30. Look at this career path chart. Discuss these career stages with your partner. Report your ideas to the group.

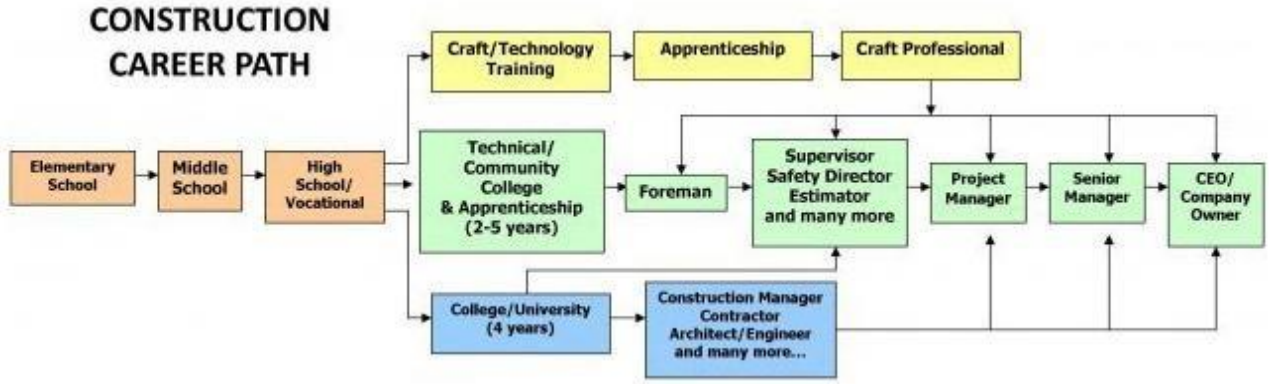


Fig. 4. Construction Career Path

Exercise 31. Look at these pictures of different construction workers. Make a list of advantages and disadvantages of these work positions.

Fig. 5. A steel fixer wears protective gloves while handling a coil of rebar, which will be embedded in a reinforced concrete column to strengthen it.

Fig. 6. Ironworkers are erecting the steel frame of a new building at the Massachusetts General Hospital in the United States.

UNIT 2

PLANNING, SURVEYING, AND EXCAVATION

Text A

Exercise 1.Match the words with their meanings.

1.	Construction planning.	A. Контроль витрат.
2.	Challenging activity.	B. витрати споживання.
3.	Estimation.	C. спостережуваний.
4.	Sub-contractors.	D. Орієнтований на вартість.
5.	To synthesize.	E. вимір.
6.	Generation of activities.	F. важка та цікава діяльність.
7.	Analysis of implication.	G. супутні витрати.
8.	Observable.	H оптімально мінімізоване виробниче планування
9.	Cost control.	I. Управління за календарним графіком
10.	Schedule control.	J. Синтезувати.
11.	Cost oriented.	K. Першочерговість.
12.	Expense oriented.	L. Планування в будівніцтві
13.	Expenditure.	M. Аналиіз застосуванн.
14.	Performance of a project.	N. Результативність проекту.
15.	Associated costs.	O. Оцінка.
16.	Precedence.	P. Орієнтованій на витрати.
17.	To prevail.	Q. Напрацювання плану дій.
18.	Critical path scheduling.	R. Переважати.
19.	Job shop scheduling.	S. Суб-підрядники.
20.	Dimension.	T. Складаня плану з використанням методу критичного шляху.

Exercise 2. Read and translate the text.

CONSTRUCTION PLANNING

Construction planning is a fundamental and challenging activity in the management and execution of construction projects. It involves the choice of technology, the definition of work tasks, the estimation of the required resources and durations for individual tasks, and the identification of any interactions among the different work tasks. A good construction plan is the basis for developing the budget and the schedule for work. Developing the construction plan is a critical task in the

management of construction, even if the plan is not written or otherwise formally recorded. In addition to these technical aspects of construction planning, it may also be necessary to make organizational decisions about the relationships between project participants and even which organizations to include in a project. For example, the extent to which sub-contractors will be used on a project is often determined during construction planning.

Forming a construction plan is a highly challenging task. As Sherlock Holmes noted: "Most people, if you describe a train of events to them, will tell you what the result would be. They can put those events together in their minds, and argue from them that something will come to pass. There are few people, however, who, if you told them a result, would be able to evolve from their own inner consciousness what the steps were which led up to that result. This power is what I mean when I talk of reasoning backward".

Like a detective, a planner begins with a result (i.e. a facility design) and must synthesize the steps required to yield this result. Essential aspects of construction planning include the *generation* of required activities, *analysis* of the implications of these activities, and *choice* among the various alternative means of performing activities. In contrast to a detective discovering a single train of events, however, construction planners also face the normative problem of choosing the best among numerous alternative plans. Moreover, a detective is faced with an observable result, whereas a planner must imagine the final facility as described in the plans and specifications.

In developing a construction plan, it is common to adopt a primary emphasis on either cost control or on schedule control. Some projects are primarily divided into expense categories with associated costs. In these cases, construction planning is cost or expense oriented. Within the categories of expenditure, a distinction is made between costs incurred directly in the performance of an activity and indirectly for the accomplishment of the project. For example, borrowing expenses for project financing and overhead items are commonly treated as indirect costs. For other projects, scheduling of work activities over time is critical and is emphasized in the planning process. In this case, the planner insures that the proper precedences among activities are maintained and that efficient scheduling of the available resources prevails. Traditional scheduling procedures emphasize the maintenance of task precedences (resulting in *critical path scheduling* procedures) or efficient use of resources over time (resulting in *job shop scheduling* procedures). Finally, most complex projects require consideration of both cost and scheduling over time, so that planning, monitoring and record keeping must consider both dimensions. In these cases, the integration of schedule and budget information is a major concern.

Exercise 3. Answer the questions.

1. Why is construction planning challenging and fundamental?
2. What does developing of a construction project involve?
3. What organizational decisions about the relationships between project participants should be made?
4. What is Sherlock Holmes‟ s famous note that can be referred to construction planning?
5. What does a planner begin with?
6. What are essential aspects of construction planning?
7. What are common features and differences between a detective and construction planner?
8. What are two different types of construction planning?
9. Why is scheduling of work activities critical?

Exercise 4. Translate the following word-combinations using the text. Make sentences.

Виконання будівельних планів, вибір технології, тривалість виконання завдань, формування бюджету, приймати організаційні рішення, взаємини між учасниками проекту, чекати результат, видимий результат, спочатку діляться на, превалювати, важливий, наголошувати, вимагати розгляду, важливе завдання.

Exercise 5. Complete the sentences by changing the words in capitals to the CORRECT FORM (noun, adjective, verb).

1. A good construction plan is the basis for ……. the budget and the schedule for work. DEVELOP
2. In addition to these technical aspects of construction planning, it may also be necessary to make

…… decisions about the relationships between project participants. ORGANIZE

3. Moreover, a detective is faced with an observable result, whereas a planner must imagine the final facility as described in the plans and specifications. OBSERVE
4. Traditional scheduling procedures emphasize the ……. of task precedences. MAINTAIN

5. Within the categories of expenditure, a distinction is made between costs ……. directly in the performance of an activity and indirectly for the accomplishment of the project. INCUR

Exercise 6. Complete the text using the words from the box.

Feasibility	Output	Commitment	Time-cost
Decomposition	Monitoring	Estimate	Ingenuity
Details	Guidance	Hierarchical planning	Site
Possible	Profit	Validity	

The development of a construction plan is very much analogous to the development of a good facility design. The planner must weigh the costs and reliability of different options while at the same time insuring technical (1)…….. . Construction planning is more difficult in some ways since the building process is dynamic as the (2)…… and the physical facility change over time as construction proceeds. On the other hand, construction operations tend to be fairly standard from one project to another, whereas structural or foundation (3)…… might differ considerably from one facility to another.

Forming a good construction plan is an exceptionally challenging problem. There are numerous (4)…….. plans available for any given project. While past experience is a good guide to construction planning, each project is likely to have special problems or opportunities that may require considerable (5)…….. and creativity to overcome or exploit. Unfortunately, it is quite difficult to provide direct (6)……. concerning general procedures or strategies to form good plans in all circumstances. There are some recommendations that can be addressed to describe the *characteristics* of good plans, but this does not necessarily tell a planner how to discover a good plan. However, as in the design process, strategies of (7)……. in which planning is divided into subproblems and (8)……. in which general activities are repeatably subdivided into more specific tasks can be readily adopted in many cases.

From the standpoint of *construction contractors* or the construction divisions of large firms, the planning process for construction projects consists of three stages that take place between the moment in which a planner starts the plan for the construction of a facility to the moment in which the evaluation of the final (9)…….. of the construction process is finished.

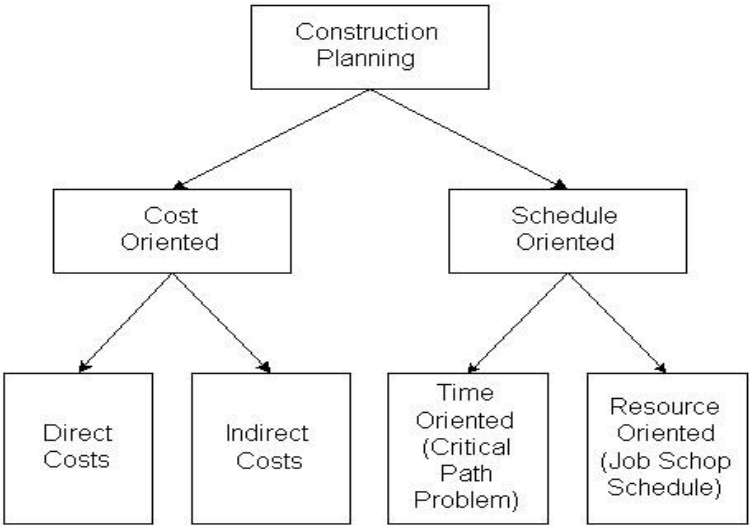
The (10)…… stage involves the development of a cost and duration estimate for the construction of a facility as part of the proposal of a contractor to an owner. It is the stage in which assumptions of resource commitment to the necessary

activities to build the facility are made by a planner. A careful and thorough analysis of different conditions imposed by the construction project design and by site characteristics are taken into consideration to determine the best estimate. The success of a contractor depends upon this estimate, not only to obtain a job but also to construct the facility with the highest (11)……... . The planner has to look for the (12)…… combination that will allow the contractor to be successful in his (13)…….. . The result of a high estimate would be to lose the job, and the result of a low estimate could be to win the job, but to lose money in the construction process. When changes are done, they should improve the estimate, taking into account not only present effects, but also future outcomes of succeeding activities. It is very seldom the case in which the output of the construction process exactly echoes the estimate offered to the owner.

In the (14)…… *and control stage* of the construction process, the construction manager has to keep constant track of both activities‟ durations and ongoing costs. It is misleading to think that if the construction of the facility is on schedule or ahead of schedule, the cost will also be on the estimate or below the estimate, especially if several changes are made. Constant evaluation is necessary until the construction of the facility is complete. When work is finished in the construction process, and information about it is provided to the planner, the third stage of the planning process can begin.

The *evaluation* stage is the one in which results of the construction process are matched against the estimate. A planner deals with this uncertainty during the estimate stage. Only when the outcome of the construction process is known is he/she able to evaluate the (15)…… of the estimate. It is in this last stage of the planning process that he or she determines if the assumptions were correct. If they were not or if new constraints emerge, he/she should introduce corresponding adjustments in future planning.

Exercise 7. Discuss the following diagram, using information and your knowledge of this section.



Exercise 8.Work in pairs. Student A and Student B look at their individual information.

Student A looks at this schedule for a bridge construction project and asks Student B for the missing information.

A: When will we do the foundations?

B: We'll start in August and we‟ ll finish in December. A: So, will it take five months?

B: Yes, that's right.

A: OK, what about...?

	May	June	lyJu	August	Sept	October	Nov	Dec	Feh	March	April	May	June	July	August	Sept
Design	X	X	X													
Site preparations																
Foundations				X	X	X	X	X								
Pier construction																
Superstructure									X	X	X	X	X			
Deck																

Opening ceremony																

Student B looks at this schedule for a bridge construction project and asks Student A for the missing information.

A: When will we do the site preparations?

B: We'll start in June and we'll finish in October.

A: So, will it take five months?

B: Yes, that's right.

A: OK, what about....

	May	June	July	August	Sept	October	Nov	Dec	Feb	March	April	May	June	July	August	Sept
Design																
Site preparations		X	X	X	X	X										
Foundations																
Pier construction								X	X	X						
Superstructure																
Deck													X	X	X	
Opening ceremony																

Exercise 9. Imagine you are going to plan a project of one of the buildings. Choose one and make a presentation. You should follow a certain plan below.

1. Hospital.
2. School.
3. Hotel.
4. Residential building.

5. A big department store.

The plan:

- The architecture of an object;
- The interior design;
- Building materials - The functionality; - The costs.

Exercise 10. Read the email from a contractor to a site manager and answer the following questions.

1. When will they have a complete site plan?
2. Is the grade rod used to measure elevation changes?
3. How will they show the wall outlines?

Keith,

Today we will finish the **site layout** for the office building on Lincoln Boulevard. We will need to have a complete site plan by the end of the day. It should show the **property lines**, available **utilities**, and all significant **changes in elevation**.

I know this is your first time leading the crew. So, I will give you a few reminders. Be sure your crew brings all necessary equipment. Don‟ t forget the **builder‟ s level** and **grade rod**. You can‟ t establish **horizontal planes** or measure elevation changes without them. There are already **bench marks** set at the site to help with that. You will also need some **monuments** to stake out the property lines. Last, bring several **batter boards** and at least 100 meters of string or **wire**. Put the boards at the building corners. Then run the wire between them to show the wall outlines.

Best regards,
Jack

Exercise 11. Read the sentence pair. Choose where the words best fit the blanks.

1. Run/stake

A. _____ the wire between the batter boards.

B. Please _____ monuments at the corners of the property.

2. Builder‟ s level/grade rod

A. A _____ is an optical instrument.

B. This _____ has a target that corresponds to the instrument‟ s line of sight.

3. Bench mark/ monument

A. The _____ shows the elevation here.

B. There is a _____ here showing the boundary of the property.

Exercise 12. Write a letter from a contractor to a site manager about finishing the site layout. Use the words and word-combinations from the box.

site plan; property lines; utilities; builder‟ s level, grade rod; horizontal; bench marks; to stake out the property lines; batter boards; wire; to run.

Text B

Exercise 13. Here is the letter from a contractor to a landowner. Its parts have been mixed. Put them in the correct order.

Mr. Muldon,

___ Next, a subsurface investigation will be necessary. We need to know what kind of soil the foundation will rest on. A preliminary check showed mostly sand and larger pieces of gravel. However, there may also be weaker silt or clay soils present.

____Before we begin construction on your property, we must conduct a thorough site investigation. This letter explains the steps in that process.

___ We will dig several test pits to obtain a complete soil profile. Some of these will only be a few meters deep. For others we will use a drill rig to dig twenty meters down.

___ First we will do a complete surface investigation. This will include a topographic survey of the surface features. The designers will use this data to design appropriate landscape features. We will also know if we need to move soil to make the site level.

__Please let me know if you have any questions.

Regards,
Jackie Sandburg

Exercise 14. Read the letter once again and mark the statements as True or False.

1. The topographic survey provides data for landscape design.
2. The preliminary investigation showed silt soil to be present.
3. The soil profile includes soil from twenty meters below the surface.

Fig. 7. A surveyor at work with an infrared reflector used for distance measurement

Exercise 15. Discuss these questions with your groupmates.

1. What surveying instruments do you know?
2. What scientific knowledge do surveyors use for surveying?
3. What associated services does land surveying include?
4. Why has surveying always been important in the development of human environment?
5. What modern uses of surveying do you know?
6. How can a surveyor measure a slope?
7. How was a compass improved?

8. Why are levels calibrated?

9. How is the height of a mountain determined?

Exercise 16. Match the words with their meanings.

1.	Accomplish an objective.	A.	Встановлювати межі.
2.	Gather information.	B.	Теодоліт.
3.	Cadastral survey.	C.	Промерна рейка.
4.	Constructionlayout survey.	D.	Разбивати майданчик.
5.	Landsurvey.	E.	вісь.
6.	Elevate.	F.	План, карта.
7.	Execute.	G.	Вимірювальний інструмент.
8.	Boundarycorner.	H.	Збирати інформацію.
9.	Property boundary.	I.	Координатна площина.
10.	Establish boundaries.	J.	Участок.
11.	Measuring tape.	K.	Піднімати, підводити.
12.	Measuring instrument.	L.	Межа володіння.
13.	Leveling instrument.	M.	Рулетка.
14.	Calibrate.	N.	Досягти мети.
15.	Plane of reference.	O.	Землемірний знак.
16.	Theodolite.	P.	Кадастрова зйомка.
17.	Area.	Q.	Нівелір.
18.	Improvement.	R.	Кутова дозволяюча поверхня.
19.	Angular resolution.	S.	Кілочоч.
20.	Measuring rod.	T.	Польова (геодезична) зйомка.

21.	Peg.	U.	Оборудование.
22.	Plat.	V.	виконувати, здійснювати.
23.	Axis.	X.	Калібрувати, градуювати.
24.	Equipment.	Y.	поліпшення.

Exercise 17. Read and translate the text.

SURVEYING TECHNIQUES

Surveying or land surveying is the technique and science of determining the terrestrial or threedimensional space position of points and the distance and angles between them. These points are usually on the surface of the Earth, and are often used to establish land maps and boundaries for ownership or governmental purposes. In order to accomplish their objective, surveyors use elements of geometry, engineering, trigonometry, mathematics, physics, and law.

Surveying has been an essential element in the development of the human environment since the beginning of recorded history (5000 years ago) and it is a requirement in the planning and execution of nearly every form of construction. Its most familiar modern uses are in the fields of transport, construction, mapping, and the definition of legal boundaries for land ownership.

Historically, distances were measured using a variety of means, such as chains with links of a known length, for instance a Gunter‟ s chain or measuring tapes made of steel. In order to measure horizontal distances, these chains or tapes would be pulled according to temperature to reduce sagging and slack. Additionally, attempts to hold the measuring instrument level would be made. In instances of measuring up a slope, the surveyor might have to “break” the measurement – that is, raise the rear part of the tape upward, plumb form where the last measurement ended.

Horizontal angles were measured using a compass which would provide a magnetic bearing from which deflections could be measured. This type of instrument was later improved with more carefully scribed discs providing better angular resolution, as well as through mounting telescopes with reticles for more precise sighting atop the disc. Additionally, levels and calibrated circles allowing measurement of vertical angles were added.

The simplest method for measuring height is with an altimeter – basically a barometer – using air pressure as an indication of height, but surveying requires greater precision. A variety of means, such as precise levels, have been developed to do this. Levels are calibrated to provide a precise plane from which differentials in

height between the instrument and the point in question can be measured, typically through the use of a vertical measuring rod.

With the triangulation method, one first needs to know the horizontal distance to the object. The height of an object can be determined by measuring the angle between the horizontal plane and the line through that point at a known distance and the top of an object. In order to determine the height of a mountain, one should do this from the sea level, but here the distances can be too great and the mountain may not be visible. So it is done in steps, first determining the position of one point, then moving to that point and doing a relative measurement, and so on until the mountain top is reached.

Exercise 18. Read the text and mark the sentences as True or False:

1. Surveying or land surveying is the technique and science of determining the space position of points and the distance and angles between them.
2. In order to accomplish their objective, surveyors use elements of medicine and linguistics.
3. Distances were measured using a variety of means, for instance a Gunter‟ s chain or measuring tapes made of steel.
4. In instances of measuring up a slope, the surveyor might have to “raise” the measurement.
5. The simplest method for measuring height is with an altimeter – basically a barometer – using wind as an indication of height.

Exercise 19. Find the definitions of the following terms in the text and translate them into Russian. Make sentences using these words:

a) surveying;
b) chains;
c) a compass;
d) an altimeter;
e) a leveling instrument;
f) calibrated circles;
g) a triangulation method.

Exercise 20. Read the text about land surveying and fill in the necessary words and wordexpressions from the box:

Cadastral surveys; boundaries; survey monumentation; woodlines;
re-establishment; map grid; pegs; wreak havoc; parole evidence; abutting; properties; land titles; flexible tape; survey control; brass caps; discrepancies; bounding.

LAND SURVEYING

The aim of (1)…… is to re-establish and mark the corners of original land (2)…….. . The first stage is to research relevant records such as (3)……. (deeds), (4)……. (marks on the ground) and any public or private records that provide relevant data. The job of a boundary surveyor retracing a deed or prior survey is to locate such monuments and verify their correct position. Over time, development, vandalism and acts of nature often (5)…….. on monuments, so the boundary surveyor is often forced to consider other evidence such as fence locations, (6)……, monuments on the neighboring property, (7)…….. and other evidence.

Monuments are the marks on the grounds that define location. (8)…… are commonly used to mark boundary corners. Small pegs in the ground and steel rods are used as instrument locations and reference marks, commonly called (9)……. . Marks should be durable and long lasting, stable so the marks do not move over time, safe from disturbance and safe to work at. The aim is to provide sufficient marks so some marks will remain for future (10)…….. of boundaries. Examples of typical man-made monuments are steel rods, pipes or bars with plastic, aluminum or (11)…….. containing descriptive markings and often bearing the license number of the surveyor responsible for the establishment of such. The material and marking used on monuments placed to mark boundary corners are often subject to state laws.

A total station or GPS (Global Positioning System) is set up over survey marks which were placed as part of a previous survey, or newly placed marks. The datum is established by measuring between points on a previous survey and a rotation is applied to orientate the new survey to correspond with the previous survey or a standard (12)…….. . The data are analyzed and comparisons are made with the existing records to determine evidence which can be used to establish boundary positions. The distance of lines between the boundary corners and total station positions are calculated and used to set out and mark the corners in the field. Checks

are made by measuring directly between peg places using a (13)……. . Subdivision of land generally requires that the external boundary is re-established and marked using pegs, and the new internal boundaries are then marked. A plat (survey plan) and description (depending on local and state requirements) are compiled, the final report is lodged with the appropriate government office (often required by law), and copies are provided to the client.

Many (14)…… have considerable problems with regards to improper (15)……., miscalculations in past surveys, titles, and others. Also many properties are created from multiple divisions of a larger piece over the course of years, and with every additional division the risk of miscalculation increases. The result can be (16)……. properties not coinciding with adjacent parcels, resulting in gaps and overlaps. The art comes in when a surveyor must solve a puzzle using pieces that do not exactly fit together. In these cases the solution is based upon the research of the surveyor, and following established procedures for resolving (17)……... .

Exercise 21. Complete the sentences choosing the best variant according to the text "Land Surveying":

1. A boundary surveyor‟ s job is

A. to mark the corners of the land boundaries desired by a customer.

B. to provide some relevant data.

C. to locate marks on the ground.

2. Pegs are used to

A. verify the boundaries.

B. locate boundaries.

C. make work safe.

3. To establish boundary positions

A. evidence of the existing records is used.

B. the distance between points on a previous survey is measured.

C. the global positioning system is set up.

4. Checks are made by

A. marking the corners in the field.

B. measuring the distance between pegs.

C. subdividing land.

5. Many properties have problems regarding A. abutting them.
B. multiple divisions of a land piece.
C. improper calculations.

Exercise 22. Read the sentence and choose the correct word.

1. The contractor will need a *test pit* / *surface investigation* ten feet deep at this location.

2. Some soil will have to be moved to make this area *sand*/*level*.
3. Can that *test pit*/ *drill rig* make a hole 25 meters deep?

4. Conduct a *subsurface investigation* / *topographic survey* to determine the foundation requirements.

5. The *drill rig* / *soil profile* shows a mix of clay and silt in this area.

Exercise 23. Match the parts of the word-combinations which come from the texts of this unit. Translate them and use in your own sentences:

1) three-dimensional;	a) data;
2) land;	b) grid;
3) data;	c) surveys;
4) property;	d) measurements;
5) land survey;	e) pressure;
6) space;	f) boundaries;
7) construction layout;	g) marks;
8) precision;	h) axis;
9) air;	i) technology;
10) reference;	j) analysis;
11) a standard map;	k) delineation;
12) rocket launch;	l) maps;

m) space

13) horizontal; position.

Exercise 24. Read the conversation between a construction company manager and an employee. Choose the correct answers.

1. What is the conversation mainly about? A. Why a drill rig is necessary?

B. When clay soil might be dangerous?

C. How to increase the strength of soil?

D. What to do for a subsurface investigation?

2. What will the woman do?

A. Dig test pits.

B. Arrange a drill rig.

C. Obtain a soil profile.

D. Order stronger soil if needed.

Contractor: Scott I need you to start that subsurface investigation tomorrow.

Employee: Okay. What will be involved in that?

Contractor: We need a complete soil profile. There is probably a good mix of soil types there. **Employee:** All right. Should I line up a drill rig?

Contractor: There is no need. It‟ s just for a house. Several small test pits should be fine.

Employee: I see. How far down should the test pits go?

Contractor: Three or four meters should be enough.

Employee: Got it. Anything else I should watch out for?

Contractor: Knowing that area, there is probably some weak clay soil. Let me know if you come across any.

Employee: Will do. Do you want me to find some stronger soil to bring in?

Contractor: No. I will take care of that. Just get me the soil data. **Employee:** Sure thing.

Exercise 25. In the previous dialogue an employee and a contractor speak about various soil types. Go online and fill in the table about types of soils.

http://www.eschooltoday.com/soils/types-of-soil.html

Fig.8. Six soil types

Soil types	**Advantages**	**Disadvantages**
Sandy soils		
Silty soils		
Clay		
Loamy soils		
Peaty soils		
Chalky soils		

Exercise 26. Find answers to the following questions about "Theodolite" on the Internet. Discuss your answers with your groupmates?

a) Why is a theodolite regarded as a key surveying instrument?

b) What does a theodolite consist of?

c) How is a theodolite adjusted?

d) How is a leveling instrument operated?

e) Why are self-levelling instruments preferred on sites?

f) What is a digital electronic level?

Exercise 27. Look at the pictures that show surveyors of different historical periods. Compare and contrast these pictures.

Fig. 9. Surveying in 1950‟ s

Fig.10. Modern Surveying

Text C

Exercise 28. Read the text below. Match each part of the text (A–C) with thecorrect heading (1–3).

1. Excavation
2. Site Clearance
3. Setting out

EXCAVATION

A. _____

Before the excavation for the proposed foundation is started, the site shall be cleared of vegetation, brushwood, stumps of trees etc. Roots of the trees shall be removed to at least 30 cm below the foundation level. The pits formed due to roots of trees, old foundations etc. shall be filled up with soil and compacted.

Fig.11. Excavation

B. _____

A bench mark shall be established at the site by a masonry pillar and connected to the nearest standard bench mark. Levels of the site should be taken at 5 to 10 m intervals depending on the terrain and the importance of the building. The centre lines of the walls are marked by stretching strings across wooden pegs driven at the ends. The centre lines of the perpendicular walls are marked by setting out the right angle with steel tapes or preferably with a theodolite. The setting out of walls shall be facilitated by having a permanent row of pillars (not less than 25 cm side) parallel to aid at a suitable distance beyond the periphery of the building so that they do not foul with the excavation. The pillars shall be located at the junctions of the cross walls and the external wall and shall be bedded sufficiently deep so that they are not disturbed during excavation for foundation. The centre lines of the walls shall be extended and marked on the plastered tops of the pillars. The tops of the pillars may be kept at the same level, preferably the plinth level. In rectangular or square settings, the diagonals shall be checked to ensure accuracy of setting out.

C. _____

For small buildings, excavation is carried out manually by means of pick axes, crow bars. spades etc. In case of large buildings and deep excavation, mechanical earth cutting equipment can be used. For hard soils when the depth of excavation is less than 1.5 m, the sides of the trench do not need any external support. If the soil is loose or the excavation is deeper, some sort of shoring is required to support the sides from falling. Planking and strutting can be intermittent or continuous depending on the nature of soil and the depth of excavation. In the case of intermittent or “open” planking and strutting the entire sides of trenches are not covered. Vertical boards (known as poling boards) of size 250 x 40 mm of the required length can be placed with gaps of about 50 cm. These shall be kept apart by horizontal waling of strong timber section 100 x 100 mm at a minimum spacing of 1.2 m and strutted by a cross piece of 100 x 100 square or 100 mm diameter. In the case of soft soils continuous or “close” planking is adopted and the vertical boards are kept touching each other without any gap as shown.

Exercise 29. Is it true or false?

1. Before the excavation for the proposed foundation is started, the site shall be cleared of the ruins of other buildings.

2. Levels of the site should be taken at 20 m intervals depending on the terrain and the importance of the building.

3. The centre lines of the perpendicular walls are marked with steel tapes or preferably with a theodolite.

4. The pillars shall be located at the cross-sections of the cross walls.

5. The centre lines of the walls shall be reduced on the plastered tops of the pillars.

6. In rectangular or square settings, the diagonals shall be checked to ensure accuracy of setting out.

Exercise 30. Match the words to make phrases.

1) to be cleared; a) strings;

2) proposed; b) with soil;

3) filled up; c) of pillars;

4) stretching; d) off;

5)row; e) distance;

6) suitable; f) foundation.

Exercise 31. Match the description of plants with their names.

1. Faceshovelexcavators.

2. Backactors (Backhoe).

3. Bulldozers.

4. Tractor shovel (loading shovel).

5. Clamshell excavator.

6. Powered shovel or drill.

1._____	They can be cable or hydraulic operated, mounted on wheel or track. They are fitted with a bucket which faces away from the machine. They are used for loosening, excavating vertical or near-vertical soil above the machine base level.

	They are not suitable for horizontal or below ground excavation.
2._____	They are used for below ground level excavation. They are used mainly for trench or large scale open excavation, but sometimes they are also used as loading machines.
3._____	They are traditionally track mounted tractors with significant weight so that they can work easier with soil. They are usually fitted with a straight or angled blade which can be slightly raised by hydraulic action to adjust level. They are used for grading materials to levels over relatively smaller area, to cut small trees, remove surface vegetation or hard surfaces etc. The max cut is about 400 mm below base of the machine.
4. _____	This machine is similar to a bulldozer but has a hydraulic operated bucket in place of the blade. Materials above the base of the vehicle can be lifted and unloadedonto a dump truck or onto a spoil heap. The bucket size varies from 0.5 m3 to 3 or 4 m3 depending on capacity of machine.
5._____	This is somewhat a crane, usually track mounted with a wire operated clamshell. It is used to handle or load soft soil on site. It is more useful in a very big site where a large amount of soil materials is required to remove.
6. _____	This is for cuttinglarger boulders or rock. Usually the drill is pneumatically operated and mounted on a tracked base. Very often, it is convertible to a backactor with the bucket replaced by the drill to

	gain flexibility and minimize capital input.

Exercise 32. Watch the video 2.1 and answer the questions.

EXCAVATION AND TRENCHING SAFETY

https://www.youtube.com/watch?v=29lCiaj3OIk

1. What is excavation according to the video?
2. What is a trench? How is it measured?
3. What are trenching hazards?
4. When does caving occur?
5. What happens when oxygen disappears?
6. When can materials that fall into excavation cause injuries?
7. How far should objects be placed from the excavation?
8. Why is water so dangerous for excavation?

Exercise 33. Brainstorm problems that can occur during excavation and discuss solutions in the group. Complete the following table.

Excavation problems	Solutions

Exercise 34. Read the e-mail from a contractor to a project manager. Then, mark the statements as true (T) or false (F).

1. _____ The worksite was flooded by runoff.
2. _____ The crew cannot use a sump to solve the problem.
3. _____ Work cannot continue until the water table is lowered.

Dear Randy,

I just wanted to let you know about a delay in construction. We ran into a problem during today‟ s excavation. While drilling, we encountered a large amount of seepage from groundwater. The water table in this area was unexpectedly high. Before we can proceed, we need to extract the water.

Since this isn‟ t runoff or standing water, it won‟ t be possible to let the water collect in a sump. The best way to solve this problem is by lowering the water level with a dewatering system. We will install a series of well-points throughout the area. As the water fills the well-points, we will use a pump to empty them. We will have to lower the water table by several feet.

I expect the process to take a few days. In the meantime, our crews will check the other areas of the construction site and make sure that this isn‟ t a problem anywhere else. If you have any questions, feel free to call me.

Marcus Adams

Exercise 35. Choose appropriate words and word-combinations. Fill in the spaces in the sentence.

water table	ground water	pump	drill	dewatering system

1. A _____ is a good way of lowering the underground water levels.

2. He attempted to _____ a hole in the ground, and hit a massive piece of rock.

3. The _____ rises and lowers according to environmental conditions, such as the amount of rainfall.

4. They used a_____ to collect the standing pool of water.

5. Most of our drinking supply comes from sources of _____ below the earth‟ s surface.

Exercise 36. Act out the roles below. Switch the roles.

Use the following phrases:

We‟ ve got a problem.

Ok, well let‟ s……

We‟ d better go with….

Student A: You are a construction worker. Talk to Student B about: water that you have encountered on the excavation site; methods of getting rid of the water.	Student B: You are a project manager. Tell Student A how to get rid of the water.

Exercise 37. Use the e-mail in exercise 34 and the conversation from exercise 36 to fill out the manager‟ s daily status report.

Excavation project:
Status report:
Problem:
Solution:

UNIT 3 BUILDING MATERIALS

The term "materials" refers to the physical matter used to produce an object or product. Materials not only comprise the products we use in our everyday lives, but define the environment in which we live.

Text A

Exercise 1. Before reading the text make sure that you understand the following words and expressions.

Durability, ecological impact, value, assumptions, processed goods, raw materials, inorganic matter, organic living matter, iron ore, clay, biotic materials, biodegradable, metal alloys, extrusion, rubbers, resins

Text A Exercise 2. Read the text and answer the questions.

1. What should be considered before choosing materials?
2. What is raw material?
3. Give examples of inorganic matter and organic living matter?

The selection of materials is one of the most important decisions that any construction engineer must make as the implications of that choice will necessarily impact all the processes and decisions that follow.

An almost unlimited number of materials exist, and new materials are evolving and being discovered at an incredibly rapid pace. Construction engineers have to consider and weigh all of the implications before choosing one particular material over other materials: how it feels, looks, smells, how heavy or light it is, its durability, cost, aesthetic or cultural resonance, ecological impact, and so on. Successful designs are dependent on the strategic selection of the best materials, coupled with the incorporation of those materials into a design that takes full advantage of their unique properties and characteristics.

Although all materials are derived from the earth, most products today are comprised of materials whose properties are far removed from those of their natural sources. In other words, most products are the result of a series of processes that transform naturally occurring substances into processed goods. Raw materials – unprocessed matter extracted directly from the earth – may be comprised of inorganic matter (iron ore, clay) or organic living matter (wood, cotton, silk). Materials comprised of organic matter are referred to as natural or biotic materials, and are for the most part easily biodegradable. Raw materials are then treated or combined with other materials to become semi–finished or processed materials (metal alloys, composites, paper, cloth). Today, these processed materials are often synthetic or man–made – that is, materials that require a series of extrusion or chemical reaction processes not found in nature (synthetic plastics, rubbers, resins, and fibers such as polyester and nylon).

Exercise 3. Fill in the blanks with the words from the text above.

1._____

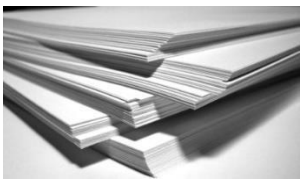
2._____

3._____

4._____

5._____

6._____



7._____

8._____

9._____

Exercise 4. Match the words with their definitions:

1. Durability.	A. An artificial material used to make cloth.
2. Man–made material.	B. A particular type of liquid, solid or gas.
3. Substance.	C. Materials, chemicals etc. that are changed naturally by bacteria into substances that do not harm the environment.
4. Biodegradable.	D. The quality of being strong and not easy to break.
5. Polyester.	E. Made by people, rather than by natural processes.

Exercise 5. Match the words with their synonyms.

1. Unlimited;	A. Quick;
2. Rapid;	B. Influence;
3. Consider;	C. Inclusion;
4. Impact;	D. One–of–a–kind;
5. Incorporation;	E. Include;
6. Unique;	F. Natural;
7. Derive;	G. Endless;
8. Comprise;	H. Obtain;
9. Organic.	I. Take into account.

Exercise 6. Use English–English dictionary to find all the definitions and synonyms for the words "Property" and "Material".

Property	*Material*

Exercise 7. Work in pairs. Find the sentences with these words in the text. Then use them in your own sentences.

Implications.	Result
Impact.	To be coupled with.
Unlimited.	Unique.
To be dependent on.	Require.
Far.	Rapid.

Exercise 8. Look back at the text and write down some questions you would like to ask about. Share the questions with your groupmates and ask them.

Text B

MATERIAS FOR CONSTRUCTION

Fig. 12. Timber Frame

Exercise 9. Match the words with their meanings.

1. Convenient.	A. Древина мяких порід.
2. Hardwood.	B. Шпилькова деревина.
3. Softwood.	C. Сосна.
4. Coniferous tree.	D. Зручний.
5. Larch.	E. Дуб.
6. Pine.	F. Ореховое дерево.
7. Spruce.	Внутрішні комплектуючі деталі
8. timber frame.	H. модрина.
9. Oak.	I. Джерело.
10. Ash.	J. Наражати на небезпеку.
11. Walnut.	K. Древесно волокнистая плита.

12. Teak.	L. Шарова древесина.
13. Interior Fitting.	M. Древина твѐ рдих порід.
14. Sustainable source.	N. Другосортний.
15. Iroko.	O. Древесно–стружкова плита.
16. Wenge.	P. Ясень.
17. To endanger.	Q. Ироко.
18. Plywood.	R. Ялина.
19. Chipboard.	S. Відповидний материал.
20. Fibreboard.	T. Деревяна конструкція.
21. Inferior.	U. Венге.
22. Valid material.	V. Тік.

TIMBER

Exercise 10. Read the text and complete it with a word from the box.

	Hardwood	Timber
Softwood	Raw timber	

A._____ is a very convenient material to use for construction. It is easy to transport and handle, and generally easy and forgiving to work with. There are two categories: hardwood and softwood. It should be understood that these names are not intended to describe the actual properties of the timber; rather they refer to its origin.

B._____ is predominantly from coniferous trees such as larch, pine and spruce, and often farmed in managed forests. It is generally used for construction

(for example, light timber frames) and therefore usually hidden from view. However, it can be used decoratively, too.

C._____ species are broadleaved trees such as oak, ash, walnut and teak. They are most often used decoratively for floors, furniture and interior fittings. Hardwoods are sometimes farmed from sustainable sources, but tropical hardwoods such as teak, iroko and wenge are vulnerable to illegal logging operations in their native forest habitats and several species are recognised internationally as being either endangered or critically endangered as a result.

D._____ can be processed into products such as plywood, chipboard and fibreboard. These materials retain many of the desirable properties of timber, such as their workability, but overcome some of the problems, imperfections and natural defects that may manifest themselves when using natural timber. They are sometimes used for construction, but can be used for furniture manufacture and may be on display. If used in this way, clients may see them as inferior or fake, but they are valid materials to use, especially in contemporary schemes, and their benefits can make them the most appropriate material choices in many situations.

Exercise 11.Answer the questions.

1. What material is convenient to use in construction?
2. What are the categories of timber?
3. What species of trees does hardwood include?
4. What species of trees does softwood include?
5. Are softwood species used for decorative purposes?
6. Tropical hardwoods are vulnerable to illegal logging operations, aren‟ t they?
7. Can raw material be processed into products such as plywood and chipboard?
8. Do raw timber materials retain the properties of timber? If yes, then what are they?

Exercise 12.Match the beginning of the sentence to its ending.

1. There are two categories …	A. Inferior or fake.
2. Light timber frames are used for construction …	B. Hardwood and softwood.
3. Hardwoods are sometimes farmed…	C. Retain many of the desirable properties.

4. Plywood, chipboard and fibreboard…	And therefore usually hidden from view.
5. Clients may see them …	E. From sustainable sources.

Exercise 13. Read the paragraph about the disadvantages of timber frame construction and fill in the gaps with the words from the box.

logging
absorbed
susceptible to
hazard
combustible
soil lead
mould
transmitter
damp
advantages

Fig.13. Using wood for timber frame construction

Timber frame construction has certain _____ but there are also disadvantages that you should be aware of before deciding if it meets your needs.

Wood is a porous and very _____ material, _____ _____water, fire and bugs. Water can be _____ into the material, causing it to rot and _____, which can compromise the strength and cause adverse health effects. This can be a major problem in humid or _____ climates.

Wood is also very flammable, which makes the material a fire _____. Ants and termites eat wood framing, with serious effects on the strength of the construction.

_____for timber framing can have a major environmental impact. Producing boards and beams for timber frame construction requires cutting down

trees. Large old–growth forests are sometimes clear cut to produce wood for timber construction, which can _____ to other problems such as _____ erosion and destruction of wildlife habitats.

Wood is an excellent _____of sound waves so any noise inside or outside is easily heard throughout the home. This can be a major problem if there are several people living in the house or if it is located near a noisy street as sounds are transmitted very clearly.

Exercise 14. Read the paragraph again and decide if the statements below are *True*or *False*.

1. Timber frame construction has certain disadvantages.
2. Wood is a nonporous material, resistant to water.
3. Water prevents the material from rotting.
4. Ants and termites can damage the strength of the construction.
5. Wood is an excellent soundproofing material.

Exercise 15.Write a list of the advantages and disadvantages of timber.

ADVANTAGES	DISADVANTAGES

Exercise 16. Prepare a report on timber including the following information: a) Types of timber;

b) Its usage;

c) Advantages and disadvantages.

Text C

Exercise 17.Match the words with their definitions.

1. Limestone. A. To arrange for something to continue for a longer period of time.
2. Stain. B. To dig stone out of the ground.
3. Fixing method. C. A type of white or grey stone containing calcium, used for building and making cement.
4. Quarry. D. A process of fastening something somewhere so that it cannot move.
5. Renew. E. To leave a mark on something accidentally.

Exercise 18. Read and translate the text.

STONE

Stone is used in construction and many types are considered attractive enough to be used for their decorative as well as their practical properties. However, natural stone should be selected carefully as some types (limestone, for example) can be porous (the result of which is that it can stain easily), can be relatively soft and may not be suitable for some uses (such as flooring, for example).

When using stone, the suppliers‟ recommended fixing methods and after–care regime should always be followed. The surface can be cut and finished in different ways to highlight colour, pattern and texture.

Construction engineers should tell their clients that as a natural material, installed stone may not match completely any samples which have previously been viewed, as there may be significant variations in pattern or colour, even from stone quarried at the same time and in the same location.

Although relatively little energy is used to finish stone to a usable condition, it is not a sustainable material simply because once quarried, the source cannot be renewed.

Exercise 19.Answer the questions.

1. Where is stone used?
2. Why should stone be selected carefully?
3. Is limestone suitable for flooring? Why?
4. What should you pay attention to when using stone?
5. The surface can be cut and finished only in one way, can‟ t it?
6. Is stone a sustainable material?

Exercise 20. Match the words and phrases from the text.

Usable;	Variations;
Practical;	Regime;
The surface can be;	Can be porous;
Limestone;	Stone;
Natural;	Properties;
After–care;	Material;
Significant;	In construction;
Sustainable;	Condition;
Stone is used.	Cut and finished.

Exercise 21. Put the words in the correct order to make complete sentences.

1. stone / carefully/ natural / should / selected / be /
2. easily / can / it / stain
3. suitable / may / they / for / be / uses / not
4. may / significant / there / be / colour / in / pattern / or / variations
5. sustainable / is / a / it / material / not
6. renewed / cannot / the / be / source

Exercise 22. Translate the following word–combinations. The text above will help you.

1. Декоративні та практичні властивості.
2. Природний камінь.
3. Відповідний для використання.
4. Спосіб прикріплення.
5. Повністю відповідати.
6. Значні зміни.
7. Стан експлуатаційної готовності.

Exercise 23. Make up 7 sentences using the phrases from the exercise above.

Text D BRICKS

Exercise 24. Read the text and label the pictures.

Bricks are made from **clay**. Clay is dried, preheated and fired at 800–1100°C for about three hours. Some types of high–

fired bricks are fired at 1100–1200°C. Brick fired at sufficiently high temperatures so that it sinters completely

(fireproof brick) is used mostly in **chimneys** and fireplaces.

Brick with a varying degree of high–firing characteristics is available. And it is best to use brick which has been fired at as low a temperature as possible. There are solid bricks and hollow bricks. Additives such as **sand**, **sawdust** or finely ground brick can be added to minimize shrinkage during firing. When sawdust is added, it burns off and leaves spaces that

have an insulating effect. Brick is, in principle, maintenance– free. A new product is **honeycomb brick**. Walls made with this are no thicker than 2 3mm. It is made of especially fine

porous clay using thin cellulose fibres as porosity builders. With honeycomb brick, insulation values similar to light weight concrete can be achieved.

Brick can be used as construction material, lining, and floor and ground covering (pavers). There are also special

hollow brick block units that can be used in ceilings or walls as well as in floor structures. Brick surfaces can be treated with linseed oil (floors), can be polished, whitewashed or painted

(walls). Bricks can be reused after the mortar has been removed. If brick is to be reused, quality control checks for compressive strength, frost resistance and contamination should be carried out.

Exercise 25. Answer the questions.

1. What is brick made from?
2. Why is brick fired at high temperatures?
3. Where is such brick used?
4. What types of bricks are there?
5. What additives can be added to minimize shrinkage during firing?
6. What is honeycomb brick?
7. How can brick be used?
8. How can brick surfaces be treated?

Exercise 26. Complete the sentences with the missing information.

1. Clay is dried, _____ and _____ at 800–1100^{0}C for about three hours.
2. Brick fired at _____ _____ temperatures.
3. There are _____ and _____ bricks.
4. Additives such as _____, _____ or _____ _____ brick can be added.
5. Brick is _____.
6. Honeycomb brick is made of _____ _____ clay.

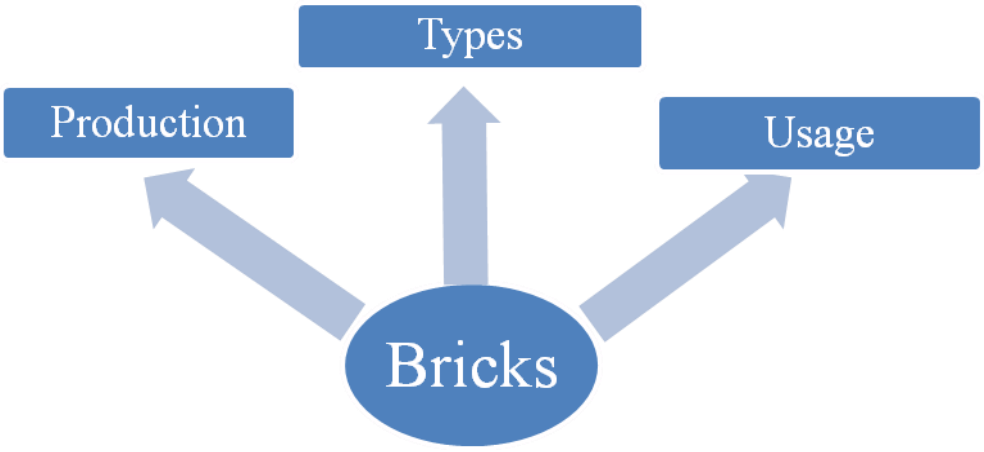
Exercise 27. Work in pairs. Find the sentences with these words in the text. Then use them in your own sentences.

Clay;	• Additives;
Fireproof;	• Burn off;
Mortar;	Fibres;
Values;	• Surface.

Exercise 28. Go online and find out more about advantages and disadvantages of bricks. Complete the table.

ADVANTAGES	DISADVANTAGES

Exercise 29. Write a summary of the text using the flow chart.



Text E

Exercise 30. Match the words with their meanings.

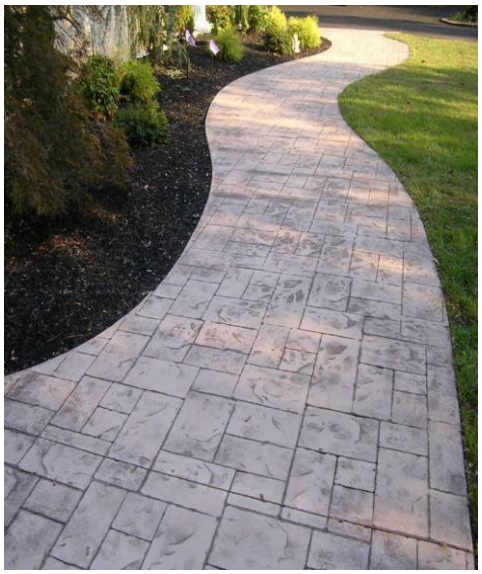
1. Cement.	a. Замінити.
2. Gravel.	b. Компенсувати.
3. Slabs.	c. Наповнювач.
4. Shuttering.	d. Цемент.
5. In conjunction.	e. Опалубка.
6. Tensile force.	f. У поєднанні.
7. Aggregate.	g. Плиты.
8. Substitute.	h. сила що розтягує.
9. Offset.	i. Галька.

Exercise 31. Read the text and fill in the gaps with the words from the box.

Slabs	Versatile	Gravel	Columns
Rods	Offset	Vast	Building Material

CONCRETE

Concrete has been used as a _____ _____ for centuries. It is a mix of cement with an aggregate, traditionally stone chippings or _____. Concrete is generally used in construction, where it is poured to form _____ for floors and foundations, or into moulds (called shuttering) to form vertical features such as walls or _____. It is often used in conjunction with steel reinforcing _____ that combat tensile and shearing forces, but it is a very _____ material. It is increasingly used for its decorative qualities as it can be polished and coloured. The gravel aggregate can be exposed, or other materials (such as crushed recycled glass) may be substituted, which give new opportunities for colour and texture when the surface of the concrete is polished. However, the



manufacture of cement used for concrete uses _____ amounts of energy and produces a great deal of pollution, to the extent that many construction engineers choose not to use the material because of the environmental harm that it causes. If used in large quantities in a structure, though, this damage may be _____ by the thermal store effect of the mass of concrete which helps to regulate temperature. Considered over a period of at least 15 years (depending on the installation), this can offset energy used during manufacture.

Exercise 32. Answer the questions.

1. What is concrete made of?
2. Where is it generally used?

Fig.14. Concrete is a mix of cement with an aggregate

3. Concrete is often used in conjunction with steel reinforcing rods, isn‟ t it?
4. Can it be polished and coloured?
5. What gives substitution of materials?
6. Does concrete production cause a great deal of pollution?

Exercise 33. Read the text again and choose the best alternative.

1. Concrete is a mix of *cement/ clay* with an aggregate.
2. Concrete is poured into moulds to form *horizontal/ vertical* features such as walls or columns.
3. It is a very *limited / versatile* material.
4. Other materials *may / may not* be substituted.
5. The manufacture of cement uses *vast / small* amount of energy.

Exercise 34. Write a list of advantages and disadvantages of concrete.

ADVANTAGES	DISADVANTAGES

Exercise 35. Work in pairs. Find 6 words in the text and make up sentences with them. Then read your answers to your groupmate. Your partner is to guess the keywords that were taken from the text.

Text F Exercise 36. Match the words to their definitions.

1. Steel. A. A long narrow piece of metal.
2. Sheet. B. A piece of material like a net, made from a lot of closely connectedwires, strings etc.
3. Bar. C. The pattern that is formed in a cloth when it is woven.
4. Mesh. D. A strong metal made from a mixture of iron and carbon.
5. Weave. E. Stiff, hard, and difficult to bend or move.
6. Rigid. F. A thin flat piece of paper, metal, plastic, glass etc.
7. Warp. G. A chemical element that is a red–brown metal. 8. Copper. H. To become bent or curved, usually because of damage by heat or water.

Exercise 37. Read and translate the text.

STEEL AND OTHER METALS

Fig.15. Metals for Construction

Used in large amounts in the construction of the frames of many structures, steel is another material that is being used more for its aesthetic qualities. As always, careful selection of materials is important as there are different types and grades of steel suitable for different purposes. Decoratively, stainless steel is most commonly used for kitchen appliances, but other steels can be used for other purposes. Steel is available as sheets, bars and tubes in various sizes. It can be formed into different shapes by metal fabricators.

Architectural metal mesh is a relatively new treatment that has great decorative potential in which steel cable and rods are woven into sheets. Depending upon the weave and the gauge (size) of material used, the mesh may be completely rigid, or it may flex parallel to the warp or weft, allowing it to be wrapped around other objects and surfaces.

Other metals used both in construction and for their decorative qualities include aluminum, zinc and copper. Construction engineers should carefully consider the effects of oxidation on the visual appearance of these materials, and protect against this as appropriate. Some metals are also relatively soft, and wear and tear needs consideration before specifying.

Exercise 38. Read the text again and decide if the statements are *True*or *False*.

1. Steel is being used for its aesthetic qualities.
2. Stainless steel is applicable everywhere.
3. Steel is available in one size.
4. It can take different shapes.
5. All metals are soft.

Exercise 39. Work in pairs. Choose 10 words from the text and make up sentences with them. Then read your answers to your groupmate. Your partner is to guess the keywords that were taken from the text.

Exercise 40. Work in small groups. Discuss the properties of metals and its application answering the following questions.

1. Why is steel used in construction?
2. What is steel suitable for?
3. What forms can steel be shaped into?
4. What is architectural metal mesh?
5. Other metals like aluminum, zinc and copper are used in construction and for decorative purposes, aren‟ t they?

Text G

GLASS

Exercise 41. Read and translate the text and complete the words in the box.

Hinges	shatters	shelving	transparent
Shards		toughened	interesting

Glass can be used as an _____material in its own right, rather than simply being a practical choice of _____ material for windows. Glass has many uses such as for _____, work surfaces and splash–backs, doors, screens and wall panels. For any interior application, _____ or tempered glass should be specified. Such glass has been made safer by heat treating. This makes it around five times stronger, but it also affects

Fig.16. Glass has many uses in construction

the properties of the glass. When it is broken it _____in small square fragments, which are unlikely to injure in comparison with long _____. However, after heat treatment, the glass cannot be cut or worked, so any drilling or cutting required for _____ and handles must be done before that.

Exercise 42. Answer the questions.

1. Is glass used only as transparent material for windows?
2. Where can glass be applied?
3. Should glass be specified for interior application?
4. What makes glass safer?
5. Can glass be cut or worked after heat treatment?

Exercise 43.Match the beginning of the sentence to its ending.

Transparent material …	Work surfaces and splash–backs.
Glass is used for …	Cut or worked.
Tempered glass should be …	Glass.
Five times …	For windows.
Properties of the …	Specified.
The glass cannot be …	Stronger.

Exercise 44. Put the words in the correct order to make sentences.

1. an / material / be / interesting / glass/ as / can / used
2. be / specified / glass/ should / tempered
3. affects / also / it / the / glass / the / properties / of
4. be / done / drilling / must / or / treatment / before / cutting / heat / the

Exercise 45. Use a dictionary to find all the definitions of the word "glass" and make up sentences to show all their meanings.

Exercise 46. Complete the crossword using the words from this Unit.

<u>Across</u>

1. A chemical element that is a red–brown metal.
3. Able to be used in many different ways.
7. A type of white or grey stone containing calcium, used for building and making cement.
9. A grey powder made from lime and clay that becomes hard when it is mixed with water and allowed to dry, and that is used in building.

10. A hard clear substance used for making objects such as windows or bottles.

14. To use something new or different instead of what is normally used.

Down

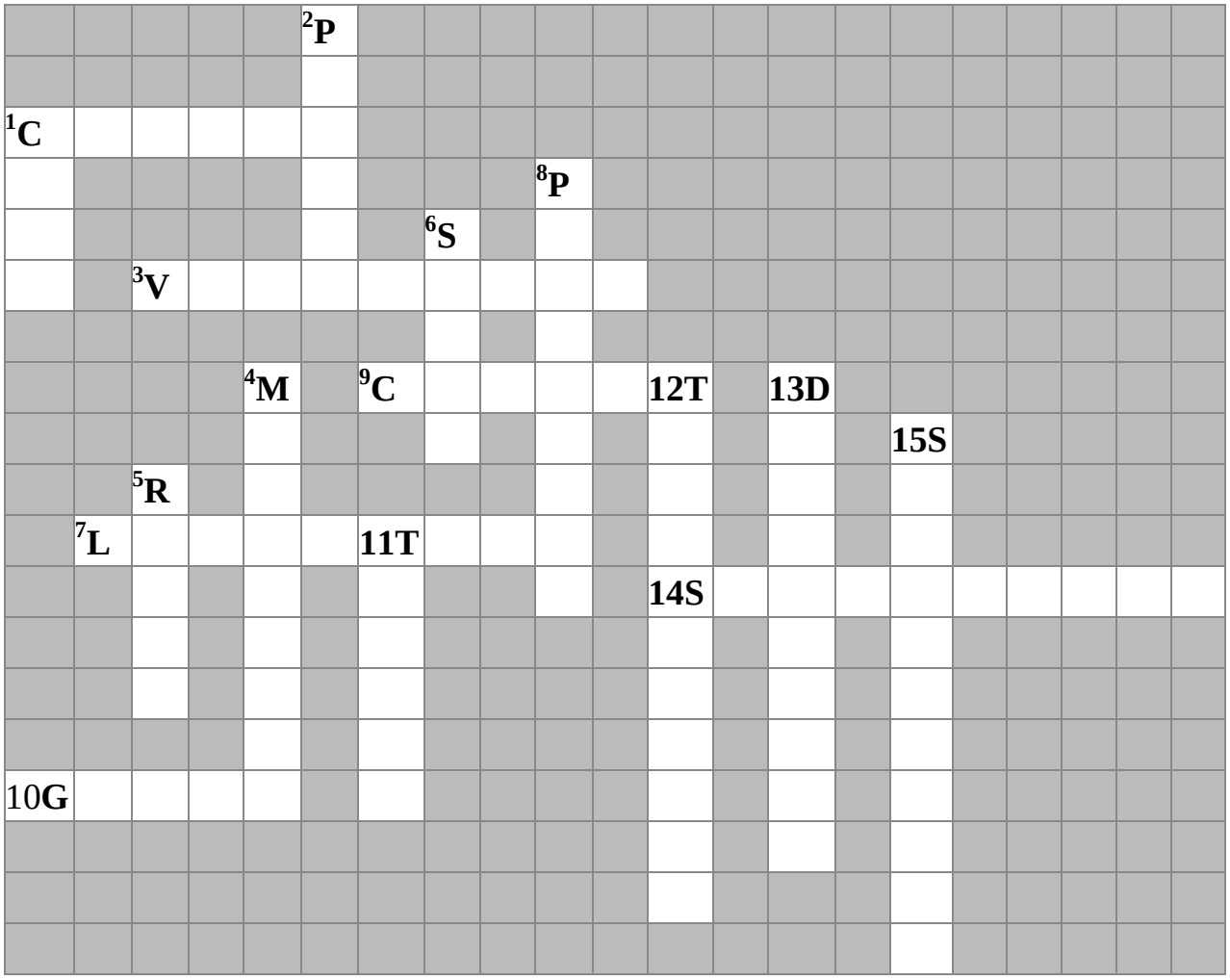
1. A type of heavy wet soil that becomes hard when it is baked in a kiln, used for making cups, plates and other objects.
2. Allowing liquid, air etc. to pass slowly through many very small holes.
4. Solid substances from which things can be made.
5. Stiff, hard and difficult to bend or move.
6. A strong metal made from a mixture of iron and carbon.
8. An artificial material used to make cloth.

11. Wood prepared for use in building and carpentry.

12. An object or substance that is clear or thin enough for you to see things through.

13. The quality of being strong and not easy to break.

14. Causing little or no damage to the environment and therefore existing for a long time.



Exercise 47. You are going to watch the video by Rachel Armstrong talking about The Architecture That Repairs Itself. First read the captions (Fig. 6, 7) and answer the questions. a) What is her profession?

b) What does to grow architecture mean?

c)List the topics you think the video will cover. Share your ideas with a partner.

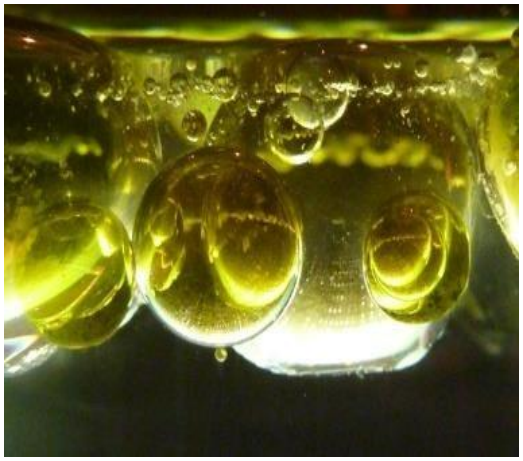


Fig.17.Protocells produce solid substances which may have future architectural applications

Fig.18. Rachel Armstrong is a sustainability innovator who creates new materials that possess some of the properties of living systems, and can be manipulated to "grow" architecture.

Exercise 48. Watch Video 3.1 and answer the questions.

https://www.ted.com/talks/rachel_armstrong_architecture_that_repairs_itself

1. What do Victorian technologies involve?
2. Are these technologies sustainable?
3. What is metabolism?
4. Do metabolic materials exist or the speaker has to make them?
5. How does Rachel Armstrong explain the definition of a protocell?
6. What construction approaches for architecture are they trying to create?

7. How can the protocell technology help to sustainably reclaim Venice?
8. What are the benefits of metabolic materials?

Exercise 49. Watch the video again and fill in the missing words.

All buildings today have something in_____. They're made using Victorian _____ but it is not sustainable. The only way to _____ genuinely sustainable homes and cities is by connecting them to nature, not _____ them from it._____ systems are in constant conversation with the natural world, through sets of chemical reactions called _____. It is the conversion of one group of _____ into another, either through the production or the absorption of energy. _____ materials don't exist. We generate these new materials from a _____ up approach. That means we're _____ them from scratch. So, Martin works with a system called the _____. It's got a chemical battery in it. And it has no DNA. It is able to move around its _____. It can follow chemical gradients. It can _____ complex reactions, some of which are happily architectural.

Exercise 50. Choose the correct definition for each of the bold words.

1. Protocell is able to **conduct** itself in a way that can only be described as living. a. Search

b**.** Behave

2.When we think about **scaling up** metabolic materials, we can start thinking about ecological interventions.

a. Expand
b. Carry out
3. Venice has a **tempestuous** relationship with the sea, and is built upon wooden piles.
a. Intense
b. Gentle
4. We have an architecture that connects a city to the natural world in a very direct and **immediate** way.

a. Powerful

b. Quick

5. This is **terrestrial** chemistry.

a. Artificial

b. Earthly

6. Metabolic materials are generated as a **counterpoise** to Victorian technologies.

a. Offset

b. Foundation

Exercise 51.Look again at Armstrong‟ s presentation and answer the questions.

1. In what ways can architecture repair itself?
2. In the video segment the speaker gave an example of Venice. Can you think of any other places where protocell technology would be appropriate? **Explain your ideas to a partner.**

Exercise 52. Go online and read Rachel Armstrong‟ s interview on the "living" cities of the future.

http://blog.ted.com/new–ted–book–envisions–the–living–cities–of–the–future/

1. What does the author mean by living architecture?
2. What is the concept of living technology? **Share your information with the class.**

Exercise 53. Work in small groups. Imagine you are building a house.

In your group discuss what materials you would choose and why. Then present it to others explaining your decision.

Exercise 54. Prepare a report on one of the building materials. Give a presentation including the following information. Be ready to answer any questions your groupmates may have.

1. Definition.
2. Types, if there are any.
3. Advantages.
4. Disadvantages.
5. Application.
6. Your personal opinion.

SUPPLEMENTARY READING

Unit 1. Career in Construction

CAREER IN CONSTRUCTION MANAGEMENT

Traditionally, construction has involved the three-party, two-relationship model. The first is the owner designer relationship, in which the project owner appoints the designer (usually an architect or an engineer) to plan or design the project. The second, that commences after the design is ready, is the owner contractor relationship. The contractor is given the project to realize based on the quotation of costs and expenditure. Recently, however, this model has undergone a radical change. The trend now is to rely on construction management.

Construction Management is also the study of construction with regard to managerial and technological aspects like construction management, construction science, construction risk etc. The most common and widely recognized format for construction management education is the scholastic degree, baccalaureate, and graduate degree. Other formats may be on the job training and apprenticeship, and higher education. High school students who want a career in construction management should take a lot of maths, also Chemistry, physics and accounting. Many colleges and universities offer master‟ s degrees in construction management or construction science. Someone who has a bachelor‟ s degree in an unrelated field can also get a master‟ s degree in construction management. One can obtain a master‟ s degree in finance or business administration to improve career prospects. There are also industry association sponsored training programs.

Excellent construction management employment opportunities are available as the huge construction boom needs a large number of qualified individuals. Also, the increasing complexity of construction projects is creating extra demand for managers. New technology and laws setting standards for materials, safety, and environmental impact have complicated the construction process, requiring trained managers to

handle it. Opportunities for advancement may vary depending upon the person‟ s performance and the size and type of company.

Construction/Project managers have limitless employment opportunities both in public and private sector infrastructure development companies. Government departments like railways and defence are among the top employers of construction/project managers. Project managers also find favorable employment options in power, energy, telecommunication and IT related companies. They can work with real estate developers. Small companies may hire project/construction managers for proper management of their projects. Experienced project managers can work independently as consultants.

Construction managers must be flexible and effective. They must be decisive and work well under pressure, or with unexpected delays. Good communication skills and language competence are important. Construction managers have to be “on call” at all times to deal with emergencies on-site. Be prepared to work much more than a 40-hour week to meet established construction deadlines. The work is not dangerous; however, construction managers must be careful onsite. Also, be prepared to be out in all kinds of weather, and wet muddy sites. However, if you are an outdoors person, this field should be perfect.

CONSTRUCTION SITE WORK

Any construction site work requires qualified people in different trades and engineers to oversee their work. Opportunities in construction depend on the state of the economy, which largely governs construction activities.

Construction site work to be done by any engineer will depend on the size and complexity of the project. Smaller projects may require a single engineer who would have to handle all aspects. As project sizes grow, workloads in various branches of the project increase, there is a need in an engineer to supervise and oversee only the particular department to which he is assigned. Engineers during their professional education and training are given the necessary skills and knowledge in all aspects of engineering and the trades to provide supervisory and supporting roles in the construction field. In addition, they have knowledge of scheduling, planning, design, surveying, management, and the cost aspects of a project. One thing that has to be constantly kept in mind by anyone seeking opportunities in construction is that such works are of a temporary nature and only last until the completion of the project.

Engineers concerned with direct field work have to allocate the work to various agencies under their control, arrange for materials and equipment, and ensure that the works are carried out by the workers as per the specifications laid down and as per drawings given to them by the planners. They would have to ensure that the work is carried out as per the given schedule, and this would require constant monitoring of the productivity of the workers under their control. The safety aspect of the workers has also to be ensured by the engineer.

Unit 2. Planning, Surveying and Excavation

THE CONSTRUCTION PLANNER

Construction project planning is receiving growing attention as the limitations of formal deterministic planning are becoming more widely recognised. There is growing concern over the failure of construction planning to achieve its goals in spite of the considerable resources allocated to it. Deficient planning techniques are commonly blamed for this state.

There has been considerable debate over the last decade or so on the effectiveness of construction project planning. However, there is remarkably little research into what construction project planners actually do.

Laufer and Tucker provide a critique of construction planning.

They protest that:

- the planning and evaluation of planning processes are non-existent;
- there is over-emphasis on critical path methods;
- planners lack construction experience;
- planners have poor information gathering methods;
- planning is control-oriented instead of action-oriented;
- Plans have beenpoorly presented with overly-complex information.

In a subsequent paper Laufer and his colleagues look at the definition and allocation of planning work. They found that there was no clear system at work and planning was done in a multiplicity of ways. They call for the process to be properly co-ordinated by a single individual who will 'own' the planning process and improve communication. Winch and Kelsey believe the specialist planner has the time to do the work but incomplete practical knowledge. The line manager has the practical knowledge but does not have the quality time to carry out the task. The specialist planner has better strategic decision-making skills than the short-term decision-making focus of the line manager. They then go on to say “Line managers see the delegation of key decision-making to another as a threat to their position”.

These problems are confirmed in Laufer wider project management study and can result in:

- The planner preparing a plan which has incomplete information and in-adequate decision making authority.
- The line manager treating such plans as merely an irrelevant forecast prepared by another.

Allen & Smallwood believe Construction planners and the role they perform are little understood both within the construction industry and the wider environment where construction has a daily impact.

Planning occupies a central position in the functions of the manager. His responsibilities may vary with organisational philosophy and contingency but planning invariably remains an essential ingredient of his duties. Much Research and Development effort has been made during the last three decades but progress with techniques has not removed the dissatisfaction with the application and results of construction planning.

Effective construction planning demands that it is carried out by competent and experienced personnel. While the estimator must remain in charge or pricing the work, most contracts, today, are too complex for the estimator to handle the technical content of pre-tender appraisal. It is here that the construction planner has a major function.

WHAT IS TRIANGULATION SURVEYING?

Triangulation is the tracing and measurement of a series or network of triangles in order to determine the distances and relative positions of points spread over an area, especially by measuring the length of one side of each triangle and deducing its angles and the length of the other two sides by observation from this baseline. This was first introduced by a Dutch man named Sneli.

Triangulation is preferred for hills and undulating areas, since it is easy to establish stations at reasonable distances apart, with intervisibility. In plane and crowded areas it is not suitable as the intervisibility of stations is affected. The difficulty is overcome by building towers which is quite expensive. The main disadvantage of triangulation is the accumulation of error in the lengths and direction of lines, since both of them, for successive lines, depend upon the computations for those of the preceding line, which necessitates the check bases.

In triangulation, entire area to be surveyed is covered with a framework of triangles. For the triangle, the length of the first line, which is measured precisely, is known as Base line. The other two Computed sides are used as new baselines for two other triangles interconnected with the first triangle.

By extending this process, a chain or network of triangles can be spread over the entire area.

The field work of a triangulation is carried out in the following well defined operations:

- Reconnaissance.

- Stationpreparation.
- Baselinemeasurement.
- Measurementofangles.

Besides field work, triangulation consists of the specifications, the design of stations and signals, and the reduction and adjustment of the observations.

ApplicationsofTriangulationSurveying:

- Establishing accurately located control points for plane and geodetic surveys of large areas.
- Establishing accurately located control points in connection with aerial surveying.
- Accurate location of engineering projects such as Centre lines, terminal points and shafts for long tunnels, and Centre lines and abutments for long span bridges.

Triangulation Systems:

It is a system consisting of triangulation stations connected by a chain of triangles. The complete figure is called Triangulation System. The most common type of figures used in a triangulation system are:

- Triangles.
- Quadrilaterals.
- Polygons.

Geometric conditions to be fulfilled by above figures in triangulation system are:

- The sum of interior angles should be $(2n-4)x90^o$, where n = no. of sides of the figure.
- If all the angles are measured at a station, their sum should be 360^o.
- The length of sides calculated through more than one routes should agree.

It is impossible to fulfil all the geometric conditions, owing to the errors, until the field measurements have been adjusted.

DEEP EXCAVATION

Deep excavation, unlike a shallow one, often requires protecting the sides of cut using suitable support. Besides, the problem of ground water cannot be avoided. There are methods to overcome this, such as:

Dumpling method. This is used where there are buildings or streets in the proximity. The method is to construct a series of retaining walls in trench, section by section, around the site perimeter, leaving a centre Called “dumpling”. When the perimeter walls are in place, excavation may start at the centre of the dumpling, until exposing a section of the wall. Then the wall may be side supported by struts, shoring or soil anchor etc., again section by section in short length, until the excavation is all completed. This method does not require much heavy mechanical equipment and thus

the cost of work is relatively lower. It can excavate up to a maximum depth of about 3m. Sometimes in very poor soil or in waterlogged ground, interlocking steel sheet pile may be driven to confine the area to be excavated. Excavation can be done after that. Excavation may reach the maximum of about 15m with the sheet piles application. However, the cost of work will be increased.

Diaphragm walling. This method is necessary for constructing a R.C. retaining wall along the area of work. Because the wall is designed to reach very great depth, mechanical excavating method is used. The typical stages of work are: a) construct a guide wall; b) excavation for the diaphragm wall; c) excavation support using bentonite slurry; d) inert reinforcement and concreting.

A guide wall is two parallel concrete beams running as a guide to the clamshell which is used for the excavation of the diaphragm wall.

Excavation for the diaphragm wall is done using a clamshell or grab suspended by cables to a crane.

Excavation for the diaphragm wall produces a vertical strip in soil which can collapse easily. Bentonite slurry is used to protect the sides of soi1. Bentonite is a naturally occurring clay which, when added to water, forms an impervious cake-like slurry with very large viscosity. The slurry will produce a great lateral pressure sufficient enough to retain the vertical soil.

Reinforcement is inserted in form of a steel cage, but may require extending to the required length. Concreting is done using a tremie.

Diaphragm walling cannot be constructed continually for a very long section due to tremendous soil pressure. Two stop end tubes will be placed at the ends of the excavated trench before concreting. The tubes are withdrawn at the same time of concreting so that a semi-circular end section is formed. Wall sections of this type are built alternatively leaving an intermediate section in between. The interior sections are built similarly but without the end tube. At the end a continual diaphragm wall is constructed with the sections tightly joined by the semi-circular groove.

Unit 3. Building Materials

A STEEL BUILDING

A steel building is a metal structure fabricated with steel for the internal support and for exterior cladding, as opposed to steel framed buildings which generally use other materials for floors, walls, and external envelope. Steel buildings are used for a variety of purposes including storage, work spaces and living accommodation. They first gained popularity in the early 20th century. Their use became more widespread during World War II and significantly expanded after the

war when steel became more available. Steel buildings have been widely accepted due to cost efficiency. The range of application has expanded with improved materials and design capabilities provided by computer design software.

Using steel minimizes mold in residential buildings. Mold needs moist, porous material to grow. Steel does not have those problems. Steel is also a „green‟ product. Steel doesn‟ t warp, twist or bend and is 100% recyclable. Some common types of steel buildings are "straight–walled" and "arch." Further, the structural type may be classed as clear span or multiple span. A clear span building does not have structural supports (e.g. columns) in the interior occupied space.

Steel arch buildings are commonly used in the agricultural industry. Straight–walled buildings provide more usable space when compared to arch buildings. They are also easier to blend into existing architecture. Straight–walled buildings are commonly used for commercial, industrial, and many other occupancy types. Building portions that are assembled in a shop before shipment to site are commonly called pre–fabricated. The smaller steel buildings tend to be pre–fabricated or simple enough to be constructed by anyone. The larger steel buildings require skilled construction workers, such as ironworkers, to ensure proper and safe assembly.

There are five main types of structural components that make up a steel frame – tension members, compression members, bending members, combined force members and their connections. Tension members carry tensile forces or pulling forces. Compression members are considered as columns, struts, or posts. They are vertical members or web members in trusses and joists that are in compression. Bending members are also known as beams, girders, joists, spandrels and girts.